ICABGEH-18

INTERNATIONAL CONGRESS ON DOMESTIC ANIMAL BREEDING GENETICS AND HUSBANDRY

2018

Proceedings of the ICABGEH-18

Antalya, TURKEY

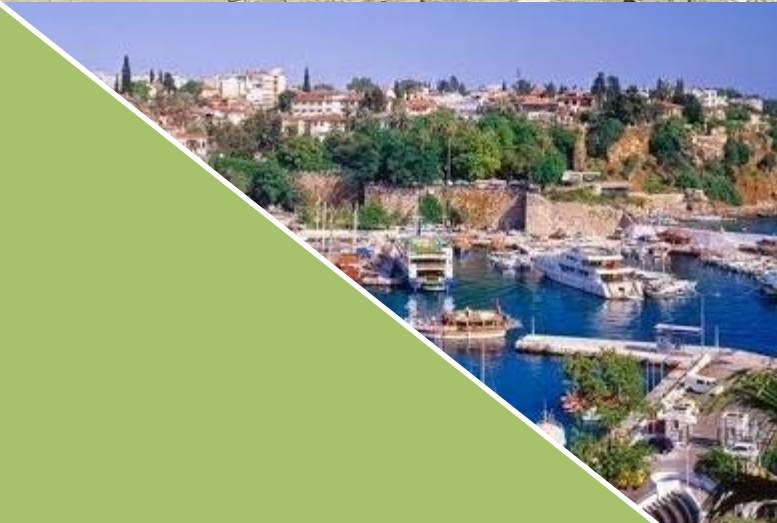
26-28 September 2018

Editors

Dr. Hasan ONDER

Dr. Ugur SEN

ISBN: 978-605-5085-19-3



Proceedings of the ICABGEH-18

Antalya, TURKEY

26-28 September 2018

Organized by

Proceedings of the International Congress on Domestic Animal Breeding Genetics and Husbandry 2018 "ICABGEH-18"

Publisher: Black Sea Publishers

E-Book Layout, Preparation and Composition:

Hasan ONDER, Ugur SEN, Cem TIRINK, Samet Hasan ABACI, Lutfi BAYYURT

All published articles were peer-reviewed by Scientific Committee

The organizers do not have any legal liability for to contents of the presentation text

Sponsors


ONDOKUZ MAYIS ÜNİVERSİTESİ


BS Publishers


TÜRKOĞLU
1960
BELEDİYESİ


1939


SAMSUN İLİ DAMIZLIK MANDA YETİŞTİRİCİLERİ BİRLİĞİ
2008


TÜRKİYE ARI YETİŞTİRİCİLERİ MERKEZ BİRLİĞİ
T A B
2003


FBM
TIP MERKEZİ


DÜZCE
Damızlık Manda
Yetiştiricileri Birliği


GİRESUN-DSYB
GİRESUN İLİ DAMIZLIK
SIĞIR YETİŞTİRİCİLERİ BİRLİĞİ


Otat


SAMSUN BÜYÜKŞEHİR BELEDİYESİ


SAMSUN
İLKADIM BELEDİYESİ

COMMITTEES

Honorary President

Prof. Dr. Sait BILGIC, Rector, Ondokuz Mayıs University, Turkey

Executive Committee

Congress Co-President

Prof. Dr. Hasan ONDER, Ondokuz Mayıs University, Turkey

Secretariat

Assoc. Prof. Dr. Ugur SEN, Ondokuz Mayıs University, Turkey

Congress Organizing Committee

Prof. Dr. Mehmet KURAN, Ondokuz Mayıs University, Turkey

Assoc. Prof. Dr. Mustafa SAHIN, Kahramanmaras Sutcu Imam University, Turkey

Assoc. Prof. Dr. Mustafa BOGA, Nigde Omer Halisdemir University, Turkey

Assist. Prof. Dr. Cagri O. OZKAN, Kahramanmaras Sutcu Imam University, Turkey

Assist. Prof. Dr. Emre SIRIN, Ahi Evran University, Turkey

Dr. Samet Hasan ABACI, Cem TIRINK, Lutfi BAYYURT, Ondokuz Mayıs University, Turkey

Fehmi KIRAZ, Turkish Agricultural Engineers Association, Turkey

Esra YAVUZ, Yıldırım GOK, Kahramanmaras Sutcu Imam University, Turkey

Scientific Committee

Dorian J. GARRICK, New Zealand	Rohan L. FERNANDO, USA	Hao CHENG, USA	Kaspar BINENEFELD, Germany
Hasan ONDER, Turkey	Horia GROSU, Romania	Musa SARICA, Turkey	Ahmet GULER, Turkey
Karl SCHELLANDER, Germany	Ercan EFE, Turkey	Edit Mikó JONAS, Hungary	Cigdem TAKMA, Turkey
Zeynel CEBECİ, Turkey	Muhammad KHALID, England	Hulya ATIL, Turkey	Abderrahmane HOUICHER, Algeria
Savas ATASEVER, Turkey	Ludek STADNIC, Czech Republic	Mustafa SAHIN, Turkey	Mustafa BOGA, Turkey
Ioana NICOLAE, Romania	Cagri O. OZKAN, Turkey	Raphael MRODE, UK	Mehmet KURAN, Turkey
Kadir KIZILKAYA, Turkey	Abdul Shakoor CHAUDHRY, UK	Ecevit EYDURAN, Turkey	Tamer KAYAALP, Turkey
Eser Kemal GURCAN, Turkey	Abdelkader BENSID, Algeria	Ozgur KOSAN, Turkey	Sherein Saeid ABDELGAYED, Egypt
Lenka KRPALKOVA, Czech Republic	Joanna NOWAK, Poland	Faisal SHAHZAD, Pakistan	Martin Ptáček, Czech Republic

Organized by

Ondokuz Mayıs University, Samsun, Turkey

Turkish Agricultural Engineers Association, Samsun, Turkey

Supported by

Ondokuz Mayıs University, Project Management Office, Samsun, Turkey

Sponsored by (Local Government & NGOs)

Municipality of Turkoglu, Kahramanmaras, Turkey

Turkish Agricultural Engineers Association, Ankara, Turkey

Samsun Water Buffalo Producers Association, Samsun, Turkey

Turkish Association of Beekeepers, Ankara, Turkey

Duzce Water Buffalo Producers Association, Duzce, Turkey

Giresun Cattle Producers Association, Giresun, Turkey

Municipality of Samsun, Samsun, Turkey

Municipality of Ilkadım, Samsun, Turkey

Sponsored by Business

Black Sea Publishers, Samsun, Turkey

FBM Medical Center, Samsun, Turkey

Otat, Samsun, Turkey

PREFACE

This volume contains the papers presented at the **International Congress on Domestic Animal Breeding Genetics and Husbandry (ICABGEH-2018)** held on September 26-28, 2018 in Antalya, Turkey.

The ICABGEH-2018 Congress is organized by the Agricultural Faculty of Ondokuz Mayıs University and Turkish Agricultural Engineers Association, and hosted by Kervansaray Lara Convention Center & Spa, Antalya. ICABGEH-2018 is the first international event of congress series with participation of very popular invited speakers Prof. Dr. Dorian J. Garrick (Massey University), Prof. Dr. Rohan L. Fernando (Iowa State University, Prof. Dr. Hao Cheng (California University) and Prof. Dr. Kaspar Bienefeld (Humboldt University). This event has brought together leading researchers, engineers and scientists in the domain of interest from around the world. It also provides opportunities for the delegates to exchange new ideas and application experiences face to face, to establish business or research relations and to find global partners for future collaboration.

Organizing committee is seriously planning, and is already working towards enabling Turkish and international animal science scientific community to meet the challenges and to move safely and successfully into the advanced information era. To this end, ICABGEH-2018 has been focused on recent developments, as far as research on animal science aiming at protecting the environment and food safety. Thus, ICABGEH-2018 has achieved its main twofold objective: Firstly, presentation of current research works in the field of animal science, and secondly, connecting the animal science community.

Prof. Dr. Hasan ÖNDER,

Congress President

TABLE OF CONTENT

ORAL PRESENTATIONS

TABLE OF CONTENT

ORAL PRESENTATIONS

SUSTAINABLE BREEDING STRATEGIES USING BLUP IN THE HONEYBEE

Kaspar BIENEFELD[1]

[1] Institute for Bee Research & Humboldt University of Berlin, 16540 Hohen Neuendorf, GERMANY

Corresponding author e-mail: kaspar.bienefeld@hu-berlin.de

Abstract

Worldwide, several indigenous Apis cerana and Apis mellifera subspecies are lacking in productivity and are increasingly being displaced by A. m. carnica and A.m.ligustica. Due to selective breeding these subspecies are most popular for beekeeping purposes, but known lacking in disease resistance and adaptation to local climatic conditions. It is not realistically possible to force beekeepers to keep endangered breeds if they do not meet their demands. One potential way to ensure survival and promote conservation of endangered honeybee subspecies is using the breeding strategies which have been shown to be very efficient to improve efficiency and behavior (SmartBees concept, www. http://www.smartbees-fp7.eu/). In 1994 the recent genetic evaluation system (BLUP Animal Model) was adjusted for the peculiarities of the honey bee at the Institute for Bee Research in Hohen Neuendorf, Germany (www.beebreed.eu). This method considers direct (worker) and maternal (queen) effects and the genetics and biology of this species to calculate the numerator relationship matrix (Bienefeld et al 2007, Apidologie 38:77-85). Since the start of genetic evaluation (1994), the selection gain increased significantly (fig. 1) for all traits considered. This system is now applied for different other honeybee subspecies in about 20 countries.

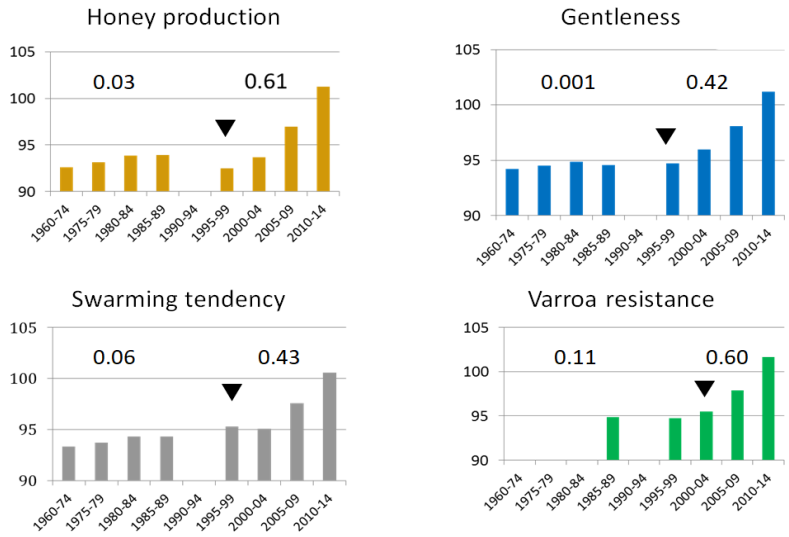


Figure 1. Genetic gain prior and after (▼) the start of genetic evaluation (GE) for the honeybee in the German A.m. carnica population. The numbers (regression coefficients) directly above the columns represent the average annual improvement in each trait for the time period before or after the introduction of GE (black triangle). Due to insufficient data available between 1990 and 1994, the average values for these years are excluded.

However, a major concern in sustainable breeding and conservation programs is the preservation of genetic variance in the population. Consequently, we applied Monte Carlo simulations to estimate the long-term development (100 years) of genetic variance and genetic response under various conditions (Plate et al. submitted). The simulations indicate that the combination of the actually used breeding schemes and small population sizes in several endangered honeybee subspecies are too strict and will potentially harm these populations. For practical purposes, other breeding strategies with more sires (mating stations) and/or reduction of the number of offspring within families need to be developed.

EFFECT OF SPECIES ON MACRO AND MICRO MINERAL COMPOSITION OF SOME TREE LEAVES WITH RESPECT TO SHEEP REQUIREMENTS

Ozer KURT[1], Ali Ihsan ATALAY[2], Emrah KAYA[1], Cagri Ozgur OZKAN[1], Adem KAMALAK[1]

[1] University of Kahramanmaras Sutcu Imam, Faculty of Agriculture, Department of Animal Science, Kahramanmaras, TURKEY
[2] University of Igdır, Faculty of Agriculture, Department of Animal Science, Igdır, TURKEY

Corresponding author e-mail: ozerkurt01@hotmail.com

Abstract

The aim of the current study was to determine the effect of species on the macro and mineral composition of some tree leaves used for small ruminant animal in Turkey. Calcium contents of tree leaves ranged from 6.64 to 8.87 g/kg DM with highest being for Ceratoniasiliqua and lowest for Salix alba. Phosphorus content of tree leaves varied widely from 2.34 to 3.17 g/kg DM with highest being for Pistacialentiscus and Ceratoniasiliqua and lowest for Alnusglutinosa. Magnesium contents of tree species ranged from 1.82 to 2.31 g/DM with highest being for Ceratoniasiliqua and Carpinusbetulus and lowest for Alnusglutinosa. Potassium contents of tree leaves ranged between 9.57 to 11.05 g/kg DM, the lower value corresponding to Alnusglutinosa and the higher to Pistacialentiscus. Sodium contents of tree leaves ranged between 1.15 to 1.35 g/kg DM, the lower value corresponding to Arbutus adrachne and the higher to Pistacialentiscus. There were significant differences among tree species in terms of Zinc contents, which varied between 32.0 to 41.6 mg/kg DM, the lower value corresponding to Carpinusbetulus and the higher to Ceratoniasiliqua. There were significant differences among tree species in terms of Iron contents, which varied between 243.3 to 292.0 mg/kg DM, the lower value corresponding to Salix alba and the higher to Pistacialentiscus. Copper contents of tree leaves ranged between 35.2 to 45.3 mg/kg DM, the lower value corresponding to Salix alba and the higher to Carpinusbetulus. Manganese contents of tree leaves ranged between 69.3 to 84.1 mg/kg DM, the lower value corresponding to Arbutus adrachne and the higher to Laurusnobilis. Species had a significant effect on the macro and micro mineral composition of tree leaves. All tree species had a significant amount macro and micro minerals to support the growth and production of lamb and sheep.

Key words: *macro mineral, micro mineral, sheep, tree leave*

EFFECT OF SPECIES ON SOLUBLE AND BOUND CONDENSED TANNINS OF SOME TREE LEAVES

Ali Ihsan ATALAY[1], Ozer KURT[2], Ali KAYA[2], Atilla BASER[2], Ahmet Aziz KURT[2], Adem KAMALAK[2]

[1] University of Igdır, Faculty of Agriculture, Department of Animal Science, Igdır, TURKEY
[2] University of Kahramanmaras Sutcu Imam, Faculty of Agriculture, Department of Animal Science, Kahramanmaras, TURKEY

Corresponding author e-mail: aliihsanatalay66@hotmail.com

Abstract

The aim of the current study was to determine the effect of species on the soluble and bound condensed tannin contents of some tree leaves used for small ruminant animal in Turkey. In the current experiment, Abies cilicica, Eucalyptus globulus. Laurus nobilis, Arbutus adrachne, Quercus coccifera, Arbutus unedo, Quercuer suber and Quercus ilex were used as a experimental materials. Tree leaves were hand harvested and dried at 105 °C. Dried tree leave samples were ground to pass through 1 mm sieve. Total and soluble condensed tannin contents of tree leaves were determined by the Butanol-HCl assay. Bound condensed tannin condensed tannin was determined by the difference between total condensed tannin and soluble tannin. Soluble condensed tannin contents of tree leaves ranged from 0.72 to 6.15 % with highest being for Arbutos andrachne and lowest for Eucalyptus globulus, Arbutos unedo and Quercuer suber. Bound condensed tannin contents of tree leaves varied widely from 0.64 to 6.7 % with highest being for Arbutos andrachne and lowest for Eucalyptus globulus. Total condensed tannin contents of tree species ranged from 1.40 to 12.85 % with highest being for Arbutos andrachne and lowest for Eucalyptus globulus. Species had a significant effect on the soluble, bound condensed and total tannin contents of tree leaves. Most of tree species studied in the current study contained considerably amount of condensed tannins, which may have detrimental effects on the ruminant animals. Therefore, care should be taken into consideration when these tree species are included into ruminant diets.

Key words: *soluble condensed tannin, bound condensed tannin, tree leaves*

GENERAL SITUATION OF MERINOS SHEEP BREEDING IN ANKARA PROVINCE

Sedat BEHREM[1], Cağatay YILDIZ[2], Sabri GUL[3], Mahmut KESKIN[3], Zuhal GUNDUZ[3]

[1] International Centre for Livestock Research and Training, Ankara, TURKEY
[2] Association of Sheep Goat Breeding, Ankara, TURKEY
[3] Hatay Mustafa Kemal University, Agricultural Faculty, Department of Animal Science, Hatay, TURKEY

Corresponding author e-mail: sedatbehrem1071@gmail.com

Abstract

In this study, some fleece characteristics of Anatolian Merino and general situation of breeders were determined in Gölbaşı, Güdül, Haymana, Polatlı Sincan districts of Ankara province. It was determined that breeders often shear their animals in June using a shearer. The average wool yield was determined as 2.0 ± 0.05 kg and fibre diameter was measured as 25.6 ± 0.09 µm. Wool prices change between 2 and 3 ₺ on premise sales. As a consequence, it was determined that the fleece diameter is suitable for processing in the textile industry.

Key words: *Merino sheep, yield, wool diameter*

INTRODUCTION

The importance of sheep breeding in a valuable branch of agriculture is increasing day by day in our country. Basic products in traditional sheep breeding such as meat, milk, leather and fleece could be turned into income easily. The first things that comes to mind are usually the meat and milk, but wool mostly disregarded. Wool of native breeds of Turkey is not suitable for wool industry since they yield mixed coarse. In order to meet this demand, German Mutton Merino was brought from Germany in the 1930's. It was crossbred with Kıvırcık and Akkaraman breeds to obtain new breeds named as Karacabey Merino and Anatolian Merino, respectively and the population of these breeds reached up to 2.2 million heads today.

A project was started by The Ministry of Agriculture and Forestry titled "Improvement of Anatolian Merinos under Farm Conditions" in 2005 to improve Merino sheep population.

In the project, selection of ewes obtained according to lamb births, weaning weights and some wool characteristics. With this project, sheep breeder numbers were increased from the beginning of project and farmers are satisfied with the project. This situation is very important for our country in terms merino sheep breeding.

Dellal et al. (2000), determined 2.8 kg greasy fleece and 28.73 µm fibre diameter in 2 years old Anatolian Merino sheep. Arık et al. (2003), reported fibre diameter as 23.46 µm in Anatoli Merino sheep. Tekin et al. (1999), declared that average greasy wool weight is 3.29 kg and it is diameter is 21.35 µm in Anatolia Merino sheep.

In this study, a general situation has been determined about the Anatolian Merino breeders registered in the national improvement project.

MATERIALS AND METHODS

Material of the study was consisted of 36 breeders and wools obtained from their sheep registered to project named as improvement of Merino sheep under farm conditions in the districts of Gölbaşı, Güdül, Haymana, Polatlı Sincan in Ankara province. In order to determine the current status of production, a questionnaire consisting of 15 questions was conducted. The obtained data were analysed in SPSS statistical package program and frequency tables were prepared.

RESULTS AND DISCUSSION

In this study, 35 of the sheep breeders declared that they shear their sheep once a year while only one breeder does twice.
Shearing months during year presented in Table 1.
Shearing months during years distributed as 88.9, 8.3 and 2.8 per cent for June, May and July, respectively. Twenty-two breeders had made their own clip, while 14 breeders hired a shearman.

Table 1. Wool shearing time in sheep

Months	f	%
May	3	8.3
June	32	88.9
July	1	2.8
General	36	100

The number of breeders who reported hand shearing were 23 whereas it was 13 who used shearer. Farmers paid 3.5 to 5 ₺ per sheared sheep varying by districts.
It was determined that 13.9 % (5 people) of the farmers bathed their sheep, while 86.1 % (31 people) did not bath in order to clean foreign materials on the wool.
The number of sheep sheared per day were given in Table 2.

Table 2. Shearing number per day

Animal number	Shear by own		Shearman	
	Farmer number	%	Farmer number	%
1-50	14	38.9	3	8.3
51-100	6	16.7	10	27.8
101 and plus	2	5.6	1	2.8
Total	14	100.0	22	100.0

As shown in Table 2, number of farmers who shear 1 to 50 animals by own were 14 whereas it was 3 for farms who hired shearman. Obviously, hiring shearman provide an advantage in terms of effective use of time to the farmers (Table 2). Average wool yield and animal number were given Table 3.

Table 3. Average wool yield (kg) and animal numbers (head) according to districts

Districts	n	Wool yield	Minimum	Maximum	Animal number
Gölbaşı	7	2.2 ± 0.13	1.93	2.88	2.400
Güdül	5	1.8 ± 0.17	1.40	2.40	1.450
Haymana	9	1.8 ± 0.20	1.50	2.00	2.540
Polatlı	8	2.2 ± 0.11	1.67	2.61	3.630
Sincan	7	2.0 ± 0.11	1.33	2.88	1.320
Genel	36	2.0 ± 0.05	1.33	2.88	11.340

n: farmer number

Maximum wool production per animal was determined as 2.2 ± 0.13 kg in Gölbaşı and 2.2 ± 0.11 kg in Polatlı district. Minimum wool yield per animal was determined as 1.8 ± 0.17 kg in Güdül and 1.8 ± 0.20 kg in Haymana districts. Average wool yield was found as 2.0 ± 0.05 kg. Dellal et al. (2000) stated that greasy wool weight was 2.8 kg in 2 aged Anatolian Merino sheep. Garip et al. (2010) reported fleece weight as 1.58 kg in base flock, 2.37 kg in elite flock in Kangal Akkaraman sheep. Our findings are in accordance with other researchers.
The fineness of fleece, which is one of the quality criteria within the fleece characteristics, was given in Table 4.

Table 4. Fleece dimeter according to ages (µm)

Age groups	n	Fleece diameter	Minimum	Maximum
7-12 month	162	24.6±0.26	17.25	32.66
2	321	25.7±0.20	19.57	35.22
3	148	25.9±0.15	20.50	37.03
4	263	26.0±0.24	15.57	35.75
General	894	25.6±0.09	15.57	37.03

It was determined that finest fleece was found at 7-12 months aged animals (24.6 ± 0.26 µm). The thickest fleece diameter was found as 26.0 ± 0.24 µm at 4 aged animals. The results exhibit that fleece diameter was affected by age. Arık et al. (2003) measured 23.46 µm fleece diameter in Anatolian Merino Sheep. Tekin et al. (1999) reported fleece diameter as 21.32 µm in Anatolian sheep. Varying to districts, the producers stated that the price of wool is about 2-3 ₺ per kg. Proportion of breeders who sell wool to merchandise was 94.4 %, while 1 person grant it to their acquaintances.

CONCLUSIONS

The quality and quantity of a product is as important as the production of a commodity in agriculture. The following results were obtained in this study; (I) average wool production was change depending on districts, found as 2.0 kg, (ii) sheep were sheared in June generally, (iii) fleece diameter was effected by age, (iv) wool was sold cheaply.

REFERENCES

Arık, İ.Z. Dellal, G., Cengiz, F. 2003. Some physical fleece characteristics of Anatolian Merino, White Karaman, Ile de France x Anatolian Merino (F1) and Ile de France x White Karaman (F1) Ewes. Turkish Journal of Veterinary and Animal Sciences, 27: 651-656.

Dellal, G., Söylemezoğlu, F. Etikan, S., Erdoğan, Z. 2000. Anadolu Merinosu koyunlarının bazı yapağı özellikleri üzerine bir araştırma. Tarım Bilimleri Dergisi, 6 (2), 48-53.

Garip, M., Coşkun, B., Polat, E.S., Yılmaz, A. Tekin, M.E., Çağlayan, T., Kılıç, N. 2010. Kangal Akkaraman koyunlarında yapağı özellikleri. Eurasian Journal of Vet. Sciences 26, 2, 93-99.

Tekin, M.E., Kadak, R., Akmaz, A., Ergin, A. 1999. The wool characteristics of Turkish Merino, German Blackheaded Mutton Sheep, Hampshire Down, Lincoln Longwool, Corriedale and their F1 and B1 Crossbreed sheeps. Turkish Journal of Veterinary and Animal Sciences, 23: 391-396.

EGG YOLKS FROM DIFFERENT FOWL SPECIES IN EXTENDER AFFECT CRYOPRESERVATION AND FERTILITY OF BUFFALO BULL SPERMATOZOA

Shamim AKHTER[1], Muhammad Sajjad ANSARI[2], Bushra Allah RAKHA[3], Muhammad KHALID[4]

[1] Pir Mehr Ali Shah Arid Agriculture University, Department of Zoology, Rawalpindi-46300, PAKISTAN
[2] University of Sargodha, Department of Zoology, Lyallpur Campus-38000, PAKISTAN
[3] Pir Mehr Ali Shah Arid Agriculture University, Department of Wildlife Management, Rawalpindi-46300, PAKISTAN
[4] University of London, Royal Veterinary College, Department of Pathobiology and Population Sciences, UNITED KINGDOM

Corresponding author e-mail: shamim@uaar.edu.pk

Abstract

Buffalo sperm membrane has comparatively higher content of polyunsaturated fatty acids and/or lower cholesterol compared to cattle bull sperm. This makes buffalo sperm more sensitive to cold shock and/or cryo-injuries and therefore, a better cryoprotectant is required for its preservation. Egg yolks from different avian species are used as croprotectants in semen extenders, however, differences in their composition lead to varying effects on freezability and fertility of semen. In our preliminary studies, compared to chicken egg yolk, we have reported an improvement in post-thaw quality of buffalo sperm using Duck, Quail, Turkey and Pigeon egg yolk. The present study was aimed to investigate the effect of egg yolk from Guinea fowl and Red Jungle fowl on the freezability, enzyme leakage and fertility of buffalo sperm. Semen collected from 6 Nili Ravi buffalo bulls (6 replicates) was cryopreserved with TCEY extender containing 5%, 10%, 15% and 20% egg yolk from Ginea fowl or Red jungle fowl or 20 % Chicken egg yolk (controls). Post-thaw sperm quality was assessed in terms of sperm motility, plasma membrane integrity, liveability, viability, chromatin damage and release of intracellular enzymes; Glutamic oxaloacetic transaminase (GOT) and Lactate dehydrogenase (LDH). The data on post-thaw sperm quality were analyzed by analysis of variance and Least Significant Difference Test was applied to compare the treatment means. The results have shown that Guinea fowl egg yolk in the extender at 5, 10, 15 and 20% did not affect (P≥0.05) post-thaw sperm motility, plasma membrane integrity, livability and viability. However chromatin damage was less (P≤0.05) and GOT leakage was significantly lower (P≤0.05) in extenders having 15 and 20% Guinea fowl egg yolk, whereas LDH release was similar (P≥0.05) to controls having 20% Chicken egg yolk. Red jungle fowl egg yolk at 15 and 20% in extender significantly improved (P≤0.05) post-thaw sperm motility and plasma membrane integrity and significantly reduced (P≤0.05) the GOT and LDH leakage compared to controls. Moreover, sperm livability and viability was higher (P≤0.05) in extender having 15 % Red Jungle fowl egg yolk and chromatin damage was lower (P≤0.05) with 20 % Red Jungle fowl egg yolk, compared to controls. To assess the fertility rate, buffalo semen cryopreserved in extenders containing 15% Guinea fowl egg yolk or 15% Red jungle fowl egg yolk or 20% Chicken egg yolk (Control) was used to inseminate a total of 600 animals (200 inseminations per extender). Pregnancy was diagnosed by rectal palpation 60 days post-insemination. The data on fertility rate were analyzed by Chi square test. Post AI, fertility rates in buffaloes were not affected (P≥0.05) by Guinea fowl egg yolk (15%) in extender, however, these were significantly higher (P≤0.05) with Red Jungle fowl egg yolk (15%) compared to Chicken egg yolk (20%). In conclusion, Red Jungle fowl egg yolk (15%) in the semen extender improves the post-thaw sperm quality, reduces intracellular enzyme leakage and gives better in vivo fertility in buffalo, and can be suggested to be used in semen extenders an alternative to routinely used Chicken egg yolk.

Key words: *guinea fowl, red jungle fowl, lactate dehydrogenase; glutamic oxaloacetic transaminase, buffalo sperm*

THE EFFECT OF DIFFERENT AGED ON THE EGG PERFORMANCE OF CHUKAR PARTRIDGES

Adem KAMALAK[1], Cagrı Ozgur OZKAN[1], Ali İhsan ATALAY[2]

[1]University of Kahramanmaras Sutcu Imam, Faculty of Agriculture, Department of Animal Science, Kahramanmaras, TURKEY
[2]University of Igdır, Faculty of Agriculture, Department of Animal Science, Igdır, TURKEY

Corresponding author e-mail: cagri@ksu.edu.tr

Abstract

This research was carried to determine the effect of the numbers of eggs obtained from different aged (36 and 88 week old) partridges used in intensive conditions. In this experiment 480 chukar partridges were used and fed with a diet containing 20% CP and 2900 Kcal ME for one month. Each treatment group consists of three replications containing of 36 female and 24 male chukar partridges. In this experiment the ration and water were supplied to chukar partridges at libitum and 18 h lighting was applied. Chukar partridges with 88 week age produced 1496 eggs whereas chukar partridges with 36 week age produced 1193 eggs. With the increase of the breeding age, there has been a significant increase in the number of eggs. Further research is needed to determine the effect of breeding age on hutching performance of chukar partridges.

Key words: *chukar partridges, egg, age*

STRUCTURAL CONFORMATION, GENETIC STRUCTURE AND DIVERSITY AMONG SPATIALLY DISTRIBUTED NIGERIAN DWARF GOATS BASED ON MORPHOMETRIC CHARACTERS

Oluwatosin Mawunapon ADEGOKE JESUYON[1], Simeon OLAWUMI[2]

[1]Federal University, Department of Animal Production and Health, Animal Breeding and Genetics Unit, P. M. B. 373, Oye-Ekiti, Ekiti State, NIGERIA
[2]Ekiti State University, Department of Animal Production and Health, Ado-Ekiti, NIGERIA

Corresponding author e-mail: dr.oluwatosinjesuyon14@gmail.com

Abstract

Goat production and breeding in South-west Nigeria is largely under traditional system, and needs aggressive and State intervention for rapid improvement. To understand the body conformation, genetic structure and diversity among spatially distributed Nigerian dwarf goats, a survey was conducted between May 2015 and June 2017 in two States: Ekiti and Osun. Data were recorded on two hundred and twenty-seven (227) free-ranging and scavenging West African Dwarf (WAD) goats, consisting of 124 males and 103 females. Body traits measured included body weight (BWT), Heart girth (HGH), Diagonal trunk length (DTL), Height at the withers (HWT), Height at the rump (HRP), while body indices included Body Breadth Index (BBI), Body Depth Index (BDI), Body length Index (BLI), Trunk length index (Shape), Weight-Height Index (WHI), Overbuilding Index (OBI) and Leg Length Index (LLI). Data were subjected to analysis by randomized complete block design in factorial using General Linear Model Procedure (PROC GLM), ANOVA, Least square means procedures and Tukey HSD test, Principal component (PRINCOMP) analysis, Multiple linear regression (MLR) analysis by Statistical Analytical Systems software, Version 9.2, (SAS, 2010). K-means cluster analysis (K-CA) was conducted using SPSS software, Version 17.0. Significant ($p<0.05$) values between locations (BWT, DTL, TLI, OBI, BLI and WHI), between sexes for all traits and interaction of LOCxSEX (DTL, TLI, OBI, BDI, BBI, LLI and BLI) were obtained. K-Means cluster analysis (K-CA) identified five genetic clusters among WAD goats in the two States. The Squared Euclidean Distance measures between paired genetic-clusters 3/2, 5/1, 5/2, 5/4, 2/1, and 3/1 were 149.57, 135.50, 118.65, 107.64, 104.07 and 102.00 respectively. Pearson correlation, r, coefficients between 3/2, 4/3, 5/2, 4/1 were 0.744; 0.884, 0.906, and 0.983 respectively. Principal component loadings structure on PC1 revealed underlining structural conformation for sources investigated. Ekiti Does had body-trunk-girth structure while Osun Does possessed body-depth-length structure. Ekiti bucks possessed higher trunk structure while Osun bucks possessed heavier body-girth structure. Does revealed better girth-body-leg structure while Bucks indicated better weight-height-trunk structure. Between States, Ekiti goats were heavily built on weight-trunk-height structure; while Osun goats had better hearth girth structure. PC diversity biplot of PC1 against PC2 displayed most animals crowded at the origin, but few were placed far from origin indicating wider genetic diversity, net attributes and relationship among WAD goats in an environment. Multiple linear regression (MLR) equations by stepwise method revealed that Ekiti (HWT and TLI) and Osun (DTL, HRP and OBI) Does differ widely, Ekiti (BLI) and Osun bucks (BBI) differ, while both sexes recorded BWT and WHI common within sex. The general MLR equation regressed HWT, HGH, BDI, BLI and WHI as common traits to all WAD goats in the environment, although with very high VIF value of 81.26. All equations were significant at $p<0.0001$ with low SE: 0.570 – 2.936, R^2: 0.993 – 0.997, and DW statistics of 1.346 – 2.151. These results are useful information for improvement and selection programmes on WAD goats in South-west Nigeria and the Tropics.

Key words: *diversity, morphology, metric traits, Osun and Ekiti States, PCA, cluster analysis, structural indices, West African Dwarf goats.*

THE EFFECT OF NON-GENETIC FACTORS ON THE LINEAR TYPE TRAITS IN SIMMENTAL COWS IN EASTERN REGION OF TURKEY

Olcay GULER[1], Abdulkerim DILER[2], Mete YANAR[3], Recep AYDIN[3], Rıdvan KOCYIGIT[3]

[1]University of Ataturk, Hinis Vocational School, Department of Laboratory and Veterinary Health, Hinis, 25600, Erzurum, TURKEY
[2]University of Ataturk, Erzurum Vocational School, Department of Plant and Animal Production, 25240, Erzurum, TURKEY
[3]University of Ataturk, College of Agriculture, Department of Animal Science, 25240, Erzurum, TURKEY

Corresponding author e-mail: olcay.guler@atauni.edu.tr

Abstract

The research was conducted to determine the magnitude of non-genetic factors affecting linear type traits in Simmental cows reared in Eastern Region of Turkey. For this purpose, 897 observations for the 16 linear type traits on 148 cows were made. Statistical model utilized in this study included fixed effects of scorer, stage of lactation, parity, season at classification. In addition, the age at classification was included to the statistical model as linear and quadratic covariates. Average linear scores for chest width, body depth, angularity, foot angle, rear leg (side view), rear leg (rear view), rump angle, rump width, fore udder attachment, rear udder attachment width, rear udder attachment height, teat placement (rear view), teat placement (side view), teat length, central ligament and udder depth were 5.4±0.1, 6.4±0.1, 5.0±0.2, 5.0±0.2, 4.6±0.2, 3.9±0.1, 6.0±0.1, 4.8±0.1, 4.2±0.2, 4.8±0.8, 4.6±0.2, 5.1±0.2, 5.0±0.2, 6.0±0.2, 5.9±0.1 and 5.5±0.1 respectively. Scorers have significant effects on the chest width, body depth, angularity, teat length ($P<0.01$) and teat placement (side view) ($P<0.05$). However, stage of lactation, parity and season at classification affected significantly most of the linear type traits of Simmental cows. The linear and quadratic effects of age at classification on the most of linear type traits were also not significant. Phenotypic correlations among the linear type traits were in low to medium range.

Key words: *non-genetic factors, linear type traits, Simmental cows*

EVALUATION OF ENSILABILITY OF SOME FORAGES USING ROSTOCKER FERMENTATION TEST

Emrah KAYA[1], Ozer KURT[2], Ali Ihsan ATALAY[3], Adem KAMALAK[2]

[1]Tokat Gaziosmanpasa University, Artova Vocational School, Department of Veterinary, Tokat, TURKEY
[2]University of Kahramanmaras Sutcu Imam, Faculty of Agriculture, Department of Animal Science, Kahramanmaras, TURKEY
[3]University of Igdır, Faculty of Agriculture, Department of Animal Science, Igdır, TURKEY

Corresponding author e-mail: emrah.kaya@gop.edu.tr

Abstract

The aim of the current study was to evaluate the ensilability of some forages using Rostocker fermentation test. In the current experiment, Medicago sativa, Vicia narbonensis, Avena fatua and Hordeum bulbosum were used as experimental materials. Approximately 20 gr harvested forages were homogenized in a blender with 180 mL of distilled water for 3 min and then filtered through four layers of cheesecloth. 50 ml of extracted juice was incubated in bottles in quadruplicate at 25oC. The pH of the extracted juice was determined at 24 h intervals for 3 days. At the beginning of experiment the pH of the extracted juice of forages ranged from 6.03 to 6.17. The pH of the extracted juice of forages decreased with increasing time of incubation. At all incubation times, the pH of the extracted juice of Medicago sativa significantly higher than the others. The pH values of extract from Avena fatua and Hordeum bulbosum were 4.72 to 4.11 respectively. It can be clearly seen that legume forages should be supplemented with water soluble carbohydrate to obtain the requested pH when ensiled.

Key words: *forage, ensilability, silage, pH*

SUSTAINABLE AGRICULTURE IN TURKEY: POTENTIAL, OBSTACLES AND RECOMMENDATIONS

Arzu SECER[1], Mutlu BULUT[1], Mustafa BOGA[2]

[1]Cukurova University, Faculty of Agriculture, Department of Agricultural Economics, 01330. Sarıcam, Adana, TURKEY

[2]Nigde Ömer Halisdemir University, Bor Vocational School, 51700, Bor, Nigde, TURKEY

Corresponding author e-mail: mustafaboga79@gmail.com

Abstract

Natural resources are threatened to meet needing of increased population. Sustainable agricultural production practices are required to provide activities against global warming, energy use and water scarcity etc. the aim of the study, This study is aim to put current situation and potential of Turkish Agriculture for sustainability, reveal obstacles and present recommendations. The information collected is presented by SWOT Analysis approach and some recommendations are made. In terms of sustainability Turkey has some strengths (wide agricultural and ecological zones, biological diversity, high numbers and quality research institutes, increased levels of education and awareness of producers) and opportunities (supports for organic agriculture and biological control, New trends towards consuming natural products etc.) for sustainable agriculture. Even there are some weaknesses (low competitiveness, large numbers of small farmers and wide chemical input use) and threats (lack of knowledge about sustainability in the society, agricultural subsidies and inexpensive food demand etc.)

Key words: *sustainable agriculture, SWOT analysis, Turkey.*

INTRODUCTION

The world's population is forecasted to rise dramatically over the next 30 years, from 7.5 billion in 2017 to 9.2 billion by 2050 (UN, 2017). At the same time, economic development will lead to an increase in demand for meat, dairy, vegetables and fruit. Global food production will need to double by 2050 to feed the world well. The problem is that half of the habitable land on Earth is already used for farming. As resources are limited, the challenge is to achieve global food security while having a positive impact on the environment and society (Saiplatform, 2009). Sustainable agricultural practices are considered importantly to provide efficient solution for these concerns.

Sustainable agriculture has environmental, social and economic dimensions. Protecting and improving of the natural environment are fundamental, and issues like global warming, energy use, water scarcity, saving of biodiversity and soil degradation need to be addressed. The social dimension covers labor rights and the health of communities, food quality and animal welfare. On the economic side, sustainable agriculture is productive, efficient and competitive (Table 1).

Table 1. Environmental, social and economic dimensions in sustainable agriculture*

Environmental Impacts	Social Impacts	Economic Impacts
• Biodiversity • Climate change/ Energy • Soil degradation • Water scarcity	•Labor Rights • Community Health • Food Quality & Safety • Animal Welfare	• Farm Profitability • Livelihoods • Value Chain

*Saiplatform, 2009

Sustainable agricultural development plays a major role in improving food security and nutrition, increasing the quantity and diversity of food and providing economic transformation. From this point, sustainable agricultural development was defined as "Sustainable agricultural development is agricultural development that contributes to improving resource efficiency, strengthening resilience and securing social equity/responsibility of agriculture and food systems in order to ensure food security and nutrition for all, now and in the future" (HLPE, 2016). Main tools of sustainable agriculture are multi-cropping, minimal or no pesticide use, focusing soil health, choosing sustainable seeds and plant varieties, practicing water conservation and sustainable irrigation. Other Methods of Sustainable Crop Production are aquaponics, agroforestry, permaculture, rooftop farms and other methods of urban agriculture.

Sustainable agriculture is satisfied the features at below;

- It sustains the economic viability of farm operations
- It satisfies human food, fiber and energy needs
- It maintains or enhances the resource base upon which it depends by emphasizing soil conservation, nutrient recycling, biologically based-pest management and biodiversity
- It takes advantage of the knowledge and skills of farmers
- It is durable and resilient to disturbance, pest outbreaks and market variability
- It makes the most efficient use of non-renewable resources and on-farm resources
- It integrates, where appropriate, natural biological cycles and pest control tools with production practices (Menalled et al., 2008).

Turkey has great agricultural potential because of climate, wide agricultural area, biological diversity and productive soil. However, it is known that economic and environmental sustainability are under great pressure by inappropriate and excessive use of chemical input, conventional production techniques, and excessive use of natural resources. In this case, defining current situation and problems have significant importance to present recommendation to provide sustainability in the sector overall. This study is aim to put current situation and potential of Turkish Agriculture for sustainability, reveal obstacles and present recommendations.

MATERIALS AND METHODS

The main material of the study is secondary data which are obtained from literature review (books, reports, journals and statistics). The data is presented by SWOT Analysis approach and some recommendations are made. SWOT Analysis is a strategic planning framework used in evaluation of an organization, a plan, a project or a business activity. This analysis is therefore a significant tool for situation analysis that helps the managers to identify organizational and environmental factors. It has two dimensions as internal and external. Internal dimension includes organizational factors, also strengths and weaknesses, external dimension includes opportunities and threats (Gürel and Tat, 2017). SWOT Analysis is defined as "SWOT Analysis is a simple but powerful tool for sizing up an organization's resource capabilities and deficiencies, its market opportunities, and the external threats to its future" (Thompson et al., 2007: 97).

INTERNAL	
Strengths	Weaknesses
Opportunities	Threats
EXTERNAL	

Figure 1. SWOT analysis

RESULTS AND DISCUSSION

Strengths

Wide agricultural and ecological zones: Turkey is characterized by extreme geo-climatic diversity which permits the production of a wide range of livestock and crops. As per the classification developed by TURKSTAT, there are nine agricultural

zones in Turkey. These agricultural zones allow producing almost all of the products. This situation allows using sustainable agriculture practices easily. Thus, it is provided to minimized factors that prevent sustainable agriculture.

Biological diversity: Turkey displays the character of a small continent in terms of biological diversity. Among the reasons for this situation, one may count the fact that the country has three different types of bioclimatic and three Biogeographical Zones, namely Euro-Siberian, Mediterranean and Irano-Turanian. In other words, the country is at the point where three continents intersect. This results quite rich ecological and floristic differences throughout the country (MEF, 2007). Biodiversity is the origin of all crops and domesticated livestock and the variety within them. Biodiversity in agricultural and associated landscapes provides and maintains ecosystem services essential to agriculture. By this way, Sustainable agriculture is enhanced by biodiversity. Sustainable agriculture uses water, land and nutrients efficiently, while producing lasting economic and social benefits (WTC, 2008).

High numbers and quality of research institutes: Turkey presents a good research environment with research institutes and faculties for agricultural and natural sciences to improve and expand sustainable agricultural practices. Agricultural Research is one of the duties of Ministry of Agriculture and Forestry in Turkey. In this concept, there are 50 research institutes to conduct agricultural researches (MAF, 2018). In tasks directions of these institutes, it especially emphasized the sustainable use of natural resources must be taken as a basis. Also, there are 39 faculties of agricultural and natural sciences, 24 faculties of veterinary, 10 faculties of forestry and 11 faculties of fishery (YOK, 2018).

Increased levels of education and awareness of producers: It is known that agricultural extension activities about conservation of natural resources expand recently. Also numbers of educated farmers have increased rapidly. As a tool of sustainable agriculture, organic agriculture is quite important in Turkey, like all over the world. Numbers of organic production producers were 14,798 in 2003, it reached 67,878 in 2016 (MAF, 2018). This indicator shows that the producers have tendency to provide sustainable agriculture if they are motivated as needed.

Weaknesses

Low competitiveness: It can be said that sustainable agriculture practices have been newly recognized by producers and some of producers may have negative behaviors of farmers towards adoption of new farm technologies. This situation brings low competitiveness for products produced in sustainable practices comparing conventional products.

Large numbers of small farmers (low skilled): Most of producers are small scale farmers which prefers conventional production techniques in Turkey. This applications result inefficient using of natural resources and effect sustainability of agricultural development negatively.

Wide chemical input use: Unfortunately, most of agricultural production is grown with chemical inputs like synthetic fertilizers and chemical pesticides as conventionally. Although chemical input intensive agriculture produces great quantities of products at low prices, this production system threats the environment, human health, rural communities and animal welfare. In some farms, meat, eggs, and dairy products are now produced on enormous industrial livestock facilities. These facilities confine hundreds of animals in cramped conditions. In addition to compromising animal welfare, factory farms generate a huge amount of waste, which pollutes air, water, and soil, degrading the natural environment and threatening public health.

Inappropriate water use: In Turkey, agriculture is the greatest water consuming sector (with about 73%). Turkey is geographically located within the focus of the world and Middle Eastern countries. Water is the most critical issue of the world agenda in 2010s. significance of water was pointed out and water was placed among strategic resources. The basic target of agricultural water management is to

prevent water wastages ad losses. Sensitivity of surface and ground waters resources to environmental impacts, ever-complexing agricultural, domestic and industrial demands are the significant issues of sustainable agricultural water management (Gökalp and Cakmak, 2016).

Higher prices of environmentally friends inputs: Prices of environmentally friends inputs are higher than chemical inputs. Using chemical inputs farmers are able to produce agricultural products at lower cost. It gives opportunity to the producers to get higher profit. Even some producers have awareness of environmental issues and pressure on natural resources, most of them prefer to use chemical inputs because of economic concern.

Opportunities

Supports for organic agriculture: In Turkey, Producers are supported by Ministry of Agriculture and Forestry to increase crop production, improve quality, and provide sustainability and environmentally sensitive farming techniques since 2005. The amount of support was defined between 10 TL/da and 100 TL/da for different categories of products in 2017 (MAF, 2018).

Supports for biological control: In Turkey, producers who prefer biological control in agricultural production are supported Ministry of Agriculture and Forestry to reduce chemical input use to preserve human health and natural resources since 2010. The amount of support was defined as 350 TL/da for greenhouses and 35 TL/da for open-field areas in 2017 (MAF, 2018).

New trends towards consuming natural products: Many consumers have tendency to consume natural or organic products because of some reasons such as health concern, increasing education level, effects of media. These products are required sustainable agricultural techniques for production. It means that consumers have positive effect on sustainability indirectly.

Supports are given by organizations: In Turkey, as the world, many non-profit organizations give effort to increase public (all sides of public) conscious on importance to preserve natural resource use, support traditional agricultural production techniques, expand sustainable agricultural practices, increase consumers' knowledge level of sustainability.

Public education to inform consumers: Education is one of the most powerful tools for providing individuals with the appropriate skills and competencies to become sustainable consumers. UNESCO has designated 2005-2014 as the Decade of Education for Sustainable Development. Giving this importance, many official (such as Ministry of Agriculture and Forestry, Ministry of Health, universities and research institutes) or unofficial organizations (such as non-profit organizations, firms and extension services) by means of all media tools (such as TV, social media, printed documents). It provides to increase demand for sustainable production practices.

Threats

Lack of knowledge about sustainability in the society: It is known that there is a gap among relevant actors (consumers, business, government, and non-profit organizations). Also, there is a gap between the available knowledge about sustainable consumption and real action towards it, at all levels of society (Thogersen and Schrader, 2012). Understanding the reason for this gap and developing strategies and instruments for producers and others to close this gap is quite important for policy makers as whole the society.

Agricultural subsidies: Agricultural subsidies that favor excessive production of a single commodity may have harmful results. The subsidies force farmers to produce same products every year. Crop diversification is an environmentally alternative to the maintenance of soil fertility in agriculture. It is often presented as a method to enhance the sustainability of agricultural production systems (Truscot et al., 2009).

Inexpensive food demand: Consumers demand reasonable or somehow cheaper prices for food products. This prevents new or sustainable production techniques.

Rapid population growth: In Turkey, total population was 80,1 million person and 28,0% of the population was in rural areas.

Also, fertility rate was 2, 10 and density was 105 person/km^2 (Worldometers, 2018). These indicators show that there is a high pressure on natural resources to meet food demand and provide income for rural population.

Climate change: Agriculture remains an important source of income and employment in Turkey. Agricultural production is heavily dependent on water availability for increasing productivity and decreasing volatility in production. Half of the crop production in Turkey relies on irrigation. Irrigated agriculture currently consumes about 75 percent of total water consumption which is about 30 percent of renewable water availability. However climate change is expected to increase the sectoral competition for water resources and raise the need for major changes in water policies in the medium and the long-run (Cakmak et al., 2009).

Soil Erosion: Land use management requires controlling natural resources for sustainability. Soil erosion related to improper land use is a major issue around the world. Land degradation may harm the health of ecosystem. Defining the soil loss in a basin the starting point in the restoration of soil quality for crop production. Reducing soil losses to a tolerable rate is one of the primary objectives for sustainability and soil conservation (Karas and Oguz, 2017).

Table 2: SWOT analysis of Turkish agriculture from the point of sustainability

Strengths	**Weaknesses**
• Wide agricultural and ecological zones	• Low competitiveness
• Biological diversity	• Large numbers of small farmers (low skilled)
• High numbers and quality research institutes	• Wide chemical input use
• Increased levels of education and awareness of producers	• Inappropriate water use
	• Higher prices of environmentally friends inputs
Opportunities	**Threats**
• Supports for organic agriculture	• Lack of knowledge about sustainability in the society
• Supports for biological control	• Agricultural subsidies
• New trends towards consuming natural products	• Inexpensive food demand
• Supports are given by organizations	• Rapid population growth
• Public education to inform consumers	• Climate change
	• Soil Erosion

CONCLUSIONS

Sustainable agricultural development is very controversial and crucial issue for all dimensions of society. In the study, current situation and potential of Turkish Agriculture is defined and obstacles are revealed and recommendations are presented. Some recommendations are given at the below.

Importance of sustainable production systems should be introduced to farmers and given information about supports which are given by Ministry of Agriculture and Forestry.

Some supports are given by different organizations for people who want to use sustainable production systems. Farmers should be given information about these information and encouraged

The education, publishing and consulting system must be actively organized by the Ministry of Agriculture and Forestry.

Practices to develop organic farming should be enhanced and an organized production plan by increasing knowledge level of farmers should be done.

Additional projects should be developed to increase the quality of life and income of farmers in areas where sustainable agriculture practices are being implemented. Also infrastructure investments to be made in these regions are applications that can increase the prosperity of the farmers in the long period.

REFERENCES

Cakmak H, Dudu H, Saracoglu S. 2009. Climate change and agriculture in Turkey: A Cge Modeling Approach. Econ Anadolu 2009: Anadolu International Conference in Economics. June 17-19, Eskişehir, Turkey.

Gökalp Z, Cakmak B. 2016. Agricultural water management in Turkey: past-present-future. Current Trends in Natural Sciences. 5 (9): 133-138.

Gürel E, Tat M. 2017. SWOT analysis: A theoretical review. The Journal of International Social Research, 10 (51): 994-1006.

HLPE, 2016. Sustainable agricultural development for food security and nutrition: what roles for livestock? A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome.

Karas E, Oguz İ. 2017. Evaluation of soil erosion and sustainable land use management in the Sarısu Basin. Turkish Journal of Agriculture - Food Science and Technology, 5(8): 864-872.

MEF, 2007. The national diversity strategy and action plan. Ministry of Environment and Forestry General Directorate of Nature Conservation and National Parks. Department of Nature Conservation. National Focal Point of Convention on Biological Diversity. Ankara. 176 pages.

MAF, Ministry of Agriculture and Forestry, 2018. https://www.tarim.gov.tr (Available at: 01.09.2018).

Menalled F, Bass T, Buschena D, Cash D, Malone M, Maxwell B, McVay K, Miller P, Soto R. 2008. An Introduction to the principles and practices of sustainable farming. https://www.researchgate.net/publication/237634289_An_Introduction_to_the_Principles_and_Practices_of_Sustainable_Farming (Avaible at: 01.09.2018).

SAI Platform, 2018. Short guide the sustainable agriculture. http://www.saiplatform.org/uploads/Library/short_guide_to_sa_-_final%5B1%5D.pdf (Available at: 01.09.2018).

UN, 2017. World population prospects 2017. https://esa.un.org/unpd/wpp/ (Available at: 01.09.2018).

Thogersen J, Schrader U. 2012. From knowledge to action-new paths towards sustainable consumption. Journal of Consumer Policy, 35(1):1-5.

Thompson AA, Strickland AJ, Gamble JE. 2007. Crafting and executing strategy-concepts and cases, (15th Edition), USA: McGrawHill/Irwin. Figure 3.1. SWOT Analysis

Truscott L, Aranda D, Nagarajan P, Tovignan S, Travaglini AL. 2009. A snapshot of crop diversification in organic cotton farms. in: Discussion paper. Soil Association

WTC, 2008. Biodiversity and Agriculture: Safeguarding Biodiversity and Securing Food for the World. World Trade Centre. Secretariat of the Convention on Biological Diversity. Montreal, 56 pages.

Worldometers, 2018. Turkey Population. http://www.worldometers.info/world-population/turkey-population/ (Available at: 31.08.2018).

YOK, Council of Higher Education, 2018. https://istatistik.yok.gov.tr/ (Available at: 01.09.2018)

RED-PARTRIDGE KAHRAMANMARAS SUTCU IMAM UNIVERSITY AVSAR SETTLEMENT WITH TELEMETRY DEVICE

Cagri Ozgur OZKAN[1], Mustafa ALTUNTAS[1], Aynur OZKAN[1], Ali KIZIL[1], Hacı KALINKUTUK[2], Haluk BASDOGAN[2], Adem KAMALAK[1]

[1]Kahramanmaras Sutcu İmam University, Faculty of Agriculture, Onikisubat, Kahramanmaras, TURKEY
[2]T.C. Minister of Forestry and Water Affairs XV. Regional Directorete, Kahramanmaras Province Branch Directoreta, Dulkadiroglu, Kahramanmaras, TURKEY

Corresponding author e-mail: cagri@ksu.edu.tr

Abstract

With the aim of increasing the natural population, there is no scientific research carried out in our country about the adaptation of the Ministry of Forestry and Water Affairs to the natural environments of the partridges raised and released to the nature. The Ministry of Forestry and Water Affairs and other non-governmental organizations are required to know the living and reproduction rates in the natural environment of partridges that are released in order to base their efforts on raising and raising partridges
For this purpose; Kahramanmaras Department of Nature Conservation and National Parks Department, Forty Kınalı Keklik Generation Station, 40 pieces of red-headed partridge, 02.10.2014 Kahramanmaras Sutcu Imam University, Avsar settlement was released to the environment.
With this study; such as adaptation to nature, shelter, feeding and protection from riddles have been researched.

Key words: *red partridge (alectorischukar), telemetry, adaptation*

SEASONAL VARIATIONS OF FATTY ACID COMPOSITION AND CONJUGATED LINOLEIC ACID CONTENT IN GRAZING AKKARAMAN SHEEP AND HAIR GOAT MILK FAT

Selcuk OZYUREK[1], Kadir CEBi[1]

[1] Erzincan Binali Yildirim University, TURKEY

Corresponding author e-mail: sozyurek@erzincan.edu.tr

Abstract

The conjugated linoleic acid (CLA) content of grazing Akkaraman sheep and Hair goat milk fat and the botanical composition, throughout their grazing period, was examined. It focuses on the effects of the grazing season on: (i) the fatty acid profile of the forage, (ii) the milk fatty acid composition. Here we refer specifically to putatively beneficial fatty acids (mono- and poly-unsaturated fatty acids (PUFA), including conjugated linoleic acid (CLA, C18:2 c-9, t-11). During the pasture season (May – September), 10 Akkaraman sheep and 10 Hair goat milk samples and pasture plants were collected and the fatty acid composition was examined in Erzincan. The results showed that: a. pasture fatty acid composition ($P<0.05$) affected the content of linoleic acid, a precursor of CLA in the forage, b. the PUFA level in sheep and goat milk was higher in May and June than other month, c. the CLA content of sheep milk fat was much higher ($P<0.05$) than goats milk, d. the pasture seasonal variations were directly proportional to the corresponding content of CLA in ewes' milk fat, e. the atherogenic index was the highest in June and lowest in September ($P<0.05$) in sheep and goat milk. The results suggest that the seasonal variations in CLA content in ewes and goats' milk fat are related primarily to the seasonal variation in linolenic acid content in grass lipids. It is recommended to carry out studies to increase the CLA ratio in milk with artificial pasture and different rations.

Key words: *pasture fatty acid, conjugated linoleic acid, milk, Akkaraman, hair goat*

OCCURRENCE, DETECTION, PRECAUTIONARY MEASURES OF AFRICAN SWINE FEVER VIRUS OUTBREAK IN BUEA, SOUTH WEST REGION OF CAMEROON

Ndam Abdel AZIZ[1], Atanga Gilbert CHE[1]

[1] Farming and Animal Husbandry Project (FAHP), CAMEROON

Corresponding author e-mail: abdelndam5@gmail.com

Abstract

African swine fever (ASF) is a highly contagious, haemorrhagic and fatal disease of pigs, caused by a virus known as African swine fever virus (ASFV). The ASFV can last for long periods in contaminated environments or cured pork products, which can be a source of infection or introduction of the disease to distant areas. The disease may occur in acute, sub-acute or chronic forms. Mortality is usually close to 100% and pigs of all ages are affected. Pigs are infected as a result of contact with infected wild or domestic pigs and by transmission from infected soft ticks of the Ornithodoros genus. Occurrence and study of ASF in Buea The disease began in Buea, Fako Division of the South West Region in May 2016 but it was not immediately diagnosed as ASF. This is due to the fact that the disease started by attacking one or two pigs and when the animals were treated with Pencilline/Streptomycine combination of antibiotics; dexamethasone, which is an anti-inflammatory drug and multivitamins, the disease subsided. But two weeks later, by early June the disease re-occurred with pigs and piglets presenting with reddened ears and areas of the legs. This time it responded to no treatment. It was at this point that concerned farmers started reporting the disease outbreak to Farming and Animal Husbandry Technical Team, who in turn collected samples from pigs and sent to the National Veterinary Laboratory in Yaoundé the nation's capital city. Collection, analysis of samples a total of 44 blood samples were collected from twelve heavily infected farms in Buea, Fako Division of the South West Region and sent for analysis. Samples for analysis were also collected from the piggery unit of Farming and Animal Husbandry Project (FAHP -Cameroon). The collection points were the lymph nodes, spleen and serum of all infected pigs. The blood samples were treated with EDTA. The samples were analyzed and confirm positive for the disease. FAHP staffs were then sent out immediately to locate the pig farms in the whole region and collect more statistics including the total number of infected pigs, mortality and survival if any. Precautionary Methods or Control of ASF •There should be stricter control over the import of meat and meat products primarily to guard against re-introduction of animal diseases. •Practicing good bio-security at all times can help reduce the risk of many diseases like ASF spreading. •Farmers should be properly educated to be able to recognize disease symptoms early so as to act promptly and avoid the serious socio-economic consequences that could follow. Conclusion Despite the present knowledge on ASF, the disease continues to re-occur in Cameroon due to the general fact that farmers only reluctantly heed to or simply shun instructions to confine their animals and disinfect their piggeries as well as report suspected cases. It is possible that the ASF outbreak that occurred in the Buea, Fako Division, South West Region of Cameroon was introduced through contaminated meat or meat products. The success of the prevention measures depends on strengthening national epidemiological capabilities to render support.

Key words: *African swine fever ASF, Buea, South West region, farmers*

EVALUATING OF INSEMINATIONS ON DAIRY CATTLE ENTERPRISES IN BURDUR PROVINCE

Zafer USTA[1], Aykut Asım AKBAS[1]

[1] Mehmet Akif Ersoy University, Faculty of Veterinary Medicine, Department of Animal Science, Burdur, TURKEY

Corresponding author e-mail: zusta@mehmetakif.edu.tr

Abstract

Study was carried out in order to determine of inseminations applicated in dairy cattle enterprises in the center towns of Burdur province during the year of 2017. Holstein is the prominent dairy breed with the high percentages in this province. Inseminations were involved just Holstein breed enterprises. The most inseminations were used in the months of November and December according to the other months. When data of 3205 artficial inseminations was considered, it was seen mostly Holstein x Holstein inseminations were applied in farms. The percentage of inseminations for crossbreeding was detected as 14.82 with the number of 475. According to data, while the number of imported sperm was more than domestic ones, the percentages were detected as 93.9 and 6.1 for crossbreeding in 2017, respectively. In addition to this, the large part of Simmental sperm was used for crosbreeding with the percentage of 61.26. This was followed by Montbeliarde breed (17.47%), Brown Swiss (6.32%), Belgian Bule (5.47%) and Normande breed (4.21%). It shows that beef cattle breeds were not properly integrated to dairy cattle sector in Burdur province. So it was thought that, the breeders have not been willing to beef cattle x Holstein, yet. But, as a positive contribution to holding harmless of dairy cattle from disproportionate red meat policies, using dairy cattle enterpries with commercial crossing for beef production cyclically can be one the methods.

Key words: *dairy cattle, insemination, crossbreeding*

A MONTE CARLO SIMULATION STUDY ROBUSTNESS OF MANOVA TEST STATISTICS IN BERNOULLI and UNIFORM DISTRIBUTION

Seyma KOC[1], Demet CANGA[2], A. Betul ONEM[1], Esra YAVUZ[1], Mustafa SAHIN[1]

[1]Kahramanmaraş Sütçü Imam University, Institute of Science and Technology, Department of Animal Science, TR46040, Onikişubat, Kahramanmaraş, TURKEY
[2]Osmaniye Korkut Ata University, Department of Food Processing, TR80050, Bahçe, Osmaniye, TURKEY
[3]Kahramanmaraş Sütçü Imam University, Faculty of Agriculture, Department of Animal Science, TR46040, Onikişubat, Kahramanmaraş, TURKEY

*Corresponding author e-mail: kockutlu1@gmail.com

Abstract

The aim of this study is to compare the robustness of Manova test statistics against the Type I error rate using the Monte Carlo simulation in Bernoulli and Uniform distribution. In the method, numbers have been generated according to constant and increasing variance for g=3, 4, 5 group p=3, 5, 7 dependent variables n=10, 30, 60 sample size using the RStudio. The specified combinations have been repeated 10,000 times. As the result Pillai Trace test statistic has been the least deviating from the nominal α =0.05 value. Wilk Lambda and Hotelling-Lawley Trace test statistics results have been close to each other. Researchers can get help from these suggested results during their own study.

Key words: *monte-carlo, simulation, bernoulli, uniform*

INTRODUCTION

The one-way multivariate analysis of variance (one-way MANOVA) is used to determine whether there are any differences between independent groups on more than one dependent variable. The most important assumptions are multivariate normality and homogeneity of variance-covariance matrices. The most well known and widely used MANOVA test statistics are Wilk's Λ, Pillai, Lawley-Hotelling, and Roy's test.

Wilk's Λ: Wilks' lambda (Wilks,1932) is a test statistic used in multivariate analysis of variance (MANOVA) to test whether there are differences between the means of identified groups of subjects on a combination of dependent variables. Wilks' lambda is the oldest multivariate test statistic, and is the most widelyused (Johnson and Wichern, 1982)
Let,
T: Total sums of squares and cross-products matrix
B: Between-group sums of squares and cross-products matrix
W: Within-group sums of squares and cross-products matrix
p: Number of dependent variables in each group
g: The number of groups g ≥ 2.
$\bar{x}$: Overall sample mean vectors
n_i : sample size for the i-th group
S_i : sample covariance matrix for the i − th sample
Thus B and W matrix can be expressed by

$$B = \sum_{i=1}^{g} n_i(\bar{x}_i - \bar{x})(\bar{x}_i - \bar{x})' \quad W = \sum_{i=1}^{g}(n_i - 1)\,S_i \qquad (1)$$

The Wilks' Lambda statistic is the ratio of the within generalized dispersion to the total generalized dispersion

$$\Lambda = \frac{|W|}{|B+W|} = \frac{|W|}{|T|} \qquad (2)$$

takes values between zero and one. The Wilks' Lambda can be obtained as a product of eigenvalues which can be obtained by the eigenvalues of the matrix of BW^{-1} by following method

$$\Lambda = \prod_{i=1}^{s} \frac{1}{1+\lambda_i} \qquad (3)$$

where s = min(p, g−1) and the rank of the B matrix and the expression λ_i are eigenvalues of the BW^{-1} matrix. According

to Johnson and Wichern the Wilks' Lambda performs, in a multivariate setting, with a combination of dependent variables - the same role as the F-test performs in a one-way analysis of variance. Bartlett (1954) using a chi-square test instead of an F-distribution test. Bartlett's test is a modification of the corresponding likelihood ratio test designed to make the approximation of the chi-square distribution better at all stages as formuled

$$V = -[N - 1 - (p + g)/2] ln\Lambda \quad (4)$$

denotes the χ^2 distribution of p (g-1) degrees of freedom if $V > \chi^2_{Tablo[p(g-1)];\alpha}$ there is a difference between the mean vectors. The Wilks Lambda statistic can salso be calculated with the help of the F distribution. In different groups, variables and observation numbers, approach to F distribution and degrees of freedom are available.

Hotelling-Lawley Trace (T): The Hotelling ve Lawley Trace (1938) statistic, which defined as follows (Seber 1984).

$$T = trace(BW^{-1}) = \sum_{i=1}^{s} \lambda_i$$

The F distribution can be used to test the T statistic (Stevens 1986). T is the trace of the BW^{-1} matrix (Hotelling 1931; Lawley 1939).

Pillai trace statistic (V): Pillai (1955) trace statistic can be interpreted as the proportion of variance in the dependent variables, which is accounted for by variation in the independent variables. The V statistics where s, m, n parameters are as follows;

s=*min (g-1,p),* $m = \frac{|p-(g-1)|-1}{2}$, $n = \frac{N-p-g-1}{2}$, $\frac{2n+s+1}{2m+s+1} \times \frac{V}{s-V}$

closed F distribution with s(2m+s+1*)* and (2n +s+1) degrees of freedom (Morrison 1976).

Roy's Largest Root (R): If the big eigenvalue of the matrix of BW^{-1} is denoted by λ_{max} Roy's R statistic is given by $R = \sum_{i=1}^{s} \frac{\lambda_{max}}{1+\lambda_{max}}$. This value is compared to the Heck graph value with parameter s, m, n. If the R statistic is greater than the Heck graph value, it is said to be the difference between the mean vectors (Alpar 2013). When s = 1, R shows exact F distribution (Kanık 1999).

MATERIALS AND METHODS

This investigation deals mainly to assess the robustness of MANOVA. To do is the Multivariate Normality assumption is violated to see if that will affect Type I error rate. In order to evaluate the robustness of MANOVA the virtual experiment was designed in the following way. For the significance test of difference between the groups, the number of groups was determined as g=3, g=4, g=5. Dependent variable numbers were set at p= 3, p=5, p=7 for each group. Sample size determined as n=10,30,60. That simulation was based on 10,000 replications. The Monte Carlo study manipulated in equal variance ($\sigma_1^2 = \sigma_2^2 = \ldots = \sigma_g^2$) and unequal variance ($\sigma_1^2 < \sigma_2^2 \ldots < \sigma_g^2$). When establishing the unequal variance, the variance of a dependent variable was first set, then the other dependent variables were multiplied by 3, that mean variance ratio is (1:3).All of the statistical methods were conducted using R (MVNormTest written by Slawomir on 04/12/2012: Normality test for multivariate variables package). In order to test the hypothesis used to compare the mean of more than two groups the Wilks' Lambda(W), Pillai's Trace(V), Hotelling-Lawley Trace(T), Roy's Largest Root test(R) statistics values and their Type I error rate were calculated. If p-value was less than 0.05, the nominal alpha level, the null hypothesis was rejected. The data are produced in the Bernoulli and Uniform distribution. Scenarios were prepared in 54 different combinations for each test statistic. These operations were repeated 10,000 times and the number of null hypothesis rejections was determined for each test statistic. Experimental Type I error rates were calculated for each test statistic with dividing the rejection number by the repeat number.

RESULTS AND DISCUSSION

Monte Carlo test result for R, V, T, W test statistics is given respectively Table 1, Table 2, Table 3 and the comments are below.

When group number is g=3, for all values of p, observations are interpreted in Bernoulli and Uniform distribution according to sample size for Roy Largest Root test statistics with Figure 1.

For the Roy in Bernoulli test statistic, constant and increasing variance; when the sample size and the number of variables increased, it was seen that deviations from Type I error decreased. For Roy test statistic in g=3, the highest deviation was seen in all scenarios when p=3 n=10,constant variance with 0.0592 value. In uniform distribution it was observed that deviations from 0.05 are low when p and g are small, and large when p and g are big. The highest deviation in uniform distribution was seen in all scenarios when p=7 n=60,constant variance with 0.0449 value.

Table1. For g=3, p=3, 5, 7; sample size n=10,30,60 experimental Type I error rate with 10000 raplicate.

g	p	variance	n	Roy (R)		Pillai Tracks (V)		Hotelling-Lawley (T)		Wilks Lambda (W)	
				B	U	B	U	B	U	B	U
3	3	constant	10	0.0592	0.0507	0.0544	0.0504	0.0522	0.0551	0.0572	0.0525
			30	0.0521	0.0496	0.0542	0.0497	0.0519	0.0483	0.0502	0.0479
			60	0.0537	0.0504	0.0538	0.0477	0.0542	0.0488	0.0512	0.0511
		Increase	10	0.0563	0.0501	0.0549	0.0563	0.0551	0.0537	0.0608	0.0504
			30	0.0541	0.0512	0.0549	0.0444	0.0548	0.0498	0.0533	0.0514
			60	0.055	0.0497	0.0494	0.0476	0.0568	0.0497	0.0503	0.0466
	5	constant	10	0.0549	0.0537	0.0521	0.0474	0.058	0.0533	0.0517	0.0497
			30	0.0526	0.0478	0.0575	0.0495	0.0584	0.0501	0.0558	0.0521
			60	0.0517	0.0489	0.0543	0.0506	0.0484	0.0519	0.0511	0.0474
		Increase	10	0.0563	0.0509	0.0522	0.0529	0.0533	0.0506	0.0548	0.0507
			30	0.0527	0.0475	0.0549	0.0512	0.0498	0.0503	0.0524	0.0527
			60	0.0545	0.0477	0.0503	0.0468	0.0525	0.0478	0.0549	0.0491
	7	constant	10	0.0515	0.0486	0.0509	0.0488	0.052	0.0546	0.0529	0.0498
			30	0.0556	0.0529	0.055	0.048	0.0545	0.0497	0.0518	0.0478
			60	0.054	0.0449	0.0534	0.0489	0.053	0.0466	0.0491	0.0462
		Increase	10	0.058	0.0494	0.0568	0.0546	0.0561	0.0521	0.0547	0.0513
			30	0.053	0.0468	0.0573	0.0527	0.0535	0.0477	0.0542	0.0494
			60	0.0517	0.0502	0.0511	0.0471	0.0528	0.0478	0.0494	0.0461

When group number is g=3, for all values of p, observations are interpreted in Bernoulli and Uniform distribution according to sample size of Pillai's Trace test statistics with Figure 2.

For Pillai in Bernoulli distribution when p=3, both constant and increasing variance, deviations from nominal significance level, α =0.05, decrease as the sample size (n value) increase. For Pillai test statistic in g=3, the highest deviation was seen in all scenarios when p=5, n=30, in constant variance with 0.0575 value. In uniform distribution for Pillai test statistic in g=3, the highest deviation was seen in all scenarios when p=3, n=10, in increasing variance with 0.0563 value.

When group number is g=3, for all values of p, observations are interpreted in Bernoulli and Uniform distribution according to sample size of Hotelling-Lawley test statistics with Figure 3.

For Hotelling-Lawley in Bernoulli distrubition when p=3, most deviations was seen when the sample size n=60 both in case of constant and increasing variance. When p = 5, the greatest deviation was seen when n = 30, both in case of constant and increasing variance again. As the number of variables p = 7 the highest deviation was seen; when n = 30 for the constant variance and when n = 10 for the increasing variance. For Hotelling-Lawley test statistic in g=3 in bernoulli distrubition, the highest deviation was seen in all scenarios when p=5, n=30, in constant variance with 0.0584 value. In Uniform distribution, it was observed that the

deviation increases when the number of variables increases. For Hotelling-Lawley test statistic in g=3 in Uniform distrubition, the highest deviation was seen in all scenarios when p=3, n=10, in constant variance with 0.0551 value.

When group number is g=3, for all values of p, observations was interpreted in Bernoulli and Uniform distribution according to sample size of Wilks' Lambda test statistics with Figure 4.

Wilks' Lambda in Bernoulli Distrubition when p=3, both constant and increasing variance, the highest deviation was seen when n=10. As p=5 the highest deviation is seen; when n = 30 for the constant variance and when n = 10 for the increasing variance. As p=7 both constant and increasing variance, the highest deviation is seen when n=10. For Wilks Lambda test statistic in g=3, the highest deviation was seen in all scenarios when p=3, n=10, in constant variance with 0.0608 value. In Uniform distrubition, the highest deviation was seen in all scenarios when p=7, n=60, in constant variance with 0.0461 value.

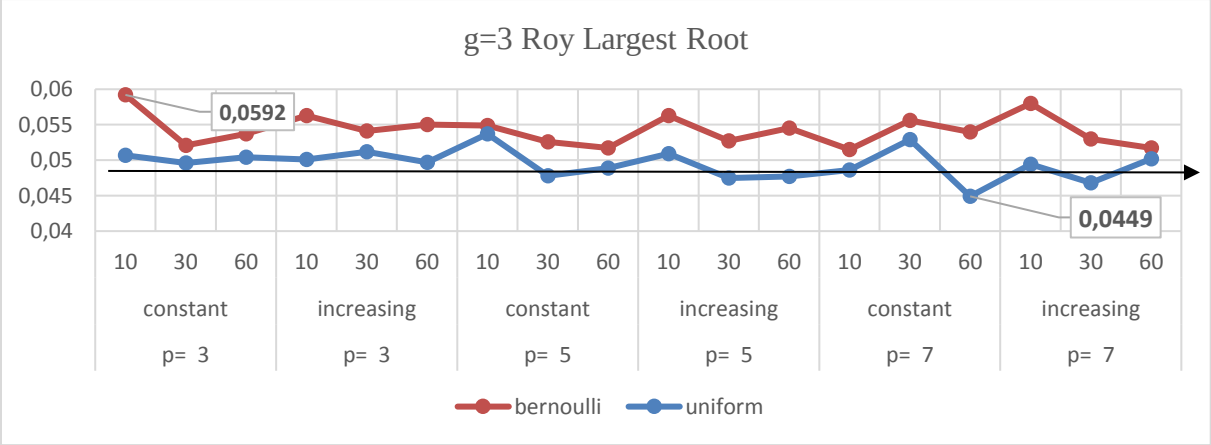


Figure 1. Type I error rates for Roy Largest Root test statistic in g=3

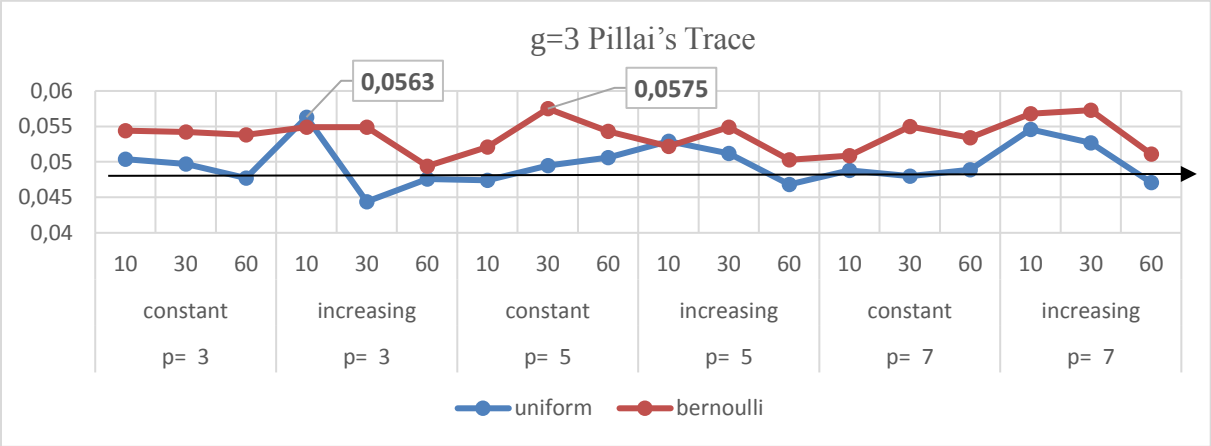


Figure 2. Type I error rates for Pillai's Trace test statistic in g=3

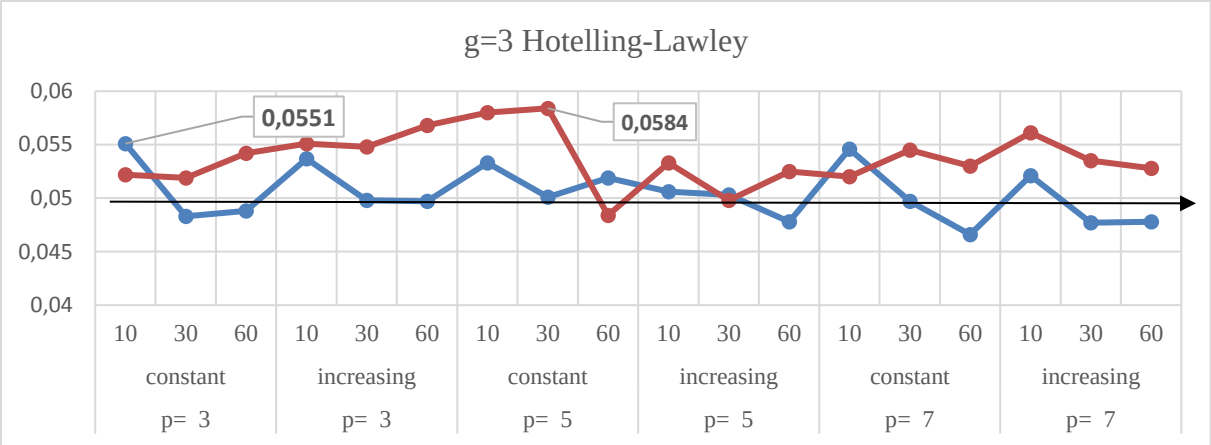


Figure 3. Type I error rates for Hotelling-Lawley test statistic in g=3

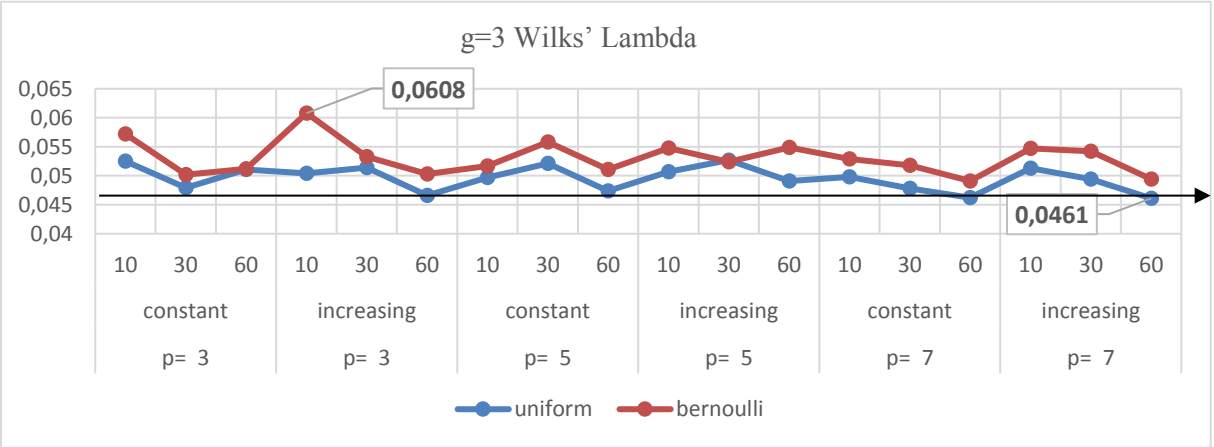


Figure 4. Type I error rates for Wilks'Lambda test statistic in g=3

Table 2. For g=4, p=3, 5, 7; sample size n=10,30,60 experimental Type I error rate with 10000 raplicate

g	p	variance	n	Roy (R)		Pillai Tracks (V)		Hotelling-Lawley (T)		Wilks Lambda (W)	
				B	U	B	U	B	U	B	U
4	3	constant	10	0.0535	0.053	0.0499	0.0505	0.0545	0.0484	0.0549	0.0527
			30	0.0599	0.0502	0.0548	0.0475	0.0505	0.0502	0.0552	0.049
			60	0.0517	0.0474	0.0497	0.0455	0.0508	0.0489	0.0537	0.046
		Increase	10	0.0526	0.0476	0.052	0.0513	0.0556	0.0494	0.0506	0.0479
			30	0.0532	0.0494	0.0519	0.0474	0.0518	0.0475	0.0528	0.0503
			60	0.0531	0.0502	0.0528	0.0481	0.0502	0.0539	0.0513	0.0441
	5	constant	10	0.0534	0.0489	0.0506	0.0501	0.0565	0.0499	0.0551	0.0518
			30	0.0543	0.0494	0.0498	0.0521	0.0533	0.0505	0.0533	0.0489
			60	0.0544	0.0491	0.0502	0.0511	0.0518	0.0501	0.0503	0.0486
		Increase	10	0.0543	0.0496	0.0541	0.0506	0.0539	0.0535	0.0567	0.0538
			30	0.0518	0.0494	0.0537	0.0462	0.0521	0.05	0.054	0.0461
			60	0.0536	0.0524	0.0508	0.0424	0.0523	0.0477	0.0542	0.0505
	7	constant	10	0.0561	0.0487	0.0553	0.0446	0.0517	0.0492	0.0508	0.047
			30	0.0559	0.0493	0.0538	0.0499	0.055	0.0504	0.0526	0.0486
			60	0.0505	0.0483	0.0537	0.0505	0.0513	0.0515	0.0508	0.0518
		Increase	10	0.0511	0.0528	0.0551	0.0503	0.0567	0.0537	0.0545	0.0514
			30	0.0581	0.0493	0.0526	0.0491	0.0577	0.0501	0.0544	0.0502
			60	0.0557	0.0493	0.052	0.0464	0.053	0.0516	0.0539	0.0494

When group number is g=4, for all values of p, observations are interpreted according to sample size of Roy Largest Root test statistics with Figure 5.

For the Roy test statistic, it was seen that when n=30,p = 3 and the both constant and increasing variance, there is more deviations from nominal signifcance level, α =0.05. As p = 5, the greatest deviation was seen when n = 60 for the constant variance, and when n = 10 for the increasing variance. As the number of variables p = 7, the highest deviation is seen when n=10 for constant variance and when n=30 for the increasing variance. For Roy test statistic in g=4, the highest deviation was seen in all scenarios when p=3, n=30, in constant variance with 0.0599 value. The highest deviation in the uniform distribution was observed when p = 3 n = 10, and this deviation was the highest one in all scenarios with 0.053.

When group number is g=4, for all values of p, observations are interpreted according to sample size of Pillai's Trace test statistics with Figure 6.

For Pillai'sTrace when p=3 per group, most deviations is seen when the sample size n=30 for the constant variance and when n = 60 for the increasing variance. When p = 5, 7 the greatest deviation is seen when n = 30, both constant and increasing variance. For Pillai test statistic in g=4, the highest deviation was seen in all scenarios when p = 7 n = 10 with 0.0553 value. In uniform distribution, deviations are reduced as variable values grow. The highest variance value 0.0424, while p = 5, n = 60 while increasing variance was observed.

When group number is g=4, for all values of p, observations are interpreted according to sample size of Hotelling-Lawley test statistics with Figure 7.

For Hotelling-Lawley in Bernoulli distrubition when p=3 and p=5 per group, both constant and increasing variance, the highest deviation is seen when n=10. As p=7 both constant and increasing variance, the highest deviation is seen when n=30. For Hotelling-Lawley test statistic in g=4, the highest deviation was seen in all scenarios when p=7, n=30, in increasing variance with 0.0577 value. In Uniform distrubition the closest results to the nominal α =0.05 value were seen when p = 5 at constant variance. Also 0.0539 is which is the highest value in uniform distrubition all scenarios.

When group number is g=4, for all values of p, observations are interpreted according to sample size of Wilks'Lambda test statistics with Figure 8.

For Wilks'Lambda in Bernoulli distribution when p=3, both constant and increasing variance, the highest deviation was seen when n=30. The number of variables p=5, both constant and increasing variance, the highest deviation was seen when n=10. The highest deviation was seen as the p = 7, n = 30 for the constant variance and as n=10 for the increasing variance. For Wilks Lambda test statistic, the highest deviation was seen in all scenarios when p=5, n=10, in increasing variance with 0.0567 value. In the uniform distribution, the Wilks' Lambda test statistic gave deviated results for all scenarios in general, except for p = 7.

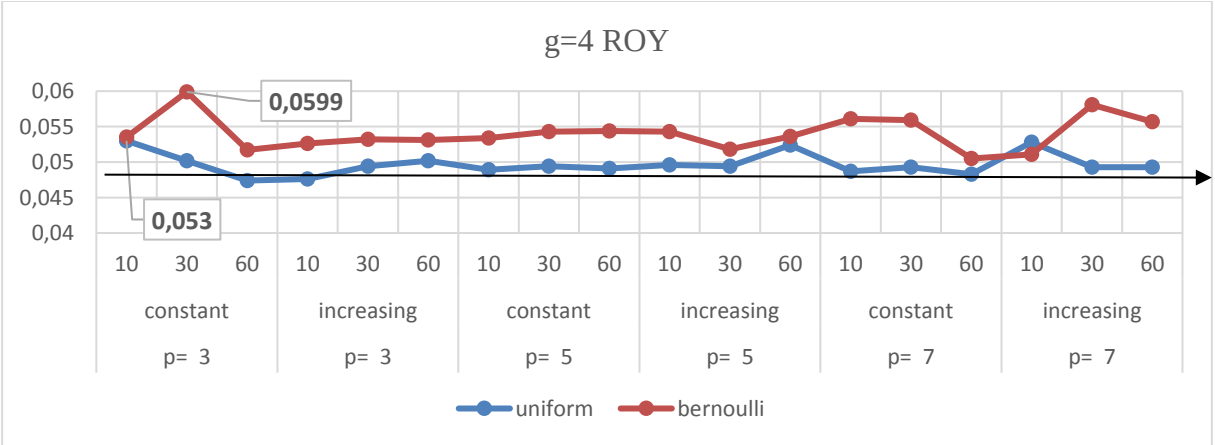


Figure 5. Type I error rates for Rooy Largest Root test statistic in g=3

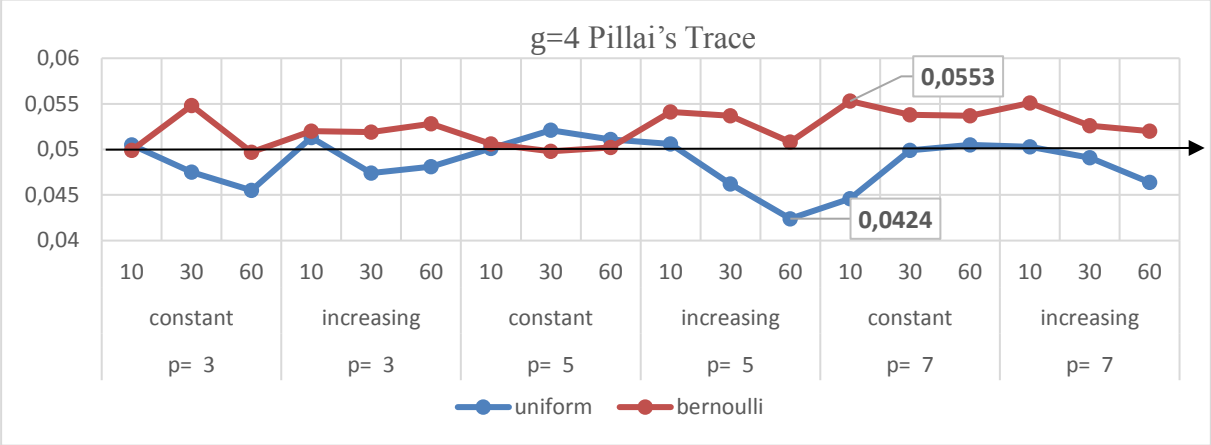


Figure 6. Type I error rates for Pillai's Trace test statistic in g=4

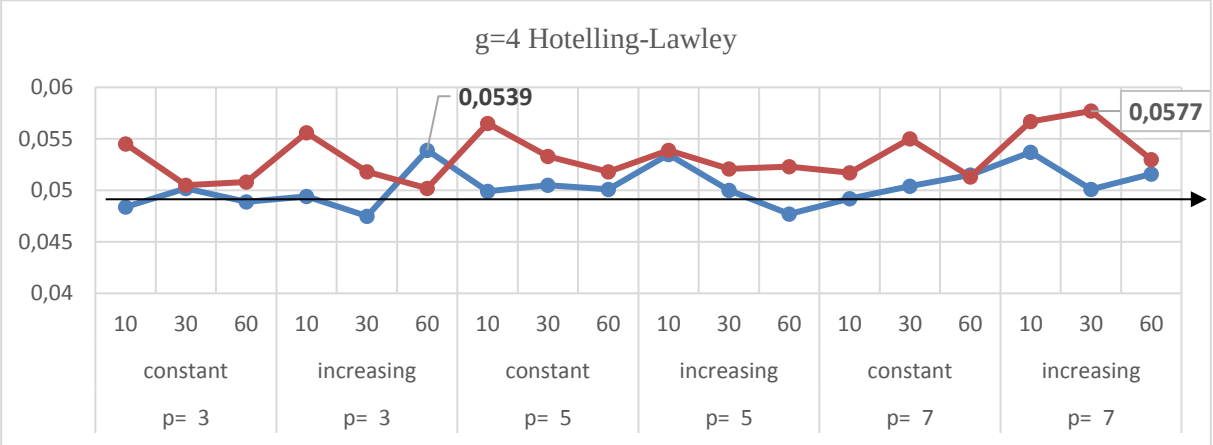


Figure 7. Type I error rates for Hotelling-Lawley test statistic in g=4

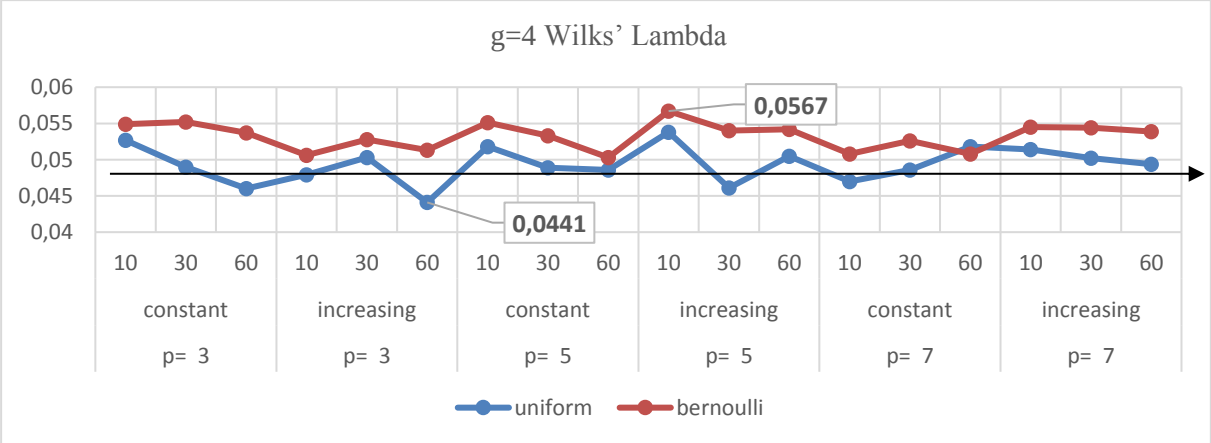


Figure 8. Type I error rates for Wilks' Lambda test statistic in g=4

Table 3. For g=5, p=3, 5, 7; sample size n=10,30,60 experimental Type I error rate with 10000 raplicate

g	p	variance	n	Roy (R)		Pillai Tracks (V)		Hotelling-Lawley (T)		Wilks Lambda (W)	
				B	U	B	U	B	U	B	U
5	3	constant	10	0.0559	0.046	0.0521	0.046	0.0517	0.0516	0.0536	0.0494
			30	0.0505	0.0489	0.0524	0.0471	0.0535	0.0466	0.051	0.0481
			60	0.0537	0.0491	0.0523	0.045	0.0539	0.0464	0.0531	0.0439
		Increase	10	0.0535	0.0507	0.053	0.049	0.0495	0.0504	0.0566	0.051
			30	0.0522	0.0507	0.0542	0.0476	0.0538	0.0533	0.054	0.0471
			60	0.0549	0.0515	0.051	0.0521	0.0544	0.0488	0.0524	0.048
	5	constant	10	0.0502	0.0492	0.0508	0.0485	0.0519	0.044	0.0537	0.0481
			30	0.0518	0.0492	0.0569	0.0502	0.0538	0.0488	0.0555	0.0468
			60	0.0551	0.0495	0.0534	0.0521	0.0531	0.0489	0.0513	0.0489
		Increase	10	0.0553	0.0493	0.0517	0.0461	0.0549	0.0475	0.0531	0.0511
			30	0.0493	0.0494	0.0462	0.0474	0.0543	0.0483	0.0585	0.0492
			60	0.0543	0.0491	0.0518	0.0455	0.0473	0.0484	0.0496	0.0489
	7	constant	10	0.0531	0.0476	0.0507	0.0517	0.0541	0.0482	0.0537	0.0502
			30	0.0508	0.0465	0.051	0.0499	0.055	0.0473	0.0542	0.0494
			60	0.0487	0.0511	0.05	0.0492	0.0508	0.0454	0.0539	0.0486
		Increase	10	0.052	0.0533	0.0521	0.0474	0.0519	0.0493	0.0565	0.048
			30	0.0524	0.0501	0.0559	0.0477	0.0583	0.0501	0.053	0.0475
			60	0.0531	0.0488	0.0518	0.0453	0.0534	0.0484	0.0556	0.0487

When group number is g=5, for all values of p, observations are interpreted according to sample size of Roy Largest Root test statistics with Figure 9.

For Roy in Bernoulli distrubition as p=3 the greatest deviation was seen when n = 30 for the constant variance, and when n = 60 for the increasing variance. As p = 5, the greatest deviation was seen when n = 60 for the constant variance, and when n = 10 for the increasing variance. As p = 7, n=10 , at constant variance the greatest deviation was seen and as n = 60 for the increasing variance. For Roy test statistic in g=5, both Bernoulli and Uniform distrubition the highest deviation was seen in all scenarios when p=3, n=10, in constant variance respectively 0.0559 and 0.046. In uniform distribution, the deviation increases as the number of variables increases.

When group number is g=5, for all values of p, observations are interpreted according to sample size of Pillai's Trace test statistics with Figure 10.

For Pillai's Trace in Bernoulli distribution when p=3,5,7 per group, both constant and increasing variance, the highest deviation was seen when n=30. For Pillai test statistic in g=5, the highest deviation was seen in all scenarios when p=5, n=30, in constant variance with 0.0569 value. In the uniform distribution, deviations are usually below 0.05 for all variable values. Also the highest deviation was seen as p=7,n=60 in increasing variance.

When group number is g=5, for all values of p, observations are interpreted according to sample size of Hotelling-Lawley test statistics with Figure 11.

For Hotelling-Lawley in Bernoulli distribution when p=3 per group, both constant and increasing variance, the highest deviation is seen when n=60. As p=5 the highest deviation is seen; when n = 30 for the constant variance and when n=10 for the increasing variance. As the number of variables p = 7 the highest deviation is seen; when n=30 for both constant and increasing variance. For Hotelling-Lawley test statistic in g=5, the highest deviation was seen in all scenarios when p=7, n=30, in increasing variance with 0.0583 value. In uniform distribution, the deviation increases as the number of variables increases and also 0.044 is the highest deviation as p=5,n=10 in constant variance.

When group number is g=4, for all values of p, observations are interpreted according to sample size of Wilks'Lambda test statistics with Figure 12.

For Wilks'Lambda in Bernoulli distribution when p=3 the highest deviation was seen; when n = 10 for both constant and increasing variance. When p = 5, the greatest deviation was seen when n =30 for the constant variance and when n=10 for

the increasing variance. When p=7 the highest deviation was seen; when n = 30 for both constant and increasing variance. For Wilks Lambda test statistic in g=5, the highest deviation was seen in all scenarios when p=5, n=30, in increasing variance with 0.0585 value. In Uniform distrubition, deviations from the nominal value were less than 0.05 as the variable values increased. In large variable values deviations are small. The smallest deviation observed in all scenarios was 0.0439 when p=3, n = 60 in constant variance.

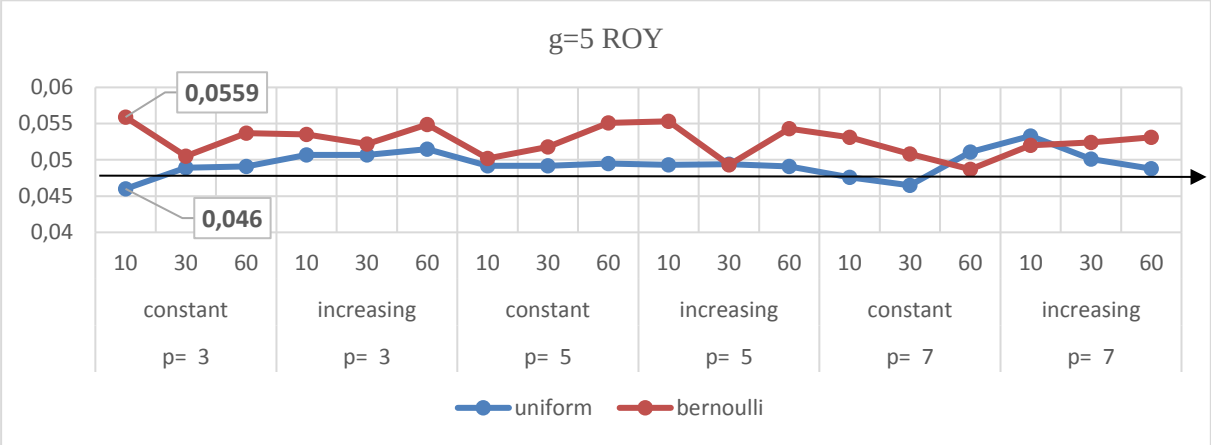


Figure 9. Type I error rates for Roy Largest Root test statistic in g=5

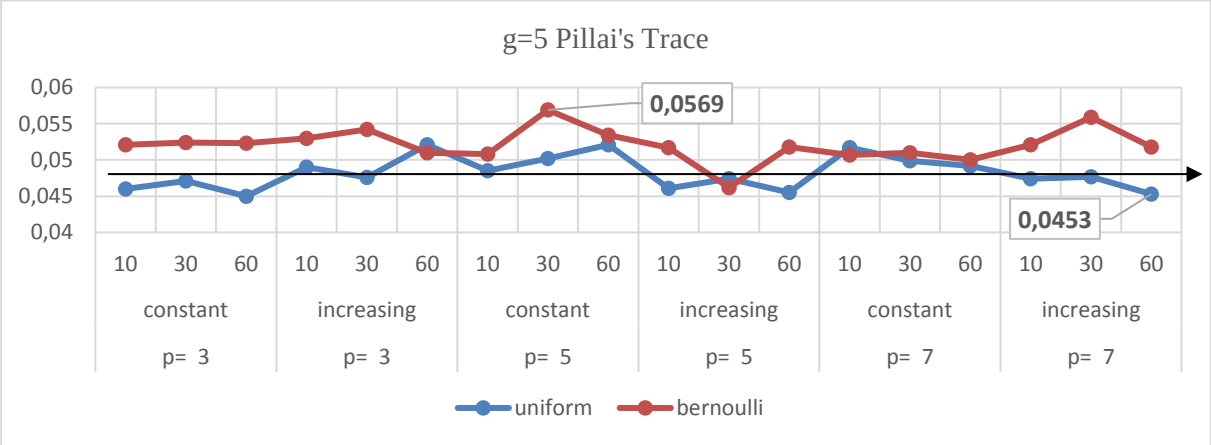


Figure 10. Type I error rates for Pillai's Trace test statistic in g=5

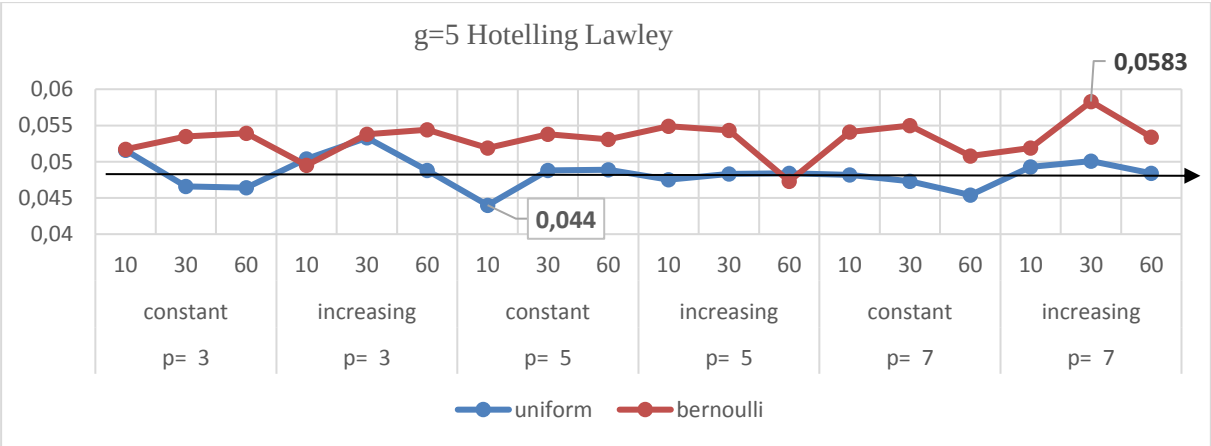


Figure 11. Type I error rates for Hotelling-Lawley test statistic in g=5.

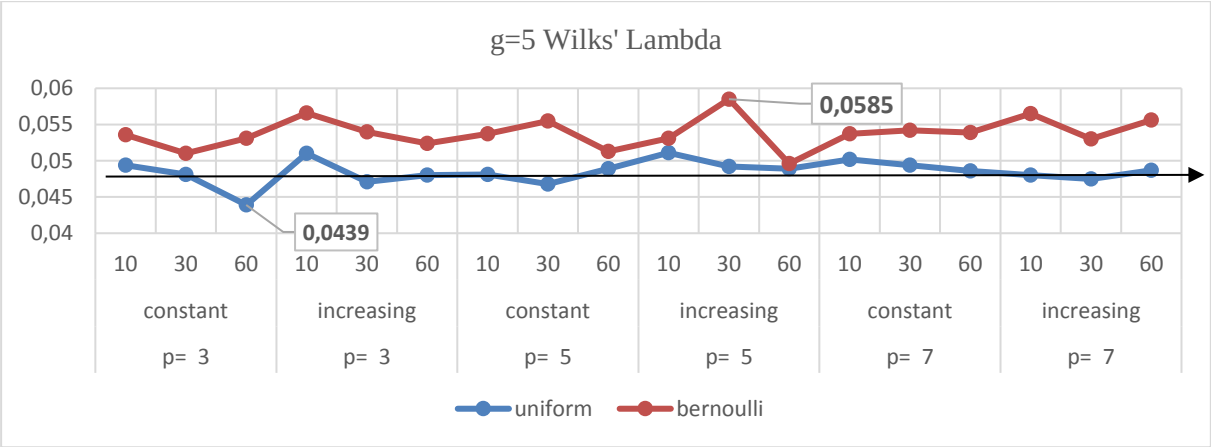


Figure 12. Type I error rates for Wilks'Lambda test statistic in g=5.

CONCLUSION

In this study, 54 design points were created for 10, 30 and 60 observations with 3, 4, 5 variable numbers 3, 5, 7, constant and increasing variance groups for each test statistic. The results of the Monte Carlo simulation run 10,000 times with each design and numbers are produced from bernoulli and uniform distributions. Results are as follows. In Bernoulli distribution in cases where the deviation from the Type I error rate deviates from the value of 0.05, it is mostly observed in the R test statistic followed by W and T statistics. W and T statistics were given close results in terms of the maximum bias. In the V statistic, the maximum deviation scenarios are less common than the other test statistics. This study suggests that the Pillai Trace statistic works well in the Bernoulli Distribution. Other studies are that found the Pillai Trace test statistic to be reliable in the form of Olson (1974), Hopkins and Clay (1963), Holloway and Dunn (1967), Ito (1969), Seber (1984), Korin (1972) and Davis (1980,1982). The details of the test statistics which give the best results in constant and increasing variance cases with different sample sizes, group numbers and variable numbers according to the derivation when comparing the scenarios for both distributions are presented below.

In case of constant variance in Bernoulli distribution;

When group number is 3, Wilks' Lambda statistic,

When the group number is 4, the Pillai's Trace,

When the group number is 5, Roy's Largest Root statistic can be suggested. However, in the case of constant variance, it can be said that Wilks' Lambda and Pillai's Trace gave better results regardless of the sample and variable numbers.

In case of increasing variance; When the group number is 3, Pillai's Trace When the group number is 4, the statistic Pillai's Trace When the group number is 5 Pillai's Trace, can be suggested. However, it can be said that in general, the Hotelling's Trace and the Pillai's Trace (Pillai's Trace) gave better results regardless of the sample and variant number.

In uniform distribution, in the case of constant variance;

When the group number is 3, Pillai's Trace statistic

When the group number is 4 Roy's Largest Root statistic

When the group number is 5, Roy's Largest Root statistic can be suggested.

In the case of constant variance, it can be said that Roy's Largest Root Statistics and Pillai's Trace statistic gave better results regardless of the sample and variable numbers.

In case of increasing variance;

When group number is 3, Wilks' Lambda statistic,

When the group number is 4, Roy's largest Root statistic,

When the group number is 5, the Wilks' Lambda statistic can be suggested.

However, in the case of increasing variance, it can be said that Roy's Largest Root Statistics in general and Wilks 'Lambda Statistic (Wilks' Lambda) statistic are better,

regardless of the number and variety of statistics.

In general, when all the test statistics are examined, the I.Tip error ratios of the Pillai test statistic are the least deviating from the nominal $\alpha = 0.05$ value, as in many studies. However, the theoretical distribution of this statistic is not known precisely. Using the Monte Carlo method, researchers can produce critical values at some Type I error rates and degrees of freedom, and they can present a comparative chart of the literature.

REFERENCES

Avis AW. 1980. On the effects of the moderate multyvariate nonnormality on wilks's likelihood ratio criterion. Journal of American Statistical Association, 67: 419-427.

Davis AW. 1982. On the effects of the moderate multivariate nonnormality on roy's largest root test. Journal of American Statistical Association, 77: 986-990.

Holloway LN, Dunn OJ. 1967. The robestness of Hotelling's T^2. Journal of American Statistical Association, 62: 124-136.

Hopkins JW, Clay PPF. 1963. Some emprical distribution of bivariate t^2 and homoscedasticity criterion m under unecual variance and leptokurtosis. Journal of American Statistical Association, 58: 1048-1053.

Ito K. 1969. On the effect of homoscedasticity and nonnormality upon some multivariate procedures. Multivariate Analysis, 2: 87-120.

Johnson RA, Wichern DW. 1982. Applied multivariate statistical analysis. Prentice-Hall, Inc., 594s, USA.

Kanık A. 1999. Çok değişkenli varyans analizinde kovaryans matrislerinin homejenliği ön şartı. Ankara Üniversity Institute of science.

Korin BP. 1972. Some comment on the homoscedasticity criterion M and the multivariate analysis of variance test T^2, W and R. Biometrica, 59: 215-216.

Mendeş M. 2005. Uygun simülasyon sayisinin belirlenmesi: Monte Carlo simülasyon çalişması. Tarım Bilimleri Dergisi 2005, 11 (1) 12-15.

Morrison FD. 1976. Multivariate statistical methods. MC Graw_Hill Book Company, 2nd edition, 410s. USA.

Olson CL. 1974. Copperative robustness of six tests in multivariate analysis of variance. Journal of American Association, 69(348): 894-907.

Pillai KCS. 1955. Some new test criteria in multivariate analysis. The Annals of Mathematical Statistics, 26: 117-121.

Seber GAF. 1984. Multivariate observations. John Wiley&sons, Inc., 686s, USA.

Wilks SS. 1932. Certain generalizations in the analysis of variance, Biometrica, 24: 471-494.

INVESTIGATION OF GHR EFFECTS ON MILK RELATED TRAITS IN JERSEY AND HOLSTEIN COWS RAISED IN BLACK SEA REGION

Ozden COBANOGLU[1], Ertugrul KUL[2], Eser Kemal GURCAN[3], Samet Hasan ABACI[4], Soner CANKAYA[5]

[1]Uludag University, Faculty of Veterinary Medicine, Department of Genetics, Bursa, TURKEY
[2]Ahi Evran University, Faculty of Agriculture, Department of Animal Science, Kirsehir, TURKEY
[3]Namik Kemal University, Faculty of Agriculture, Department of Animal Science, Tekirdag, TURKEY
[4]Ondokuz Mayis University, Faculty of Agriculture, Department of Animal Science, Samsun, TURKEY
[5]Ondokuz Mayis University, Faculty of Yasar Dogu Sports Science, Department of Sport Management, Samsun, TURKEY

Corresponding author e-mail: ocobanoglu@uludag.edu.tr

Abstract

This research has been carried out to determine the effect of growth hormone receptor (GHR) gene on milk production traits in Jersey and Holstein breed cows raised in the north part of Turkey. Milk samples were recorded as the test day milk yield (TDMY) and adjusted based 305–day milk (305-DMY). Also, milk fat and protein contents were analyzed by the MilkoScan FT1 analyzer. Besides milk fat and protein yields were also calculated based on milk analyses. DNA was isolated from 280 Jersey and 163 Holstein cows grown in commercial farms located in Black Sea Region. RFLP-PCR technique was used to genotype animals for 342 bp fragment in GHR gene. For GHR/AluI polymorphism, a total of 443 animals were genotyped. Three SNP genotypes as AA, AG, and GG were identified at this position. Despite the insignificant effect of GHR gene in Holstein cows raised in the northern region, animals with AA genotypes displayed to be higher TDMY, 305-DMY, and milk fat yield than those observed at animals with AG genotypes. There was not detected any animals with GG genotypes in this herd. On the other hand, the GHR gene was determined to have a significant effect on the fat and protein contents in Jerseys. GG genotyped animals had the highest fat and protein percentages, those with AA genotypes were at the low levels. In conclusion, GHR gene might be used as a candidate gene to enhance milk fat and protein yields in the national dairy cattle breeding program.

Key words: *GHR, dairy cow, milk yield, fat and protein contents*

INTRODUCTION

The economically important traits are determined by many genes with interacting environmental factors in dairy cows. One of the gene have an effect on these type of traits is growth hormone receptor (GHR). GHR gene is a member of cytokine/hematopoietin family with three functional extracellular domains (Maj et al., 2006). The gene encode the protein which operates as a transmembrane receptor for growth hormone (GH). In fact GHR intercede GH to carry out its biological role on metabolic activity and growth on target cell surface by transducing the signal through the cell membrane (Lincoln et al., 1995). Bovine GHR gene is located on chromosome 20 and contains 9 intronic and 10 exonic regions in DNA sequences (Menon et al., 2001 and Maj et al., 2004). Several genetic polymorphism were detected in the bovine GHR gene. These polymorpic sites are mainly reported in the 5′-non coding region, in exon 8, and in exon 10 (Aggrey et al., 1999; Blott et al., 2003; Ge et al., 2003; Maj et al., 2005; Viitala et al., 2006). The single nucleotide polymorphisms (SNP)s in GHR gene are associated with growth performance, carcass traits, milk yield, and milk composition traits in dairy cattle (Maj et al., 2004; Olenski et al., 2010; Hadi et al., 2015). But there was not enough study to demonstrate relationship between polymorphic sites of GHR gene and milk

related traits in Turkish dairy populations. Therefore, the aim of this study to detect a potential association between GHR/*AluI* polymorphism and milk yield and milk composition traits in dairy cattle grown up Black Sea region using PCR-RFLP assay.

MATERIALS AND METHODS

A total of 163 Holstein and 280 Jersey catlle raised in Black Sea region were used in this study. Data on daily milk production records (test day records) were obtained monthly basis during the lactation periods. The milk samples were analyzed for milk fat and milk protein contents using MilkoScan FT1 ultrasonic milk analyzer. Further milk fat and protein yields were calculated based on the milk related trait records.

Blood samples were collected from a total of 443 cows. DNA isolations from blood samples taken from 10 ml EDTA tubes were made with the standard phenol / chloroform method (Sambrook and Russel, 2001).PCR-RFLP method were used to genotype animals for a candidate region in GHR gene (Accession Number: *AF140284*). The amplification of genomic DNA was carried out with a total volume of 25 µl in PCR reaction, including 50 ng of genomic DNA, 50 µM of each primer, 200 µM each dNTP, 2.5 µl of 10x PCR buffer and 0.3 U of Taq Polymerase (Thermo Fisher Scientific Inc, USA). Primer sequences used for 342 bp fragment containing a polymorphic site were 5'GCTAACTTCATCGTGGACAAC3', 5'CTATGGCATGATTTTGTTCAG3'(Di Stasio et al., 2005). The amplification program was 95°C for 5 min; 30 cycles of 94°C for 45s, an annealing from50°C for 45s, 72°C for 45s, and a final extension of 72°C for 7 min. 10 µl of PCR product were digested with 10 U/µl *AluI* enzyme (Thermo Fisher Scientific Inc., USA) at 37°C for about 4 h to determine A*/G* allelic polymorphism.

An association test were conducted between the GHR/*AluI*genotypes and the milk production traits using using the least square analysis in SPSS package (IBM SPSS Statistics, USA).

RESULTS AND DISCUSSION

Results of the association study of GHR/*AluI*polymorphisms with milk production traits are discussed in details. There were no significant associations between genotypes, milk yield and milk component traits among Holstein cows in this study. Yet animals with *AA* genotypes displayed higher test day milk yield (TDMY), 305-day milk yield (305-DMY), and fat yields than those animals carrying *AG*genotypes. There was also not any animals with *GG* genotype in this herd. Several researhes have also examined the association between GHR/*AluI* polymorphisms and reproductive performance traits and came up with very inconsisted results about the expected relationship (Ge et al., 2003; Di Stasio et al., 2005; Varvio et al., 2008; Olenski et al., 2010). Similar to this present study, there was no significant relationship between GHR/*AluI* and milk yield and its composition (Varvio et al., 2008; Hadi et al., 2015). Even Hadi et al. (2015) reported there was no animal with *GG* genotype among Iranian Holstein cows as it is displayed in the present study. ButHradecka et al., (2008) showed that animals with *GG* homozygote genotypes were significanlty associated with a low fat yield. On the other hand, some studies reported that there was a strong relationship between SNP markers and meat characteristics and lactation performance (Di Stasio et al., 2005; Olenski et al., 2010).

Table1. Least Square Means (±SE) of milk yield and milk components based on GHR/*AluI*genotypes

Genotype	*N*	TDMY (kg)	305-DMY (kg)	Fat %	Fat Yield* (kg/d)	Protein %	Protein Yield* (kg/d)
AA	22	16.18±3.6	5155.3±1206.5	4.80±0.41^{b}	0.78±0.18	3.30±0.10^{b}	0.5±0.11
AG	204	16.03±3.3	5166.1±1408.1	4.97±0.61^{b}	0.79±0.16	3.38±0.16^{a}	0.54±0.11
GG	54	14.96±3.1	4873.9±1301.7	5.24±0.71^{a}	0.77±0.14	3.44±0.20^{a}	0.51±0.10

$^{a,b.}$Different superscripts within a column indicate significant difference.with P<0,05.
TDMY: test day milk yield; 305 DMY: 305-day milk yield. * Fat and protein yields (kg) were calculated based on TDMY.

The findings may be assessed as the SNP locus in GHR gene was not polymorphic enough to detect a strong association for milk yield traits in Holstein cows.nversely there are statistically significant differences between the GHR genotypes and fat% (P: 0.002) and protein% (P <0.001) in Jersey dairy cattle while TDMY, 305-DMY, fat yield and protein yield values are similar. As a matter of fact, the fat ratio was highest in Jersey cattle carrying the *GG* genotype than animals with *AA* and then *AG* genotypes. However protein ratio was observed as high level in animals carrying the *GG* and *AG* genotypes while it is low in those carrying the *AA* genotype. Whereas Komisarek et al. (2008) reported a strong relationship between SNP marker and milk, fat and protein yields. Based on their findings, a variant at GHR-F279Y locus cause to decrease milk and milk component production levels. Thus there are different regions in GHR gene might be associated with the reproduction traits in Jersey cattle.

CONCLUSIONS

As a conclusion, the detected SNP sites should be considered for selecting dairy cows to improve milk yield and especially milk fat and protein ratios thus GHR gene might be used as a potential candidate gene in dairy improving program.

ACKNOWLEDGEMENT

The study had an approval from the Ethical Committee of Namik Kemal University and was supported by The Scientific and Technological Research Council of Turkey (TUBITAK) with project number # 110 O 821.

REFERENCES

Aggrey SE, Yao J, Sabour MP, Lin CY, Zadworny D, Hayes JF, Kuhnlein U. 1999. Markers within the regulatory region of the growth hormone receptor gene and their association with milk-related traits in Holsteins. J. Hered, 90, 148–151.

Blott S, Kim J, Moisio S, et al. 2003. Molecular dissection of a quantitative trait locus: a phenylalanine-to-tyrosine substitution in the transmembrane domain of the bovine growth hormone receptor is associated with a major effect on milk yield and composition. Genetics, 163: 253–266.

Di Stasio L, Destefanis G, Brugiapaglia A, Albera A, Rolando A. 2005. Polymorphism of the GHR gene in cattle and relationships with meat production and quality. Anim Genet, 36;138-140.

Ge W, Davis ME, Hines HC, Irvin KM, Simmen RCM.2003. Association of single nucleotide polymorphismsin the growth hormone and growth hormonereceptor genes with blood serum insulin-like growth factorI concentration and growth traits in Angus cattle. J AnimSci, 81:641-648.

Hadi Z, AtashiH, Dadpasand M, Derakhshandeh A, Ghahramani Seno MM. 2015. The relationship between growth hormone polymorphism and growth hormone receptor genes with milk yield and reproductive performance in Holstein dairy cows. Iranian Journal of Veterinary Research (IJVR), 16(3): 244-248

Hradecka E, Citek J, Panicke L, Rehout V, Hanusova L. 2008. The relation of GH1, GHR and DGAT1 polymorphisms with estimated breeding values for milk production traits of German Holstein sires. Czech J Anim Sci, 53(6):238-245.

Komisarek J, Michalak A, Walendowska A. 2011. The effects of polymorphisms in DGAT1, GH and GHR genes reproduction and production traits in Jersey cows. Animal Science Papers and Reports,29(1): 29-36.

Lincoln, DT, Sinowatz F, El-Hifnawi E, Hughes RL, Waters M. 1995. Evidence of a direct role for growth hormone (GH) in mammary gland proliferation and lactation. Anat Histol Embryol, 24:107-115.

Maj A, Oprzdek J, Oprzdek A, Dymnicki I, Zwierzchowski L. 2004. Polymorphism in the 5′-noncoding region of the bovine growth hormone receptor gene and its association with meat production traits in cattle. Anim Res 53:503-514.

Maj A, Pareek C, Klauziñska M. Zwierzchowski L. 2005. Structure and polymorphism of the 5′-noncoding region of the bovine growth hormone receptor gene. J Anim Breed Genet, 122:414-417.

Maj A, Oprzadek J, Dymnicki E, Zwierzchowski L. 2006. Association of the polymorphism in the 5′-noncoding region of the bovine growth hormone receptor gene with meat production traits in Polish Black-and- White cattle. J Meat Sci, 72: 539-544.

Menon RK, Shaufl A, Yu JH, Stephan DA, Friday RP. 2001. Identification and characterization of a novel transcript of the murine growth hormone receptor gene exhibiting development and tissue-specific expression. Mol Cell Endocrinol, 172:135-146.

Olenski K, Suchocki T, Kaminski S. 2010. Inconsistency of associations between growth hormone receptor gene polymorphism and milk performance traits in Polish Holstein-Friesian cows and bulls. AnimSci Papers and Rep, 28(3):229-234.

Varvio SL, Iso-TouruT, Kantanen J, Viitala S, Tapio I,Maki-Tanila A, Zerabruk M, Vilkki J.2008.Molecular anatomy of the cytoplasmic domain of bovine growth hormone receptor, a quantitative trait locus. P RoySoc B-Biol Sci, 275:1525-1534.

Viitala S, Szyda J, Blott S, Schulman N, Lidauer M, Maki-Tanila A, Georges M, Vilkki J. 2006. The role of the bovine growth hormone receptor and prolactin receptor genes in milk, fat and protein production in Finnish Ayrshire dairy cattle. Genetics, 173:2151–2164.

Sambrook J, Russel D. 2001. Molecular Cloning: A Laboratory Manual,3rd edn. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, USA.

INVESTIGATING β-LACTOGLOBULIN (β-LG) GENE VARIANT IN PUREBRED KIVIRCIK SHEEP BREED

Eser Kemal GURCAN[1], Ozden COBANOGLU[2], Elif ALMAZ[1]

[1]Namik Kemal University, Faculty of Agriculture, Department of AnimalScience, Tekirdag, TURKEY
[2]UludagUniversity, Faculty of Veterinary-Medicine, Department of Genetics, Bursa, TURKEY

Corresponding author e-mail: ocobanoglu@uludag.edu.tr

Abstract

Th eaim of this study was to investigate β-lactoglobulin (β-LG) gene polymorphism for native Kivircik sheep breed in Turkey. Kivircik sheep was fed and reared on some flocks even in small numbers as pure breeds in Trakya region especially around Kirklareli. Due to difficulty of finding purebred animals, animal material was consisted with 48 pure bred Kivircik sheep. PCR-RFLP methods were used to detect genotypes of animals in β-LG gene. Three genotypes (AA, AB and BB) were observed for pure bred sheeps by using PCR-RFLP methods. The gene frequencies of β-LG were calculated as 0.469 for A allele and 0.531 for B allele in Kivircik sheep. The effective alleles number (Ne) as 1.992, an observed heterozygosity (Ho) as 0.396, an expected heterozygosity (He) as 0.498 and a fixation index value (F_{is}) as 0.205 were calculated respectively. Based on a statistical analysis, the flock was detected in Hardy-Weinberg Equilibrium. As a conclusion, a genetic variation was determined for major whey protein in Kivircik sheep milk.

Key words: *Kivircik, β-lactoglobulin, PCR-RFLP, polymorphism,*

INTRODUCTION

Milk is the most important nutrient source in human nutrition especially in early ages. Milk protein includes the components which has several different and featured protein combinations. Especially complex of casein is known as main fraction of milk proteins. Casein is easily separating by precipitation with acid. The rest of the proteins are whey protein or serum proteins. Whey protein dissolving in semi-saturated ammonium solution is named alpha-lactoal bumin and if it is not dissolving in semi-saturated ammonium then it is named beta-lactoglobulin. Caseins (αs1 casein, σs2 casein, β casein, and *k*casein), β lactoglobulin(β-LG) and α lactal bumin are syntesized in the mammary epitheli al cells. Contary to this, immunoglobulin and serum albümin are absorbed from the blood. (Demirci, 1995). Ovine whey protein is determined by ratio of β-LG protein than bovine and caprine among livestock species (Casper et al., 1998). Several researches have been performed on milk protein polymorphism to detect a possible associationbetween milk protein genotypes and production traits in livestock species. Genes affecting milk protein are associated with milk production level and also significantly affect the milk composition and milk processing features (Anton et al., 1999; Mroczkowski et al., 2004; Dario et al., 2008; Baranyi et al., 2010; Kusza et al., 2015). There are some studies also carried out on a polymorphism in Turkish indigenous sheep and cattle breeds raised in Turkey (Celik and Ozdemir, 2006; Elmaci et al., 2006; Erdogan, 2009; Elmaci et al., 2012). Therefore the aim of this study to determine β-LG gene polymorphism fornative Kivircik sheep breed in Turkey.

MATERIALS AND METHODS

DNA was isolated from then eckveins (Vena jugularis) of animals by 10 ml blood EDTA tubes. Genomic DNA was extracted from total bloods amples using fenol/kloroform method (Sambrook et al. 1989).

Variants of β-LGloci was identified by PCR-RFLP technique on genomic DNA (Feligini et al. 1998). PCR reaction was carried outusing 5'-CAACTCAAGGTCCCTCTCCA-3' and 5'-CTTCAGCTCCTCCACGTACA-3',primers respectively. The presence of the β-LG*C* allele, a subtype of the β-Lg*A*allele, was then investigate dusing 105 bpsheep beta-lactoglobulin fragment as a PCR product. The forward and reverse primers were 5'-TCAGGACCCCGCGAGGTGGACAAC-3 'and 5'-CCTCCAGCTGGGTCGGGTTGAAG-3'to detect β-Lg C allele, respectively.

Allele gene frequencies of genotypes were calculated according to direct gene counting method. A chisquare analysis was conducted to see if th epopulationis in Hardy-Weinberg Equilibrum. Furthermore, the F statistic values were calculated to show the genetic structure and diversity of the population. Using PopGene32 program (Yeh et al. 2000). These values are given as effective alleles number (Ne), observed heterozygosity (Ho), expected heterozygosity (He) and fixation index (Fis) (Nei, 1973).

RESULTS AND DISCUSSION

A genotyping by β-LGlocus was made on pure bred Kivircik sheep. As a result of genotyping made according to bands obtained after enzymedigesting with Rsa*I*andMsp*I*, while 13 β-LG*AA*, 19 β-LG*A B*and 16 β-LG*BB* genotypes were seen in Table 1. There was no chance seen on β-LG*CC* genotype. As torelated allele gene frequencies found for β-LG*A* and β-LG *B*alleles as 0.469 and 0.531, respectively. In the genetic analysis of population, according to Hardy-Weinberglaw, it is reported that the population was at genetic equilibrium as a result of chisquare analysis (P>0.05). Otherwise, according to some calculated F statistics it is calculated that the effective allel enumber (Ne) as 1.992, observed heterozygosity (Ho) as 0.396, expected heterozygosity (He) as 0.498 and fixation index Fis as 0.205.

In this study, the β-LG*A* gene Frequency found as 0.469 in pure breed kivircik breed and in another research this frequencies werefound in Kivircik, Gokceada and Sakizsheep as 0.7759, 0.9756 and 0.7632, respectively (Elmaci et al. 2006). As toother dairy sheep (Ivesi, Dairy English, Tsigaia and Lacaune), they were found as 0.3478, 0.6857, 0.5650 and 0.4730, respectively (Anton et al. 1999). In this study the β-LG*B*allele gene frequence was found higher than the β-LG*A*. Similarly as to sheep breeds breeding in India, the β-LG*B* gene frequencies was found higher Frequency for all breeds(Araro et al. 2010). Whilethe β-LG*A* and β-LG*B* allele were seen in all the presented studies, since all the variants*C* (-), the β-LG*C* allele could not been observed in this study.

Unfortunatelly the relation between β-LG and yield production were not investigated in this present study since any record for production level was not available. But some of there searchers were investigated these relationships and displayed significant results. It is reported that in Polish Merinos sheep β-LG*BB* genotype milks are higher than β-LG*AA* and *AB* types, in terms of protein content (Mroczkowski et al. 2004). In Hungarian Merinos and Dairy English sheep, the highest milk yield and milk contents were found in β-LG*AB* genotypes (Anton et al. 2005).

Table 1. The Gene andGenotypicFrequencies of β-LGand F statisticin KivircikSheep

	β-LG Genotypes			β-LG Gene Frequences		Genetic Equilibrium Test
	AA	AB	BB	A	B	x^2
Observed	13	19	16	0.469	0.531	2.09
% Frequency	27	40	33			(P>0.05)
Expected	11	24	13			
Ne	1.992					
Ho	0.396					
He	0.498					
F_{is}	0.205					

CONCLUSIONS

In conclusion, a genetic variation was realized based on genotyping for β-LG locus of Kivircik sheep breed in ou rcountry. Further research is definitely necessary to find out an effect of milk protein genes on milk yield and milk contents to improve dairy production level.

ACKNOWLEDGEMENT

This research was supported with Scientific Research Projects Council of Namik Kemal University, Tekirdag-Turkey (NKUBAP.00.24.YL.11.01).

REFERENCES

Anton I, Zsolnai A, Fesus L, Kukovics S, Molnar A. 1999.Survey of β-lactoglobulin and alfa S1-Casein polymorphism in Hungarian dairy sheep breeds and crosses on DNA level. ArchTierzuct, 42: 387-392.

Anton I, Zsolnai A, Fesus L. 2005. β-lactoglobulin and alfa S1-casein polymorphism in Hungarian sheep breeds and crosses on DNA level. Vratnadolina, 63-67.

Araro R, Bhatia S, Mishra B P, Sharma R, Pandey A K, Prakash B, Jain A. 2010. Genetic polymorphism of the β-lactoglobulin gene in nativ esheep from India. Biochem Genet, 48 (3-4): 304-311.

Baranyi M, Kerekes A, Hiripi L, Bozse Z. 2010. Preliminary data on beta lactoglobulin genetic polymorphisms in Hungary Awassi and Racka sheep. Romanian Academy, DAGENE-2010.

Casper JL, Wendorff WL, Thomas DL. 1998. Seasonal changes in protein composition of whey from commercial manufacture of caprine and ovine specialty cheeses. J DairySci, 81: 3117–3122.

Celik S, Ozdemir S. 2006. β-Lactoglobulinvariants in Awassiand Morkaraman sheep and their association with the composition and rennet clotting time of th emilk. Turk J Vet Anim Sci, 30: 539-544.

Dario C, Carnicella D, Dario M, Bufano G. 2008. Genetic polymorphism of -lactoglobulin gene and effect on milk composition in Leccese sheep. Small Ruminant Research, 74: 270–273.

Demirci M.1995. Süt Teknolojisine Giriş. Trakya Üniversitesi Tekirdağ Ziraat Fakültesi Yayın No: 105, Ders Notu No: 68, Tekirdağ.

Elmaci C, Oner Y, Balcioglu MS. 2006. Genetic polymorphism of β-lactoglobulin gene in native Turkish sheep breeds. Biochem Genet, 44 (7-8): 376-381.

Elmacı C, Oner Y,Balcioglu MS. 2012. β-lactoglobulin gene types in Karacabey Merino sheep breeds using PCR-RFLP. J Appl Anim Res, 32 (2): 145-148.

Erdogan F. 2009. Yerli gen kaynağı Çine Çaparı koyunlarının süt verim özellikleri ve Beta laktoglobulin gen polimorfizmi. M. Sc. Thesis (unpublished). ADÜ, Fen BilimleriEnstitüsü Aydın.

Feligini M, Parma P, Aleandri R, Greppi GF, Enne E. 1998. PCR-RFLP test for direct determination of β-lactoglobulin genotype in sheep. Anim Genet, 29(6): 473-474.

Kusza S, Sziszkosz N, Nagy K, Masala A, Kukovics S, Andras J. 2015. Preliminary result of a genetic polymorphism of β-lactoglobulin gene and the phylogenetic study of ten balkan and central european indigenous sheep breeds. Acta Biochimica Polonica, 62(1):109–112.

Mroczkowski S,Korman K, Erhardt G, Piwezynski D, Borys B. 2004. Sheep milk protein polymorphism and its effect on milk performance of Polish Merino. Arch Tierz Dummerstorf, 47 Special Issue, 114-121.

Nei M. 1973. Analysis of gene diversity in subdivided populations. ProcNatnAcadSci, U.S.A. 70, 3321-3323.

Sambrook J, Fritsch EF, Maniatis T. 1989. Molecular Cloning: A Laboratory Manual. 2nd ed.,chapter 6, 22, Cold Spring Harbor Laboratory, Cold-Spring Harbor, New York.

Yeh F, Yang RC, Boyle T. 2000. Pop Gene (v.1.32), Microsoft Windows-based free ware for population genetic analysis. Retrieved from http://www.ualberta.ca/fyeh/Pop32.exe.

COMPARISON OF COMMONLY USED STATISTICS PACKAGE PROGRAMS

Omer Faruk KARAOKUR[1], Fahrettin KAYA[2], Esra YAVUZ[1], Aysel YENIPINAR[1]

[1]Kahramanmaras Sutcu Imam University, Institute of Science and Technology, Department of Animal Science, TR46040, Onikisubat, Kahramanmaras, TURKEY
[2]Kahramanmaras Sutcu Imam University, Andirin Vocational School, Computer Technology Department, TR46410, Andirin, Kahramanmaras, TURKEY

Corresponding author e-mail: karaokur@gmail.com

Abstract

The specialized computer programs used in the collection, organization, analysis, interpretation and presentation of the data are known as statistical software. Descriptive statistics and inferential statistics are two main statistical methodologies in some of the software used in data analysis. Descriptive statistics summarizes data in a sample using indices such as mean or standard deviation. Inferential statistics draws conclusions that are subject to random variables such as observational errors and sampling variation. In this study, statistical software used in data analysis is examined under two main headings as open source (free) and licensed (paid). For this purpose, 15 software were selected from each of the most commonly used groups. Statistical analyzes and analysis outputs of these selected software have been examined comparatively. As a result of this study, the outputs of licensed and unlicensed programs are presented to the researchers in a comparative way.

Key words: *statistical software, statistical analysis, data analysis*

INTRODUCTION

Statistical Analysis is the collection, organization, analysis, interpretation and presentation of data. It starts with defining the method and population. The population consists of observations collected by selected methods at various times, and the data obtained from each observation serves as a member of the overall group. Statistical analysis examined in two groups which are descriptive statistics and inferential statistics.

Descriptive statistics summarize population data by describing what was observed in the sample graphically or numerically. The numeric descriptors are the mean and standard deviation for continuous data types, and the percent and frequency for categorical data.

Inferential statistics allows to make inferences about population using patterns in the sample by taking into consideration the randomness. The inference can extend to forecasting and prediction. Bu, zaman serilerinin veya mekansal verilerin ekstrapolasyonunu ve enterpolasyonunu da içerebilir.

Analysis of variance (Anova), chi-square test, correlation, factor analysis, Mann-Whitney U, mean square weighted deviation (MSWD), regression analysis, student t-test, time series analysis, k-nn), majority classifier, group method of data processing algorithms, logistic regression, uplift modeling, naive bayes classifier, support vector machines etc. are some statistical tests and procedures used in predictive analysis.

Application of statistical tests and procedures will cause time loss if the number of data is excessive. The use of statistical analysis package programs has become a necessity to avoid a waste of time. A number of statistical analysis package programs have emerged to meet the needs of researchers, students and businesses.

MATERIALS VE METHODS

Open Source (Free) Statistical Analysis Package Programs:

SAS University Edition

SAS Analytıcs has launched a free program called SAS Unıversıty Edıtıon for higher education in the context of educational support. SAS Unıversıty Edıtıon is a free

edition that includes selected SAS products for learning and teaching statistics and quantitative methods. SAS Unıversıty Edıtıon provides easy access to statistical software for courses such as research, engineering, social sciences, economics, computer science, trade, medicine and health. SAS Unıversıty Edıtıon is available in two versions. These are vıa SAS Download that runs locally on your machine andvıaAws Marketplace that requires internet connection. Both versions work in wındows, lınux and mac operating systems. The SAS Unıversıty Edıtıon package also includes access to the SAS Analytıcs community, where you can access e-learning classes, training videos, and more SAS resources. SAS Unıversıty Edıtıon consists of Base SAS, SAS / STAT, SAS / IML, SAS Studio and SAS / Access components.
Base SAS programming vıa SAS programming language, ODS graphics and reporting procedures. It also provides convenient data analysis including intuitive 4GL and easy-to-learn syntax, including correlations, intuitive statistics, distribution and table analysis. SAS Macro Facility reduces coding to modularize work such as easy reuse and maintenance and support for Structured Query Language (SQL).
SAS / STAT offers analysis such as variance, Bayes, categorical data, clustering, discriminant distribution, group order design, multivariate, psychometric, regression, spatial. It also offers methods and techniques such as descriptive statistics, definite methods, group order design, market research, missing value estimation, power and sample size.
SAS / IML provides a matrix programming language for more specific analysis and data research such as matrix functions, linear algebra and statistical functions, time series functions, interactive data analysis, etc..
SAS Studio provides hundreds of SAS statements and procedures along with programming tools that are useful for improving productivity by using autocomplete for built-in syntax help, using the browser-based interface for basic data processing and basic statistical tasks to build SAS code.(Anonymous, 2018g)
SAS / Access provides easy connectivity with SAS and other file formats for access and integration.
An intuitive interface, a powerful programming language, comprehensive and reliable tools, a robust and flexible matrix programming language and a great user community are among the benefits and best features offered to users by SAS Unıversıty Edıtıon.

PAST

PAST is a free statistical software for data analysis, graph creation, data manipulation, univariate and multivariate statistics, time series, ecological analysis, morphometric, stratigraphy and spatial analysis. PAST provides an easy-to-use analysis package that includes statistical, graphical and modeling functions to users. PAST is easy to use because it provides an interactive user interface, easy coding, and a spreadsheet type data entry form where excel users can enter their data. Users can make curve fitting in many types. Linear with bootstrapping and permutation, Breusch-Pagan and Durblin-Watson tests and generalized linear model that includes Logit regression, log-log, logistic, polynomial, lin- log, Von Bertanalany and sum of sines are some of the curve fitting types located in PAST. PAST provides a good platform for users to perform multivariate statistics including principal coordinates, key components, non-metric and multidimensional scaling, and much more. PAST also offers time series analysis features including spectral analysis, cross-correlation, autocorrelation, Walsh transform, wavelet transform, runs test, short time Fourier transform and Markov chains and Mantel correlogram and periodogram. Directional statistics, angular mean with CI, kernel density estimation of point density, rose plots, alignment detection and more are the geometric analysis methods offered by PAST to users. Analysis of parsimony that includes Heuristic algorithms, Fitch and Dollo characters and Wagner is also performed by PAST. PAST also has a biostratigraphic property and guiding feature including thin plate spline and moving average.(Anonymous, 2018h)

Curve fitting, multivariate statistics, time series analysis and geometrical analysis are the best of the features offered by PAST to users.

MacAnova

MacAnova was written and developed by two statisticians from the Statistical School of the University of Minnesota, Gary W. OEHLERT and Christopher BINGHAM. MacAnova, unlike its name, is not designed for Macintosh computers only and does not perform variance analysis only. MacAnova has several abilities, including analysis of variance and related models, matrix algebra, time series analysis and exploratory statistics. It is reasonably fast, it can be expanded via macros, the data in the spreadsheet can be imported directly and the results can be transferred to other programs via clipboard. MacAnova has a functional or command-oriented user interface. It also offers other features via menu / dialog / mouse type interface. MacAnova is similar to S and S-Plus statistical programs, and this similarity makes it much easier to translate S-plus and R codes into MacAnova. MacAnova codes have various differences from S-Plus and R codes and work well with named data sets and macros' libraries. Although MacAnova is not a comprehensive package, it is flexible and powerful enough to be used in research-level statistical calculations, and can also be used extensively in course work. Students can solve statistical and algebraic problems with a few commands. Information and documents about MacAnova, including various versions of the program, are available on the University website. MacAnova provides online usage summaries and full help for more than 550 topics in 8 files. (Anonymous, 2018j)

Variables and operations, descriptive statistics, linear and generalized linear models, matrix algebra, random numbers and probabilities, graphs, transformations, in and out data transfer, programmability, dynamic user functions, online documentation, experiment design, time series and multivariate analysis are among the features offered by MacAnova to the users.

GNU PSPP

GNU PSPP is a program for statistical analysis of sampled data and is an alternative to IBM SPSS Statıstıcs and written in C language. PSPP has a graphical user interface. T tests, descriptive statistics, anova, linear and logistic regression, clustering analysis, reliability and factor analysis, nonparametric tests and more are among the analyzes, methods and techniques offered by the PSPP. Features of the PSPP include more than 1 billion files and variable support, syntax and data files compatible with SPSS, terminal or graphical user interface selection, text selection, postscript, pdf, opendocument or html output formats and database resources. It has the ability to open, analyze and arrange two or more datasets simultaneously. PSPP supports operations such as loading and saving data and syntax files as well as having popup windows that provide access to supported statistical analysis and transforms. Features can be used through interactive dialog boxes that display each command's options and required parameters. PSPP can generate high-quality graphics (box and whisker plots, normal probability plots and histograms) to help visualize the distribution of data. These graphs complete descriptive statistics and help determine the most appropriate analysis for the dataset and / or which transformations are required. The PSPP's data selection capabilities (from a subset of variables or from which data only match certain criteria) make it easy to create graphics. Recoding and manipulation of the data using the transformations of the PSPP can be accomplished quickly. These transformations provide simple boolean criteria, arithmetic expressions and mathematical functions without requiring an extra iteration. PSPP also supports many math functions such as random number distrubitions, trigonometry and date-time conversions.(Anonymous, 2018f)

Free license, does not expire, enter an unlimited number of samples, ımport data from any database, two or more datasets run at once, speedy data analysis and core package contains complete functions are some of the benefits provided by the GNU

PSPP to the users.

Develve

Develve is a statistical software that helps in quick and easy interpretation and analysis of scientific and experimental data in a technical environment and prevents false assumptions. In short, facilitating and accelerating statistics, and suitable for inexperienced users but sufficiently developed in demanding users. Develve does not have a secret menu. Everything can be accessed directly to improve productivity and results can be seen directly. For example, result graphs can be shifted up and down, and a larger version is opened when the graph is clicked. Develve clearly states that the sample size is large enough to avoid false assumptions when the two variables are distinctly different. Develve helps to create a test matrix for experimental design, to detect if there is a factor that is not balanced, and to develop a robust product at high quality. This makes Develve the perfect perfect six sigma toolbox. Six sıgma methodology is a discipline and data-driven approach to maximizing the quality level and minimizing defects in the manufacturing process. The six sigma tools supported by Develve are cp cpk % out of tolerance, regression analysis, correlation, one way anova, Gauge R&R measurement system analyses, chi square test respectively. Develve also supports a variety of graphs such as histogram, control chart, scatter correlation plot, time series plot and ındividual dot plot.

difference, t-test, wilcoxon-mann-whitney test, variation F test, variation Levene test, Anderson Darling normality test, correlation test and regression are among the features provided by Develve.(Anonymous, 2018i)

Tests normally distributed data, Tests non normal distribution data, measures system analyses, reliability and oers a statistical handbook are some some of the benefits provided by Develve to the user.

The free version is available for non-commercial purposes and is the same as the paid version. It is foreseen that non-commercial use will primarily involve teachers and students who may wish to use it without any commercial advantage or financial gain.

Licensed Statistical Analysis Package Programs

IBM SPSS Modeler

IBM SPSS Modeler provides a range of analytic solutions to daily business problems such as text analytics, asset analysis, social network analysis, automated modeling, decision management and optimization. IBM SPSS Modeler has the ability to conduct analysis wherever data is stored, regardless of format and structured status.

IBM SPSS Modeleris available in three editions

IBM SPSS Modeler Gold - It enables organizations to build forecasting models and place these models directly into business processes. This has been achieved through decision management.

IBM SPSS Modeler Premium - It offers a number of advanced algorithms besides capabilities such as text analysis, asset analysis, social network analysis, and automatic modeling and preparation techniques.

IBM SPSS Modeler Professional- It provides an advanced set of algorithms, data manipulation, automatic modeling and preparation techniques to users for creating predictive models and revealing hidden patterns in structured data.

Interactive easy to use interface without the need for programming, automated modeling and data preparation capabilities, access to all structured and unstructured data from different sources, natural language processing (NLP) to extract concepts and sentiments in text, entity analytics ensures the quality of the data and results in more accurate models and ıntegration to cognos, netezza, ınfosphere and System Z are some of the features offered by IBM SPSS Modeler to the user. IBM SPSS Modeler Increases performance by reducing data movement with client server architecture. Integration with other open source technologies such as R, Python, Spark can be achieved to increase the analytical power of IBM SPSS Modeler. Auto classifiers, decision trees, logistic, SVM, time series, anomaly detection, APRIORI, carma, sequence, auto clustering, k-means etc. algorithms are included in IBM SPSS Modeler. (Anonymous, 2018b)

Benefits provided by IBM SPSS Modeler to the user include range in advanced algorithms, ımproved decision making, geospatial and text analytics, automated modeling, gained predictive accuracy, range in advanced algorithms and variety of working premises.

Matlab

Matlab is the easiest and most productive software for engineers and scientists. Matlab combines a high-level language with a desktop environment for iterative engineering and scientific workflows. Matrx-based Matlablanguage is the most natural way of expressing computational mathematics. Linear algebra in Matlab also looks like same linear algebra in the textbook. This directly catches the mathematics behind the user's thinking, which means that the code is easier to write, read, understand and maintain. Matlab is known for its excellent numbers in the numerical analysis research community. Mathematical operations are distributed to multiple cores on the user's computer and all codes are compiled just-in-time with optimized library calls. Matlab allows to write algorithms in parallel by changing for-loops into parallel for-loops or by changing standard arrays into GPU or distributed arrays. These parallel algorithms can be run infinitely scalable in public and private clouds without the need for code changes. The Matlab language also provides users with the integration of flow control, error handling, object oriented programming, unit testing and source control, which are features of traditional programming languages. Integrated tools allow less time to evaluate more ideas. Matlab has 2D and 3D drawing functions for visualizing the results. Matlab supports languages C / C ++, Java, .NET, and Python and languages for embedded systems. In addition to being able to place Matlab code easily in Hadoop systems, Matlab is an important part of model based design, which is used for simulation of physical and discrete events, multi domain simulation, and verification and code generation.(Anonymous, 2018c)

The best features Matlab offers to its users include high-level language for scientific and engineering computing, desktop environment tuned for iterative exploration, design, and problem-solving, graphics for visualizing data and tools for creating custom plots, C ++, java, .NET, Python, SQL, C ++, and many other domain-specific tasks, add-on toolboxes for a wide range of engineering and scientific applications, Hadoop, and microsoft excel.

Minitab

Minitab is one of the world's leading developers of statistical software and software for six sigma quality ımprovement projects. Thousands of companies and over 4000 colleges and universities all over the world use Minitab. Toshiba, DuPont, Boeing, Royal Bank of Scotland, Nestlé and Pfizer are just a few of Minitab's customers. Minitab's products are supported by a variety of services, ıncluding training and free technical support. Two new analyzes include experiment design (DOE) and multiple regression in Minitab's assistant, which offers many functionality and enhancements to facilitate statistical analysis and provide more information on quality ımprovement processes. The user ınterface allows the user to quickly determine the predicted variables and also the automatic model selection makes it easy to identify the important variables. with its extensive graphical options, it provides more ways to visually explore the results, while response optimizer makes it easier to find the optimal settings for process variables. Improved experiment design capabilities will enable users to more effectively identify the factors and interactions that affect their processes. Respons optimizer can be applied to general factorial designs, and response surface designs can include categorical factors and also automatic model selection can be used for both factorial and response surface designs. Bubble plot, poisson regression, outlier tests, tolerance ıntervals, stability studies, equivalence tests are some of the other features offered by Minitab. (Anonymous, 2018d)

Features of smart data ımport, automatic graph updating, seamless data manipulation, eortless presentations, basic statistics, regression and anova, quality tools and design of experiments are among the best features offered by Minitab to users.

Monitor your processes over time and evaluate their stability, determine a product's lifetime characteristics, assess how well your processes meet your specifications, and determine if your measurement systems are adequate are some of the benefits provided by Minitab to the users.

Stata

Stata is a complete, integrated statistical software that provides everything for data analysis, data management and graphics. Stata's data management features allow users to combine and reshape data sets, manage variables, and collect statistics across groups or copies. Users can work with up to 2 billion characters with byte, integer, long, float, double, and string variables. Stata also has advanced tools for managing specific data such as survival / duration data, categorical data, survey data, panel / longitudinal data, multiple-imputation data and time series data. Statamakes it easy to create graphs with unique publication quality. Users can generate hundreds of graphics in a repeatable way by writing code, and can output PNG for publishing on the web and output in PDF format for viewing. With the graphical editor integrated into Stata, users can modify graphics. Mata is a complete programming language that compiles, optimizes and executes what you write into bytecode.

Although it is not necessary for users to program when using Stata, it is comforting for users to know that a complete matrix programming language is provided by Stata. Mata provides a complete development environment for producing compiled and optimized codes at the same time, while providing an interactive environment for matrix manipulation. Mata offers custom features, processing panel data, performs operations on real or complex matrices and provides complete support for object-oriented programming, and is fully integrated into every aspect of Stata. Stata works on windows, mac and linux / unix computers. The license is not platform specific, meaning that the user can install the Stata license on any of the supported platforms.(Anonymous, 2018e)

Among the best features offered by Stata are arıma, anova and manova, linear regression, time-series smoothers, generalized linear models, cluster analysis, contrasts and comparisons and power analysis.

Everything in one package per modüle, cross platform compatible, matrix programming with Mata, broad suite of statistical features, fast, accurate and easy to use ve variety of resources are some of the benefits provided by Stata to users.

Acastat

AcaStat is a statistical data analysis software that generates tables, crosstabulations, descriptivestatistics, correlations, OLS and logistic regression, t-tests, nonparametric tests and more. Use controls, format variable and value tags, set missing values and validate variables with AcaStat. AcaStat offers different solutions designed for mac, windows and ipad. It is also designed to allow fast and uncomplicated statistical analysis. AcaStat allows you to extract, copy, paste and drag-and-drop data from spreadsheets. AcaStat analyzes the data, applies t-test, non-parametric test, regression, correlation, descriptive statistics and provides a summary for users to analyze the results. Summaries can be compared and analyzed with StatCalc. AcaStat can generate confidence intervals, regressions, descriptive statistics, correlations, price elasticity of demand and queuing theories, and decision tables for further analysis to make decisions. For example, you can add or remove variables according to the evolution of the model until a regression model yields the most appropriate result. A horizontal bar chart for frequencies, a descriptive histogram, a distribution gram for correlation, a residual histogram for OLS regression, and a ROC curve for diagnostic accuracy are five graphical types that can be automatically drawn. The analysis output and its contents can be easily copied for the reports and presentations to be created. Analysis options and settings, selecting and removing variables, selecting the most appropriate test, and saving the output are made from the main panel. Examples of how to use different features and an applied statistical book are available. Applied statistical book and other teaching materials can be downloaded free of charge from the AcaStat website. AcaStat

makes data analysis and summary creation a fast, simple and straight forward job. There is also Clarity, a low-cost version of AcaStat for students.(Anonymous, 2018a)
Benefits provided by AcaStat to the user include simple but complete software, low-cost, drag and drop variable selection, and charts module.

RESULTS AND DISCUSSION

IBM SPSS modeler does not include twenty-nine statistical analysis methods such as Lasso regression, copula models, extreme value theory, variance stabilization, Bayesian statistics etc. In addition to theseIBM SPSS Modeler performs ten statistical analysis method in a limited manner including ridge regression, nonlinear regression, naïve bayes classifier, longitudinal data, and univariate time series etc.
Stata does not include a twenty-one statistical analysis method such as nearest neighbor algorithm, naïve bayes classifier, copula models, markov chains, spatial statistics etc. In addition, Stata performs six statistical analysis method in a limited manner including ridge regression, lasso regression, stochastic volatility models (continuous case), deterministic optimization etc.
Analysis methods such as ridge regression, naïve bayes classifier, copula models, EM algorithm, propensity score matching, wavelet analysis, neural networks etc are not included by minitab or are performed in a limited manner by Minitab.
Acastat includes basic statistical analysis methods such as t test, F test, anova, point-biserial correlation, logistic regression, OLS regression etc.
Markov chain monte carlo methods, EM algorithms, diffusions, markov chains etc. statistical analysis methods are performed by matlab with more than ten lines of code writing and also, all other statistical analysis methods can be performed with matlab.
Macanova does not include many of the advanced statistical analysis methods including bootstrap and jackknife estimations, survival analysis, quality control, reliability theory, diffusions, meta analysis, roc curves etc.
Develve does not include many of the advanced statistical analysis methods including bootstrap and jackknife estimations, survival analysis, quality control, reliability theory, diffusions, meta analysis, roc curves etc. Although it is same as paid version, Develve includes basic statistics, design of experiments, measurmant system analysis and some other features.
GNU PSPP does not include many of the advanced statistical analysis methods including random forest classification, support vector machines (SVM), deterministic-stochastic optimization, meta analysis, signal processing, lasso regression, markov chains, time series etc. Also, GNU PSPP is known as the open source version of IBM SPSS Modeler and has fewer features than IBM SPSS Modeler.
PAST has a wide range of statistical analysis methods, but it does not include some of the advanced statistical analysis methods including
Bayesian statistics, variance stabilizitaion, roc curves, extreme value theory, robust estimation, propensity score matching etc.
SAS University Edition does not include twenty-nine statistical analysis methods such as naïve bayes classifier, extreme value theory, variance stabilization, diffusions, markov chains and hidden markov models. In addition to these SAS University Edition performs 12 statistical analysis method in a limited manner including ridge regression, nonlinear regression, naïve bayes classifier, longitudinal data, and univariate time series etc.
With these informations, Matlab, Minitab, Stata, Acastat and IBM SPSS Modeler compared in terms of number of features and functionality offered to users, Matlab performs better than the other statistical analysis softwares.
With these informations, Macanova, Develve, GNU PSPP, PAST and SAS University Edition compared in terms of number of features and functionality offered to users, SAS University Edition performs better than the other statistical analysis softwares. This is a predictable result, because SAS Unıversıty Edıtıon is a version of a paid software. And it has the same features except for a few features.

CONCLUSIONS

In this study, when looking at the features and facilities provided by the statistical software examined in both groups Matlab may be preferable more than others by the users. If Matlab compared to the other softwares, it includes almost all of the statistical analysis methods and also the convenience and benefits offered by the paid software. Users can choose the most appropriate paid or free software from the analyzed statistical software according to their needs.

REFERENCES

Anonymous, 2018a. Acastat. https://www.acastat.com, (Date of access: 25.08.2018)

Anonymous, 2018b. Ibm Spss Modeler. https://www.ibm.com/analytics/spss-statistics-software, (Date of access: 26.08.2018)

Anonymous, 2018c. Matlab. https://www.mathworks.com/products/matlab.html, (Date of access: 20.08.2018)

Anonymous, 2018d. Minitab. http://www.minitab.com/en-us/, (Date of access: 05.08.2018)

Anonymous, 2018e. Stata. https://www.stata.com, (Date of access: 25.07.2018)

Anonymous, 2018f. GNU PSPP. https://www.gnu.org/software/pspp/, (Date of access: 01.08.2018)

Anonymous, 2018g. SAS University Edition. https://www.sas.com/en_us/software/university-edition.html, (Date of access: 20.07.2018)

Anonymous, 2018h. PAST. http://folk.uio.no/ohammer/past/, (Date of access: 15.08.2018)

Anonymous, 2018i. Develve. https://develve.net, (Date of access: 10.07.2018)

Anonymous, 2018j. Macanova. http://www.stat.umn.edu/macanova/, (Date of access: 09.08.2018).

WEIGHTED AND UN-WEIGHTED ESTIMATION OF ECONOMIC TRAIT' HERITABILITY IN NATIVE IRANIAN CHICKENS BY META-ANALYSIS METHOD

Peymaneh DAVOODI[1], Ali Reza EHSANI[1]

[1]Tarbiat Modares University, Department of Animal Science, Tehran, PO Box 14115-336, IRAN

Corresponding author e-mail: alireza.ehsani@modares.ac.ir

Abstract

Meta-analysis is actually an analysis of analyzes that combines previous information for giving them a weighted coefficient to be compared and re-evaluates the results providing an opportunity to make an explicit judgment that inevitably influences the conclusions of any summary of research to increase the power of the test and to achieve a unit and more meticulous result. In Iran, there are 6 distinct native chicken populations that they belong to different geographical region named Fars, Isfehan, Mashhad, Mazandaran, West Azerbaijan, and Yazd, which are valuable genetic resources and also they are the main source of the livelihoods for rural families. So that a meta-analysis of 20 Iranian published papers on the native chicken was conducted to calculate weighted and un-weighted average of direct heritability of growth and production traits including day-old weight, 8, 12 weeks weight, weight and age in sexual maturity, egg number and average egg weight by Meta-analysis method. The results of this meta-analysis showed that the average heritability of the mentioned economic traits was calculated separately in Iranian native chickens. On average, the total heritability for day-old, 8, 12 weeks weight and weight in sexual maturity, egg number, average egg weight, age in sexual maturity was 0.425, 0.232, 0.438, 0.315, 0.21, 0.242 and 0.41 respectively. 8 weeks, 12 weeks body weights and the number of eggs in the Fars population showed the highest heritability, which were 0.36, 0.52 and 0.31, respectively. The heritability of sexual maturity weight in Yazd population chicken was 0.58 and the highest. The lowest heritability of sexual maturity weight belongs to the population of Azerbaijan chickens (h2= 0.22) which has the highest average weight and the gain trend until the sexual maturity age. Also, the lowest heritability of 12 weekly weight was observed in Isfahan native chickens. The present finding illustrated that weighted average heritabilities are more reliable because weighted heritability for some traits is more conservative than average of un-weighted estimated heritabilities. The data extracted and summarized from the published articles provide a more obvious picture of the specific characteristics of the Iranian indigenous chicken populations, revealing their differences, and paves the process of decision making and the formulation of an efficient and sustainable breeding or conservation programs.

Key words: *growth and production traits, Iranian native chicken, meta-analysis, weighted and unweighted heritability*

THE EFFECTS OF PARITY, BIRTH TYPE AND SEX ON THE PLACENTAL TRAITS OF HAIR GOATS

Selcuk OZYUREK[1]

[1]Erzincan Binali Yildirim University, TURKEY

Corresponding author e-mail: sozyurek@erzincan.edu.tr

Abstract

At a private farm of goat, Erzincan province, the relationship between placental traits and parity, birth type and sex of kids were investigated in this study. A total of 52 fetal placental delivered at normal kidding were collected from Hair goat. The result showed that there were significant differences (P<0.05) among does in parity for placental weight (PW) and cotyledon density (CD). As the parity of does rose, PW increased but the CD decreased. Even if not it was significant, birth weight (BW) (2.51±.14-2.76±.07 g, 2-3 and ≥4 parity respectively) and average cotyledon surface area (ACSA) (7.33±.23-7.84±.12 cm2 2-3 and ≥4 parity respectively) increased and cotyledon number (CN) decreased (102.05±4.8-96.90±2.5 respectively) with parity. Birth type affected PW, CD and ACSA. In the study it was determined that while single born does had 281.7±14.7 g placenta, twin born does had 445±7±23.7 g placenta. When we look at the kid sex factor, it was effect on BW, CD and placental efficiency (P<0.05). Also CN and cotyledon efficiency were not affected any factor. Although the parity and sex are an important factor on many traits, we did not found any statistically significant effect on the cotyledon traits for parity and sex of kids. However small cotyledon number was lower ≥4 parity does (4.85±.7) than 2-3 parity does (7.23±1.3). Large cotyledon number, cotyledon length and cotyledon width were affected (P<0.01) by birth type. There was a direct correlation between ACSA and cotyledon length (r=0.985; P<0.01), cotyledon width (r=0.969; P<0.01). However a negative correlation between ACSA and CNs (-0.553; P<0.01), CD (-0.779; P<0.01) was determined for Hair goats. A very important and noticeable finding was that twin placentas had a higher number of large cotyledons and bigger cotyledon length and wide, but fewer (P>0.05) number of small and medium sized cotyledons.

Key words: *birth type, average cotyledon surface area, hair goat, placenta*

CHANGE LEVEL OF HYGIENIC BEHAVIOUR BREEDING PARAMETERS IN THE CAUCASIAN HONEY BEE (*A. M. CAUCASICA G.*) SUBSPECIES DURING FIVE GENERATIONS

Ahmet GULER[1], Selim BIYIK[1], Gokhan KAVAK[1], Hasan ONDER[1]

[1] Ondokuz Mayis University, Faculty of Agriculture, Department of Animal Science, TR55139 Atakum, Samsun, TURKEY

Corresponding author e-mail: aguler@omu.edu.tr

Abstract

In this study, five generation selection applied to the colonies representing the Caucasian honey bee subspecies (Apis mellifera caucasica G.) in terms of hygienic behavior. In each generation the level of change and level in breeding parameters such as genetic progression level (GΔ), selection superiority (i) and coefficient of inheritance (h^2) of hygienic behavior characteristic were determined. At the beginning, 270 queen bees were bought from North-Eastern Anatolia Region. In every year and each generation fifteen colonies were chosen from selected colonies as drone bee (father) producer. In addition, 8-10 sister queens bee were reared from each selected colonies. Each queen bee (♀) was instrumentally inseminated with semen collected from 14 drone bee producers (♂) selected colonies except the colony representing their parent. Approximately 150 queen bees were instrumentally inseminated in each generation. Hygiene test was applied to the colonies one year later after the colonies requeened. The test was conducted to the colonies 4 times in each year in the first weeks of May, June, July and August. 350 cc of liquid nitrogen (-196 ◦C.) was applied to the area within the funnel where a total of 165 pupae were present. The colonies cleaned 95% or more of the dead pupae were selected as parents (mother and father) for next generation. In this study 95% or more dead pupae removal of total 420 selected honeybee colonies were determined. Less than 95% cleaned colonies were eliminated. Colonies cleaned significantly (P<0.01) different number of dead pupae. While many colonies cleaned 100% of 165 dead pupae, some cleaned only 30%. In P0, P1, P2, P3 and P4 generations, the average pupae removal of colonies were found as 138.21, 154.17, 156.5, 158.9 and 159.6 number/colony, respectively. In addition in these generations selection superiority (i) were 23.47, 9.66, 7.20, 6.0 and 1.9, the genotypic improving (GΔ) 15.58, 2.83, 2.37, 0.66 and 0.21, and the coefficients of inheritance (h^2) 0.664, 0.293, 0.325 and 0.110, respectively. The level of variation is high and important in terms of dead pupa cleaned (hygienic) behavior in Caucasian honey bee subspecies. The highest (99.92%) dead pupa cleaning rate was determined in the third generation. Therefore, this honey bee race has high hygienic behavior and it is shown this behavior in the first generations (third). As a result, it was determined that this level of hygienic behavior exhibited by the Caucasian bee is genotypically resistant to the American Fool Brood disease caused by Paenibacillus larvae and this behavior can be improved by breeding.

Key words: *honeybee, Apis mellifera, preparates, colony, varroa, pupae remove, breeding*

A CURVE FITTING WITH THE AID OF TRIGONOMETRIC FUNCTIONS ON ANIMAL DATASET

Ayse Betul ONEM[1], Omer Faruk KARAOKUR[1], Aysel YENIPINAR[1], Seyma KOC[1], Ercan EFE[2]

[1]Kahramanmaras Sutcu Imam University, Institute of Science and Technology, Department of Animal Science, 46040, Onikisubat, Kahramanmaras, TURKEY
[2]Kahramanmaras Sutcu Imam University, Faculty of Agricultural, Department of Animal Science, TR46040, Onikisubat, Kahramanmaras, TURKEY

Corresponding author e-mail: betul_onem@hotmail.com

Abstract

Traditional growth curves used in the field of livestock farming or models of milk yield models such as Brody, Bertalanffy, Logistics, Gompertz and Richards are used based on classical regression analysis. In this study, a milk yield curve model was proposed with the help of sinusoidal functions based on trigonometric functions. In this model, a curve model and parameter estimation have been made by using a milk yield data set. In addition, this study aims to explain the applicability of periodic features of sinusoidal functions in agriculture and animal data. It is thought that this solution, which can be applied in different fields, will be beneficial for researchers.

Key words: *milk yield curves, trigonometric functions, sinusoidal*

INTRODUCTION

Conventional regression models are widely used in traditional growth curve models used in agriculture and animal husbandry. In this study, a different harmony is achieved by using the periodicity feature of sinus and cosine from trigonometric functions.

This method can be applied to milk yield curves in the field of agriculture and livestock and it can be used in many fields. Especially, more adaptation is provided for oscillatory, up-and-down data. Hamming (1973), Scheid (1989), Mathews (1992), Akpınar and Kürüm (2005) and Karagöz (2017) used this method for fluctuating data. This method has been applied to electric circuits at the same time (Karaboğa, 2012). This method can be used in the fields of medicine, engineering, agriculture and animal husbandry. For example, indoor and outdoor greenhouse temperatures can be used in radiation measurements, climate change data, hunter population changes.

The main purpose of this study is to examine the utility of a model that has not been used in the field of livestock.

MATERIALS AND METHODS

In this study, a hypothetical milk production data set was prepared and given in Table 1.

Table 1. Sample data set

t	1	2	3	4	5	6	7	8
y	14	17	16	15	13	12	10	8

With the help of sinusoidal functions, the curve can be adapted to the data. Sinus and cosine functions share many desired properties of polynomials. Sinus and cosine functions share many desired properties of polynomials. Moreover, they are easily calculated with fast converging series. Sequential derivatives and integrals are also sinuses and cosines. They also have orthogonality feature and periodicity that polynomials do not have. For these reasons, they are used in approximation theory of trigonometric functions.

Taking these properties into consideration,

$$f(x) = \frac{A_0}{2} + \sum_{n=1}^{\infty} (A_n \cos nx + B_n \sin nx)$$

in the Fourier series. Coefficients A_n and B_n in this formula;

$$A_n = \frac{1}{\pi}\int_0^{2\pi} f(x)\cos nx dx \qquad (n=0,1,2,...)$$

$$B_n = \frac{1}{\pi}\int_0^{2\pi} f(x)\sin nx dx \qquad (n=1,2,3,...)$$

calculated as. The following four preconditions must be satisfied in order for any function to be approximated by the Fourier.

i. If the function is single-valued at each point where it is continuous in the desired range,
ii. Ending in the desired interval,
iii. Continuously in the desired range,
iv. To get the maximum or minimum values in the final number in the desired interval.

If the function is not continuous and is given as n equally spaced discrete values, then the total number of symbols is used instead of the above integral operations. In particular, if the values of y vary periodically with increasing values of the variable x, the cut-off Fourier series will be selected as the mathematical model. The mathematical expression of the Fourier model to be used in the most general case,

$$y_i = A_0 + \sum_{k=1}^{m}\left[A_k \cos\left(\frac{2\pi}{T}kx_i\right) + B_k \sin\left(\frac{2\pi}{T}kx_i\right)\right] + e_i$$

becomes. In this case, the period T which is in the type and the unit of the value x variable. If the period cannot be determined with the help of observed x_i, y_i points

$$T = \max(x_i) - \min(x_i)$$

selectable as. $A_0, A_1, ..., B_1, B_2, ...$ the coefficients will be determined as the sum of the error squares will be minimum as we have seen before. Angle conversion is done.

$$\theta_i = \frac{2\pi}{T}x_i, \quad i=1,2,,...,n$$

In this case;

$$s = \sum_{i=1}^{n}\left\{y_i - \left[A_0 + \sum_{k=1}^{m}(A_k \cos k\theta_i + B_k \sin k\theta_i)\right]\right\}^2$$

return. The minimum and necessary condition for this statement to be minimum;

$$\frac{\partial s}{\partial A_k} = 0, \qquad k=0,1,...,m$$

must be. From here for k=0,1,...,m

$$A_0 = \frac{1}{n}\sum_{i=1}^{n} y_i,$$

$$A_k = \frac{2}{n}\sum_{i=1}^{n} y_i \cos k\theta_i$$

and

$$B_k = \frac{2}{n}\sum_{i=1}^{n} y_i \sin k\theta_i$$

formulas are obtained. For the number of A_k and B_k parameters, 2m+1≤n can be written, where n is the number of observed points.

Now let's see how the parameters A_0, A_1, and B_1 can be obtained by accepting m = 1;

$y_i = A_0 + A_1 \cos\theta_i + B_1 \sin\theta_i + e_i$, i=1,2,...,n because ,

$$s = \sum_{i=1}^{n}\left[y_i - A_0 - A_1 \cos\theta_i - B_1 \sin\theta_i + e_i\right]^2$$

we can write. The minimum and necessary condition for this statement to be minimum;

$$\frac{\partial s}{\partial A_0} = 0, \frac{\partial s}{\partial A_1} = 0, \frac{\partial s}{\partial B_1} = 0$$

must be. Thus, if partial derivatives are taken according to the parameters A_0, A_1 and B_1, respectively;

$$nA_0 + A_1\sum_{i=1}^{n}\cos\theta_i + B_1\sum_{i=1}^{n}\sin\theta_i = \sum_{i=1}^{n} y_i$$

$$A_0\sum_{i=1}^{n}\cos\theta_i + A_1\sum_{i=1}^{n}\cos^2\theta_i + B_1\sum_{i=1}^{n}\cos\theta_i\sin\theta_i = \sum_{i=1}^{n}y_i\cos\theta_i$$

$$A_0\sum_{i=1}^{n}\sin\theta_i + A_1\sum_{i=1}^{n}\sin\theta_i\cos\theta_i + B_1\sum_{i=1}^{n}\sin^2\theta_i = \sum_{i=1}^{n}y_i\sin\theta_i$$

obtained. These equations are in matrix form;

$$\begin{bmatrix} n & \sum\cos\theta_i & \sum\sin\theta_i \\ \sum\cos\theta_i & \sum\cos^2\theta_i & \sum\cos\theta_i\sin\theta_i \\ \sum\sin\theta_i & \sum\cos\theta_i\sin\theta_i & \sum\sin^2\theta_i \end{bmatrix}\begin{bmatrix} A_0 \\ A_1 \\ B_1 \end{bmatrix} = \begin{bmatrix} \sum y_i \\ \sum y_i\cos\theta_i \\ \sum y_i\sin\theta_i \end{bmatrix}$$

It is written as. For the sums in the matrix of coefficients,

$$\frac{1}{n}\sum_{i=1}^{n}\sin\theta_i \;,\; \frac{1}{n}\sum_{i=1}^{n}\cos\theta_i = 0 \;;$$

$$\frac{1}{n}\sum_{i=1}^{n}\sin^2\theta_i = \frac{1}{2}$$

$$\frac{1}{n}\sum_{i=1}^{n}\cos^2\theta_i = \frac{1}{2} \;;\quad \frac{1}{n}\sum_{i=1}^{n}\sin\theta_i\cos\theta_i = 0$$

If the system obtained by writing is solved,

$$\begin{bmatrix} A_0 \\ A_1 \\ B_1 \end{bmatrix} = \begin{bmatrix} 1/n & 0 & 0 \\ 0 & 2/n & 0 \\ 0 & 0 & 2/N \end{bmatrix}\begin{bmatrix} \sum y_i \\ \sum y_i\cos\theta_i \\ \sum y_i\sin\theta_i \end{bmatrix}$$

obtained (Türker and Can, 1997; Bayram, 2013; Çelik, 2016; Chapra and Canale, 2006).

RESULTS AND DISCUSSION

$y_i = A_0 + A_1\sin\theta_i + B_1\cos\theta_i$ shaped curve fit. The period of the series is t = 8.

$\theta_i = \frac{2\pi}{8}t_i = \frac{\pi}{4}t_i$; i:1,2,...,8

Table 2. Some ϴ values for ti points

t	θ_i	$\sin\theta_i$	$\cos\theta_i$
1	π /4	0.309	0.951
2	π /2	0.588	0.809
3	3 π /4	0.809	0.588
4	π	0.951	0.309
5	5 π /4	1	0
6	3 π /2	0.951	-0.309
7	7 π /4	0.809	-0.588
8	2 π	0.588	-0.809

When necessary solutions are made here parameters;

$A_0 = 5.25$

$A_1 = 2.505$

$B_1 = 7.873$ in the form of.

If it is written in the prediction equation;

$y_i = 5.25 + 2.505\sin\theta_i + 7.873\cos\theta_i$

formed as.

In this study, hypothetically generated trigonometric curve fitting was done. Figure 1 shows the actual data and Figure 2 shows the trigonometric fitting of this data set.

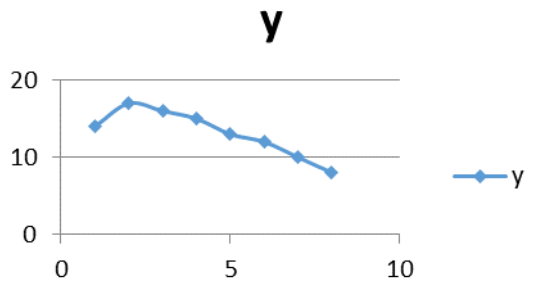


Figure 1. Data set curve

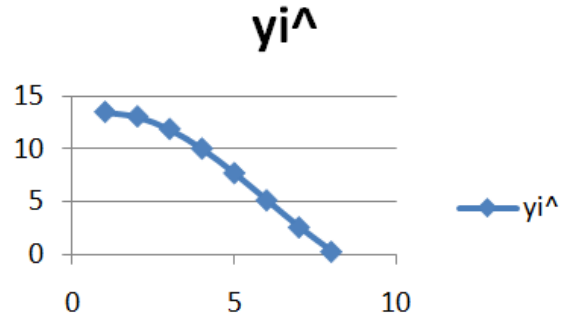


Figure 2. Forecasting curve

As can be seen, the prediction curve obtained for the numerical example in

operation seems to have a good fit. However, the fact that the trigonometric models fit periodically with recurring fluctuations, and that these models are very specific, such as growth, dairy, etc. it should be remembered that it can adapt to livestock data.

CONCLUSIONS

It has been investigated whether the trigonometric model can be adapted to some livestock data such as growth in labor and milk yield curves. A trigonometric model with three parameters has been demonstrated on hypothetical milk production example (Table 1).
It has been seen that some special cases of the trigonometric models can adapt.
However, as the number of intervals changes, the harmonics will deteriorate as the fluctuations of the trigonometric model increase. For this reason, the investigator should be careful. Growth is thought to be better used in studies involving seasonal fluctuations such as changes in seasonal fish populations, water temperature, salinity, and wildlife hunting-related populations, which are uniquely curled, such as milk yield.

REFERENCES

Akpınar, S. and Kürüm, H., 2005. Numerical Analysis. Nobel Publishing House, Ankara, pp. 226-230.
Bayram, M., 2013. Numerical Analysis. Sürat University Publications, İstanbul, pp. 273-277.
Chapra, S. C., Canale, R. P., 2006. Numerical Methods for Engineers, 10/ed. McGraw-Hill, Singapore, pp. 507-562.
Çelik, Ş., 2016. Trigonometric curve fitting and an application. IJIRR, vol. 03, issue 05, pp. 2422-2427.
Hamming, R. W., 1973. Numerical Methods for Scientists and Engineers, 2/ed. McGraw-Hill, Newyork, pp. 503-602.
Karaboğa, N., 2012. Numerical Methods and Matlab Applications. Nobel Academic Publishing, Ankara, pp. 247-255.
Karagöz, İ., 2017. Numerical Analysis and Engineering Applications. Dora Publishing, Bursa, pp. 269-280.
Mathews, J. H., 1992. Numerical Methods for Mathematics, Science, and Engineering, 2/ed. Prentice-Hall Engle wood Cliffs, New Jersey , pp. 303-314.
Scheid, F., 1989. Schaum's Outline Series Theory and Problems of Numerical Analysis 2/ed. McGraw-Hill, U.S.A., pp. 305-325. Türker, E.S. and Can, E., 1997. Computer Applied Numerical Analysis Methods. Değişim Publications, Adapazarı, pp. 234-240.

COMPARISON OF CLASSICAL AND PHOTOGRAPH METHOD OF BODY MEASUREMENTS OF SAANEN×KILIS CROSSBRED (WHITE) GOATS IN KIRSEHIR

Serdar GENC[1]

[1]Ahi Evran University, Faculty of Agriculture, Department of Agricultural Biotechnology, TR40100 Kırşehir, TURKEY

Corresponding author e-mail: serdargenc1983@gmail.com

Abstract

In this study, the withers height (WH (CY)), chest depth (CD (GD)), back height (BH (SY)), rump height (RH (SGY)), rump width (RW (SG)), pin bone width (PBW (OYG)) and body length (BL (VU)) of Saanen×Kilis Crossbred (White) Goats were measured using Classical Method (CM) and Object Photo Method (OPM). Means of (WH, CD, BH, RH, RW, PBW, BL) for CM and OPM; 66.9 and 62.5, 30.8 and 31.3, 66.9 and 62.0, 61.0 and 58.7, 8.8 and 7.3, 15.6 and 16.3, 68.0 and 59.1 respectively. For this purpose, body measurements of 26 goats in Agricultural Faculty Research and Breeding Unit, located in Kirsehir province were determined. The present study, it was conducted that OPM could be used instead of CM to determining the body measurements (BH (SY), RH (SGY) and PBW (OYG)) of goats, although there are differences between groups (p<0,05).

Key words: *Saanen×Kilis crossbred (white) goats, body measurements, image processing methods, object photography method*

COMPARISON OF CLASSICAL AND PHOTOGRAPH METHOD OF BODY MEASUREMENTS OF IVESI SHEEP IN KIRSEHIR

Serdar GENC[1]

[1]Ahi Evran University, Faculty of Agriculture, Department of Agricultural Biotechnology, TR40100 Kırşehir, TURKEY

Corresponding author e-mail: serdargenc1983@gmail.com

Abstract

In this study, the withers height (WH (CY)), chest depth (CD (GD)), back height (BH (SY)), rump height (RH (SGY)), rump width (RW (SG)) and pin bone width (PBW (OYG)) of Ivesi sheep were measured using Classical Method (CM) and Object Photo Method (OPM). For this purpose, body measurements of 24 Ivesi Sheep in private Farm, located in Kirsehir province were determined. Means of (WH, CD, BH, RH, RW, PBW) for CM and OPM; 70.0 and 69.8, 35.0 and 28.0, 73.0 and 71.7, 68.9 and 64.0, 8.2 and 8.5, 16.2 and 18.2 respectively. The present study, it was conducted that OPM could be used instead of CM to determining the body measurements (BH (SY), RH (SGY) and PBW (OYG)) of sheep, although there are differences between groups (p<0,05).

Key words: *Ivesi sheep, body measurements, image processing methods, object photography method*

INVESTIGATION OF CALPASTATIN GENE (CAST) POLYMORPHISM IN SAANEN GOAT BY PCR-RFLP METHOD

Deniz DINCEL[1], Sena ARDICLI[1], Hale SAMLI[1], Faruk BALCI[1]

[1]Uludag University, Faculty of Veterinary Medicine, Department of Genetics, 16059, Nilufer, Bursa, TURKEY

Corresponding author e-mail: deniz@uludag.edu.tr

Abstract

Calpastatin is known as a spesific inhibitor of calpains which have an important role in meat tenderness after slaughtering. Thus the calpastatin gene (CAST), located on chromosome 7 of goat genome, has been considered as a candidate gene in meat production and quality. The CAST gene is also responsible for the muscle development by the way of formation or degradation of the fibers and influence the growth performance of animals. Although A>G polymorphism in exon 1C/1D region of CAST gene has been investigated in many sheep and goat breeds, this SNP has not been studied in Saanen goats up to now in our knowledge. The aim of the study was to evaluate the genotypic frequencies of A>G polymorphism of CAST gene that affects the growth performance and meat quality/production of slaughter animals, in Saanen goats. For this purpose, we investigated the A>G polymorphism of CAST gene by PCR-RFLP method in Saanen (n=95). The genomic DNA was extracted by phenol-chloroform method from blood samples and the 622 bp PCR products were amplified for CAST gene. The obtained PCR products were digested by MspI restriction enzyme for identification of A and B alleles. The digested products (286 bp, 336 bp and 622 bp) were seperated by electrophoresis on 2.5% agarose gel and visualized by DNR's MiniLumi bio-imaging system. According to the results, AA, BB and AB genotypes were observed for CAST gene and the frequencies were determined 36.84%, 44.21%, and 18.95% in Saanen population respectively. The allele frequencies of CAST gene were found 0.463, 0.537 for A and B respectively. The significant deviation was observed for Hardy-Weinberg equilibrium in terms of χ^2-values ($P<0.05$). As a consequence, this is the first report that exhibits the A>G polimorphism of CAST gene in Saanen goat breed. Saanen goats were found polymorphic for CAST gene. Thus, the effect of CAST gene polimorphism on growth performance and meat quality should be investigated in future studies.

Key words: *polymorphism, Saanen goat, CAST gene, PCR-RFLP*

EVALUATION OF GROWTH AND SURVIVAL RATES OF AWASSI LAMBS IN BREEDER CONDITIONS IN ESKISEHIR

Ceyhan OZBEYAZ[1], Omer Faruk BILGIC[2], Afsin KOCAKAYA[1], Necmettin UNAL[1]

[1]Ankara University, Faculty of Veterinary Medicine, Department of Animal Science, TURKEY

[2] Ministry of Food, Agriculture and Livestock, TURKEY

Corresponding author e-mail: akocakaya@ankara.edu.tr

Abstract

This study was undertaken to investigate growth and survival rates of Awassi lambs in breeder conditions in Eskişehir. Continental climate conditions in the region are prevailing. 290 lambs were used in this study. The least squares means for lambs were 3.97±0.06, 10.69±0.16, 14.04±0.22, 17.05±0.27, 19.47±0.30 and 21.77±0.32 kg for birth, 30th, 45th, 60th, 75th and 90th days weights, respectively. Survival rates of lambs at 60th and 90th days were 91.72 and 89.31 %, respectively. The result of study shows that growth and survival rates of Awassi lambs in Eskişehir (Central Anatolia) conditions were similar to normal values of the breed. So, Awassi lambs could be raised successfully in Eskişehir conditions in terms of investigated production traits.

Key words: *Awassi, growth, lamb, survival rate*

This study was published in Lalahan Hay. Araşt. Enst. Derg. 2018, 58 (1) 1-6.

INTRODUCTION

Sheep is a livestock, with multipurpose, easy handling, high adaptability and disease resistance, can be highly utilized from bad quality pastures (Akcapınar, 2000). A lot of crossbreeding study was conducted with different sheep breeds in Turkey. Only few outputs of these studies can be used by sheep breeders. For this reason, it is stated that it would be a more rational way to increase production with native breeds (Akcapınar, 1996).

Climatic, geographical and economic conditions of the raising area are the main factors determining the direction of breeding. Together with all these factors, the aim of the breeder is an important criterion in the production of milk or meat. Although sheep are currently breeding for meat production, milk production can also be very profitable. Choosing the right breed for breeders who want to increase their income by producing both meat and milk has great importance.

Adaptation ability must be accounted in the selection of the breed. High adaptability breeds, can be described as the breeds that do not undergo significant decline in their viability and yields when brought to a different region from the conditions in the area where they are grown. It is important that the ability to adapt to the environment in different places than the regions where races are raised is important so that a wider area can be utilized than those breeds (Akcapınar and Ozbeyaz, 1999; Akçapınar, 2000; Akcapınar et al., 2002; Yakan et al., 2012).

The region of Sivrihisar in the province of Eskisehir has 76.000 hectare grassland of total area of 112.700 hectare. The considerable extent of people's livelihood depends on animal husbandry. Recently, milk-oriented breeds have been brought to the region due to the interest in sheep milk. One of these breeds is Turkey's indigenous sheep breed Awassi. Awassi sheep is growing in Southeast Anatolia in Turkey also is breeding in countries with hot and dry climates such as Syria, Iraq and Israel. Awassi sheep is a flock breed with high adaptability and milk yield (Akcapınar, 2000). It is appropriate to determine some

characteristics of the breed in order to be able to spread it in Sivrihisar region and similar environmental conditions.

This research was carried out in order to determine the growth and survival rates of Awassi lambs in breeder conditions in Sivrihisar region in Eskisehir.

MATERIALS AND METHODS

This research was carried out in 2013 in a private enterprise located in the Sivrihisa r region of Eskisehir. The animal material of the study was consisted of 290 head of Awassi lamb, which were examined for survival and growth characteristics until weaning (90 days).
The lambs after birth immediately were dried, weighed and recorded. Lambs were weighted three times in 30-day intervals until weaning. The weights of the 30th, 45th, 60th, 75th and 90th day of the lambs were determined by the linear interpolation method. The 259 lambs, survived until weaning, were examined for growth characteristics.
Survival rates calculated as the ratio of the number of lambs living up to 60th and 90th day to the number of live-born lambs by gender and type of birth. Comparisons between groups were made by chi-square test. Gender and birth type factors that affect growth in the lambs were examined using least squares method. The sum of the impacts in all calculated environmental factors is assumed to be zero (Akcapınar, 1998).

RESULTS AND DISCUSSION

Survival Rate

The survival rates are given in Table 1. There was no statistically significant difference between the sexes and types of births in terms of survival rates. While there was no significant difference between the groups, the females and twin births at the weaning had higher survival rates. This situation is compatible (Akcapinar et al., 2002; Unal et al., 2006) and incompatible (Yakan et al., 2012; Unal and Akcapinar, 2001; Unal, 2002; Ustuner and Ogan, 2013; Vanlı et al., 1984) with some reports. The 90th day survival rate (89.31%) in this study was higher than the results reported before by Emsen and Yaprak (2004), Ustuner and Ogan (2013), İpek (2012) and Kul and Akcan (2002), was similar to the results reported before by Tekerli et al., (2002) and lower than Yalcın and Aktas's (1969) report. There are many factors that affect the survival rates. Well-managed enterprises have fewer lamb deaths and higher survival rates. The level of survival in this enterprise is an acceptable value under extensive conditions.

Table 1. Survival rates in various periods of growth (%)

Factors	Survival rate	
	Day 60th	Day 90th
Gender	-	-
Female	92.76	90.13
Male	90.58	88.41
Birth Type	-	-
Single	91.39	88.52
Twin	93.48	93.48
Total	91.72	89.31

-: P>0,05

Growth

Birth weights and live weights of lambs were examined according to the gender and the birth type until weaning (Table 2). The least squares means for lambs were 3.97±0.06, 10.69±0.16, 14.04±0.22, 17.05±0.27, 19.47±0.30 and 21.77±0.32 kg for birth, 30th, 45th, 60th, 75th and 90th days weights, respectively. The effect of gender and birth type was important on birth weight and weights of all periods of growth (P<0.05; P<0.01; P<0.001).
In this study as expected male lambs were heavy than females and ingles are heavier than twins (Akcapinar and Kadak, 1982; Akcapinar, 1983). The values obtained during various periods of growth in this study are within the limits of the values reported in other studies. Even under extensive conditions, it can be said that the Awassi lambs have grown within the normal limits.

CONCLUSIONS

In conclusion, the results of the present study indicated that Awassi lambs have similar growth and survival rates with its

normal spreading area and Eskisehir conditions. It can be said that they can be successfully raised in terms of the characteristics examined in Eskisehir conditions. It may be advisable to conduct surveys on the quality and yield of Awassi breed in Eskisehir (Central Anatolia) conditions.

Table 2. The average of the least squares of live weights from birth weight to the weianing of Awassş lambs (kg)

Factors	n	Days					
		Birth	30th	45th	60th	75th	90th
		$\overline{X} \pm S_{\overline{X}}$	$\overline{X} \pm S_{\overline{X}}$	$\overline{X} \pm S_{\overline{X}}$	$\overline{X} \pm S_{\overline{X}}$	$\overline{X} \pm S_{\overline{X}}$	$\overline{X} \pm S_{\overline{X}}$
Gender		**	**	*	*	*	**
Female	137	3.84±0.07	10.36±0.19	13.62±0.27	16.55±0.33	18.91±0.36	21.10±0.39
Male	122	4.10±0.07	11.01±0.21	14.46±0.29	17.56±0.35	20.03±0.38	22.43±0.42
Birth Type		***	***	***	***	***	***
Single	216	4.22±0.05	11.33±0.13	14.88±0.18	18.15±0.22	20.67±0.24	23.01±0.26
Twin	43	3.73±0.10	10.04±0.30	13.19±0.41	15.96±0.50	18.27±0.54	20.52±0.59
Total	259	3.97±0.06	10.69±0.16	14.04±0.22	17.05±0.27	19.47±0.30	21.77±0.32

*: P<0.05, **: P<0.01, ***P<0.001

REFERENCES

Abdullah YA, Qudsieh RI, Nusariat BM (2011): Effect of Crossbreeding With Exoti Breeds on Meat Quality of Awassi Lambs. Livestock Science 142:121-127.

Akçapınar H, Kadak R (1982): Effects of SomeFactors on Pregnancy Time and Birth Weight in Akkaraman and Morkaraman. Vet J Ankara Univ. 29(3-4): 392-400.

Akçapınar H (1983): The Effects of Some Factors on Growth Capability of Akkaraman and Morkaraman Lambs. Vet J Ankara Univ. 30(1): 183-200.

Akçapınar H (1996): Opinion sabout the future of Sheep Breeding in Turkey. Türk Veteriner Hekimliği Dergisi 8 (2): 15-17.

Akçapınar H (1998) Elimination of EnvironmentalFactors Course notes. Ankara.

Akçapınar H, Özbeyaz C (1999): AnimalBreeding Basic Information. 1. Baskı, ISBN: 975-96978-0-7, Kariyer Matbaacılık, Ankara-Türkiye.

Akçapınar H (2000): Sheep Breeding. Yenilenmiş 2. Baskı, ISBN: 975-96978-1-5, İsmat Matbaacılık, Ankara-Türkiye.

Akçapınar H, Ünal N, Atasoy F, Özbeyaz C, Aytaç M (2002): Adaptation capability of Karayaka and Bafra (Chios x Karayaka B1) genotypes reared in Lalahan Livestock Research conditions. Lalahan Hay Araş Enst Derg 42(1): 11-24.

Çelik R (2006): İvesi ve Türk Merinosu X İvesi (F1) Kuzuların Bazı Verim Özellikleri Üzerinde Araştırmalar. Doktora Tezi, İstanbul Üniversitesi Sağlık Bilimleri Enstitüsü, İstanbul.

Elibol M, Dağ B (2004): Parameter Estımates Of Factors Affectıng Body Weıght At Shearıng And Wool ProductıonTraıts Of Akkaraman, Awassı And Awassı X Akkaraman (F1 X Awb1) Crossbreed Sheep Raısed In Ereğli Sheep Breedıng Statıon. S.Ü. Ziraat Fakültesi Dergisi 18(34):1-10.

Emsen E, Yaprak M (2004):Vit E + Se ve Eksojen Hormon Kullanımının İvesi ve Morkaraman Koyunlarında Döl Verimi Kuzularda Büyüme ve Yasama Gücü Üzerine Etkileri. 4.Ulusal Zootekni Bilim Kongresi, Isparta.

Esenbuğa N, Dayıoğlu H (2002): Effects of Som eEnvironmental Factors on Growth Traits of Awassi and Red karaman Lambs. Turk J Vet Anim Sci 26:145-150.

Hassen Y, Sölkner J, Fuerst-Waltl B (2004): Body Weight of Awassi and Indigenous Ethiopian Sheep and Their Crosses. Small RuminantRes 55:51-56.

İpek P (2012): Farklı Sürelerde Sütten Kesilen İvesi Kuzularda Büyüme, Yaşama Gücü ve Vücut Ölçüleri. Yüksek lisans Tezi, Fırat Üniversitesi Sağlık Bilimleri Enstitüsü, Elazığ.

Keskin M, Biçer O (2000): Farklı Büyütme Sistemlerinin İvesi Koyunlarda Kuzu Gelişimi ve İşletme Kârlılığına Etkileri Üzerine Bir Araştırma. MKÜ Ziraat Fakültesi Dergisi 5 (1-2):49-56.

Kul S, Akcan A (2002): Fattenning Performance, Slaughter and Carcass Characteristics in Awassi and East Friesian x Awassi (F1) Crossbred Lambs. UludagUniv. J. Fac. Vet. Med. 21:109-114.

Özbey O, Akcan A (2001): Production Performance of Morkaraman, Akkaraman And Awassi SheepUnderSemi-intcnsive Conditions II. Growth And Survival Rates Of Lambs. Vet. Bil. Derg. 17(31): 57-66.

Shaker MM, Abdullah AY, Kridli RT, Sada I, Sovjak R, Muwalla MM (2002): Effect of Crossing Indigenous Awassi Sheep Breed With Mutton and Prolific Sire Breeds on TheGrowth Performance of Lambs in a Subtropical Region. Czech J Anim Sci 47(6):239-246.

Shaker MM, Kridli RT, Abdullah AY, Malinova M, Sanago S, Sada I, Lukesova D (2010): Effect of Crossbreeding European Sheep Breeds With Awassi Sheep on Growth Efficiency of Lambs in Jordan. Agricultura Tropica et Subtropica 43(2):127-133.

Tekerli M, Gündoğan M, Akıncı Z, Akcan A (2002): Determination of Production Characteristics of Akkaraman, Daglic, Chios and Awassi sheep in the conditions of Afyon Provincel – Fertility and Survival rate. Lalahan Hay Araş Enst Derg 42(2):29-36.

Ünal N, AkçapınarH (2001): Some Important ProductionTraits of Central Anatolian Merino Sheep and possibilities of improving through selection of these traitsI. Important Production Traits. Lalahan Hay Araşt Derg 41(1): 45-58.

Ünal N (2002): Survival Rate, Growth Characteristics andSome Body Measurements of Akkaraman and Sakız

(Chios) x Akkaraman F_1 Lambs. Turk J Vet Anim Sci 26:109-116.

Ünal N, Akçapınar H, Atasoy F, Aytaç M (2006): Some Reproductiv and Growth Traits of Crossbred Genotypes Produced by Crossing Loca Sheep Breeds of Kivircik x White Karaman and Chios x White Karaman in Steppe Conditions. Arch. Tierz., Dummerstorf 49(1): 55-63.

Ünalp A, Kutsal A (1955): Çukurova Harası İvesi Koyunlarının Çeşitli Verimler Bakımından İncelenmesi. Vet Hekim Der Derg 25 (110-111): 2520-2530.

Üstüner H, Oğan MM (2013): Main Productive Performance of Awassi Sheep in The Central Anatolian Region of Turkey. Turk J Vet Anim Sci 37:271-276.

Vanlı Y, Özsoy MK, Esmen H (1984): İvesi Koyunların Erzurum Çevre Şartlarına Adaptasyon ve Çeşitli Verimler Üzerine Araştırmalar. Doğa Bilim Dergisi, D_1 8(3):302-314.

Yakan A, Ünal N, Dalcı MT (2012): Reproductive Traits, Growth andS urvival Rates of Akkaraman, Awassi and Kıvırcık Sheep Breeds in Ankara Conditions Lalahan Hay Araş Enst Derg 52(1):1-10.

Yalçın BC, Aktaş G, Sandıkçıoğlu M (1968): İvesi Kuzularını Değişik Sürelerde Sütten Kesmenin Kuzuların Büyümesine ve Anaların Süt Verimine Etkisi. Lalahan Hay Araş EnstDerg 8 (3): 45-55.

Yalçın BC, Aktas G (1969): Ergin İvesi ve Akkaraman Koyunlarının Konya Ereğlisi Sartlarındaki Performansları. Lalahan Zootekni Arastırma Enstitüsü Dergisi, 9 (3-4): 1-14.

THE PRESENT OF SCRAPIE AND THE RESULT OF BREEDING PROGRAM IN EUROPE AND CYPRUS

Meryem BETMEZOGLU[1], Dilek ARSOY[1]

[1]Near East University, Faculty of Veterinary Medicine, Department of Animal Science, Near East Boulevard, ZIP: 99138 Nicosia, NORTH CYPRUS

Corresponding author e-mail: meryembetmezoglucyrus@gmail.com

Abstract

Scrapie is a fatal neuro-degenerative disease of sheep and goats belongs to the group of transmissible spongiform encephalopathy (TSEs). Classical scrapie resistance and susceptibility are closely related to PrP Gene polymorphism (ARR, ARQ, VRQ, and AHQ ARH) in sheep. The ARR / ARR genotype is the most resistant. Subsequent annual testing campaigns among the animals at risk were done in Europe from 2001 to 2015 showed that the goat had at least 16 silent mutation of a specific study of PrP distribution. In 2014, the test in sheep and goats carried out under the frame work of the TSE monitoring programs in E.U showed that 1,015 out 325,530 sheep and 1,437 out of 127,016 goats turned out positive to classical Scrapie. There are Scrapie cases reported in both south and north Cyprus. Infected herds in Southern Cyprus represent 22.6% (2014) of total active sheep and goat herds. It has been also known that there are Scrapie cases in Northern Cyprus although there is no official data recorded. Some sheep breeds have the highest ARR / ARR allele like Canadian Arcott with 39.3%, Dorset Down with 28.9%, and Polypay with 26.8%. Among the sheep breeds, the Chios has the highest level of ARR allele with 38% in Turkey and 32.5% in North Cyprus while the lowest level (5.9%) was seen in Awassi in Turkey. In the TSE eradication program applied in Europe (2015): 1.When BSE cannot be excluded, all animals > 18 months killed for destruction shall be tested for TSE.2. When TSE and atypical Scrapie can be excluded, option A; Killing and complete destruction or slaughter for human consumption (SHC) of all animals. Option B: Killing and complete destruction of the susceptible animals only. Option C: No mandatory killing and complete destruction of animals. In Europe, selected male animals which have ARR / ARR gene are used in breeding program. As a result of the breeding programs implemented in Europe; 1108 Scrapie cases reported in 2002 decreased to 685 in 2016.

Key words: *scrapie, TSE, ovine, caprine, Europe, Cyprus*

INTRODUCTION

Scrapie is a deadly neurodegenerative disease of the sheep and goat. The disease belongs to the group of infectious spongiform encephalopathy (TSEs), together with large Bovine Spongiform encephalopathy (BSE) in cattle and Creutzfeldt-Jakob disease (CJD) in humans (Papasavva-Stylianou et al., 2011). Scrapie disease was first reported in England in 1732, and in 1938 it spread from England to Canada (Anonymous, 2006a).

The TSEs are characterized by the accumulation of the pathological protease-resistant isoform (PrP Sc) of the host-encoded cellular prion protein (PrP C) in the central nervous system of essentially affected entities (Oesch et al., 1985). Abnormal protein can also accumulate in the lymphocytic system and other tissues or body fluids (Bucalossi et al., 2011). Several biochemical tests have been approved for differentiation between BSE and Scrapie, and immunohistochemical procedures have been performed for lymphoid tissue and central nervous system with the same purpose (Corbière et al., 2013, Acutis et al., 2012).

Genetic Resistant to Scrapie Disease

Sheep

PCR and sequence sequencing methods are used to detect the PrP gene. In sheep, various polymorphisms of the PrP gene are associated with differences in phenotypic expression of prion diseases such as

incubation period, pathology and clinical manifestations. Although more than 30 polymorphisms have been identified, only a few of them are closely related to resistance or susceptibility to classical Scrapie (Belt et al., 1995). Three PrP polymorphisms have a particularly strong connection with both natural and experimental formation. These are codon 136 valine (V) or alanine (A), 154 histidine (H) or arginine (R) and codon 171 arginine (R) or glutamine (Q). Of these polymorphisms, only five of the 12 alleles formed are common. These are: a 136 R 154 R 171 (here after ARR), ARQ, VRQ, AHQ and ARH (Belt et al., 1995). ARR allele is associated with resistance and VRQ is associated with susceptibility (Belt et al., 1995). The sensitivity of the ARQ / ARQ genotype is more complex and varies by sheep type. This is the most common genetic type in the Suffolk sheep (Hunter et al., , 1997). In the UK, sheep with the VRQ allele are known to almost guarantee that any sheep with the homozygous genotype (VRQ / VRQ) will develop the Scrapie disease. The main alerter identified by these three codons, ARR <AHQ <ARQ ≈ ARH <VRQ such as increased risk. Recently, an Atypical Scrapie (AS) form has been identified and challenged such programs; because animals that are genetically resistant to Classical Scrapie (CS) have been affected (Fediaevsky et al., 2010). In the United Kingdom in 2001, the National Scrapie Plan (NSP) was launched to help sheep breeding to reduce the frequency of sensitive genotypes. In NPU Cheviot run with endemic Natural Scrapie, 100% of VRQ / VRQ animals succumb to Scrapie in about 2 years old (Hunter, 1996). In animals with the VRQ / VRQ gene the incubation time of the disease is 150 days, with VRQ / ARQ genes having 256 days and VRQ / ARR 259 days ((Hunter, 2007).

Goat

PrP amino acid polymorphisms in codon 21 are described in goats; (V → A), 23 (L → P), 49 (G → S), 142 (I → M), 143 (H → R), 154 (R → H), 168 (P → Q), 220 (Q → H), 240 (S → P). 42 (a → g), 107 (g → a), 138 (c → t) and 207 (g → a) cords are silent mutations (Billinis et al., 2002). These nine alleles are an important data set for assessing the resistance levels to Scrapie for S127, M142, R143, D145, D146, S146, H154, Q211 and K222 goats. (Ricci et al., 2017). K222, D146 and S146 alleles which are resistant to the disease are used in the European goat population. K222 polymorphism confers resistance to Classical Scrapie isolates on many Scrapie strains. However, there is no conclusive evidence that K222 carriers will be resistant to all TSE strains present in the EU goat population (Ricci et al., 2017).

Eradication Program Implemented in Countries

Monitoring Program in Europe

In 1987, 442 animals that are infected with Scrapie were reported in England. In 1992, the number of animals that are infected with Scrapie was reported as 37,301. This number was reported as 1,123 in 2002 and 610 animals in 2013. After 2013, there were no reports of animals infected with Scrapie. In Ireland, 15 animals were reported in 1990. In 2002, a total of 334 animals were reported and this year the disease peaked. Scrapie disease in France was first reported in 1993. In 2002, 240 patients were reported. The first case was reported in Germany in 1991. The number of animals reported in 2002 was 7, while in 2001, 125 animals were reported. (EFSA,2016).The first case of Scrapie in Spain was reported in 1987, and in 2001 it was observed that the number of infected animals has been increased (Acin et al., 2004). Spain has started to work on the genotypic characterization of various races in this sense and to develop different strategies for each race and to prepare the laws governing these programs (Ugarte et al., 2004). The first case of Scrapie in Greece was settled in the north of the country in 1986 and the second case was diagnosed in 1997, the second case was diagnosed after 11 years. The second case was seen near the region where the first case was seen. This is evidence that the implemented eradication program is inadequate (Leontides et al., 2000). In 2001, there were 18 cases reported in Greece. According to the eradication program in Greece, the herds with the disease were massacred (Billinis et al., 2004). As a result of the breeding policies observed in Europe, the number of Scrapie

cases has decreased since 2009 (EU report, 2014).

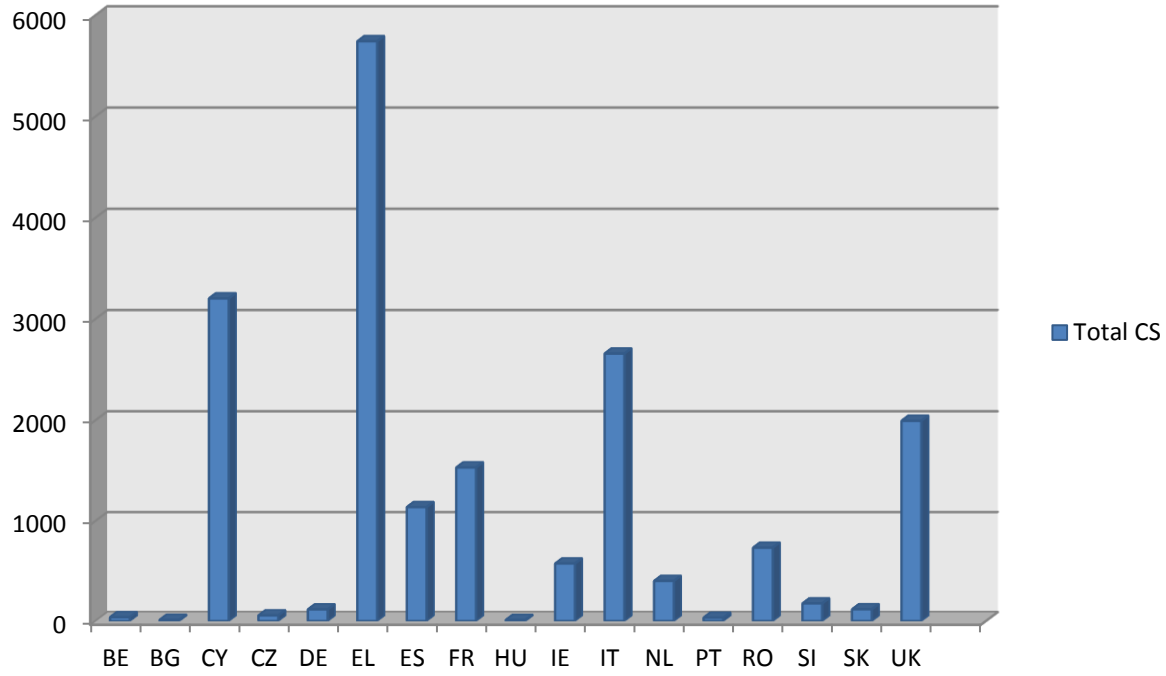


Figure 1. Number of Scrapie cases in European countries, (EFSA, 2017)

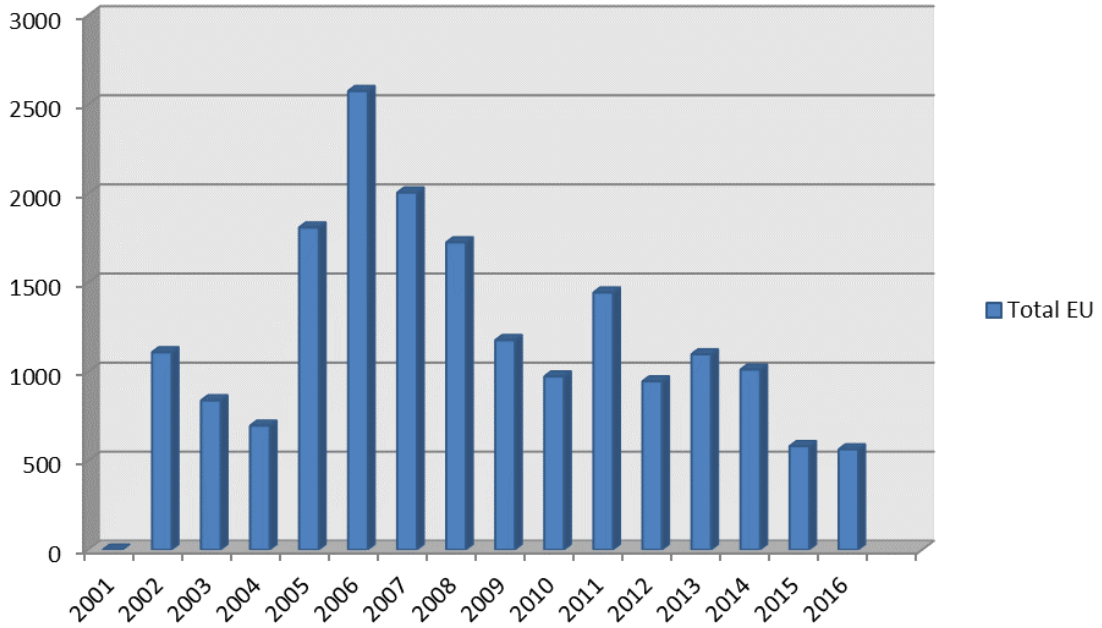


Figure 2. Total number of Classical Scrapie cases in sheep by country and year between 2001 and 2016 in the EU and other reporting countries, (EFSA, 2017)

Table 1. Europe eradication program

TSE suspect animals	Ovine	Caprine
Surveillance in holdings under TSE control and eradication measures (EM)	Different options of flock management are provided.	Different options of flock management are provided.
When BSE cannot be excluded	All animals > 18 months killed for destruction shall be tested for TSE.	All animals > 18 months killed for destruction shall be tested for TSE.
When herd have not TSE and atypical Scrapie	Option 1: Killing and complete destruction or slaughter for human consumption (SHC) of all animals. Animals > 18 months killed for destruction: a sample tested for TSE based on the actual number of animals killed. If derogations are applied: all animals > 18 months SHC shall be tested for the presence of TSE. Option 2: Killing and complete destruction of the susceptible animals only. Animals of selected genotypes killed for destruction > 18 months: a sample tested for TSE based on the actual number of animals killed. If derogations are applied: all animals > 18 months SHC shall be tested for the presence of TSE. Option 3: No mandatory killing and complete destruction of animals.	Option 1: Killing and complete destruction or SHC of all animals. Animals > 18 months killed for destruction: a sample tested for TSE based on the actual number of animals killed. If derogations are applied: all animals > 18 months SHC shall be tested for the presence of TSE. Option 3: No mandatory killing and complete destruction of animals.
Surveillance in ovine and caprine animals slaughtered for human consumption (SHC)		
Annual survey	Minimum sample size of animals > 18 months of age, if the population of ewes and ewe lambs put to the ram is >750,000: 10,000	Minimum annual sample size of animals > 18 months of age, if the population of goats that have already kidded and goats mated is > 750,000: 10,000
When herd have not TSE and atypical Scrapie	After application of Option 2 and during a period of 2 years of TSE intensified monitoring: animals (except ARR/ARR) which were kept in the holding at the time when the TSE case was confirmed and which have been slaughtered for human consumption shall be tested for the presence of TSE. After application of Option 3 or derogations (point 2.2.2 b ii and iii) of option 2 and during a period of 2 years of TSE intensified monitoring: all animals > 18 months (except ARR/ARR) which have been slaughtered for human consumption must be tested for the presence of TSE.	After application of Option 3 and during a period of 2 years of TSE intensified testing of all animals > 18 months which have been slaughtered for human consumption.
When atypical Scrapie is confirmed	During a period of 2 years of TSE intensified testing of all ovine animals > 18 months and slaughtered for human consumption.	After application of Option 3 and during a period of 2 years of TSE intensified testing of all animals > 18 months which have been slaughtered for human consumption.
Surveillance in ovine and caprine animals not slaughtered for human consumption (NSHC)		
Annual survey	Minimum sample size of dead ovine animals > 18 months of age, if the population of ewes and ewe lambs put to the ram is: > 750,000: 10,000 100,000–750,000: 1,500 40,000–100,000: 100% up to 500 < 40,000: 100% up to 100	Minimum sample size of dead caprine animals > 18 months of age, if the population of goats that have already kidded and goats mated is: > 750,000: 10,000 250,000–750,000: 1,500 40,000–250,000: 100% up to 500 < 40,000: 100% up to 100
When BSE and atypical Scrapie can be excluded	In the case of an infected flock where either option 1, 2, 3 or derogations (point 2.2.2 b ii and iii) has been applied, during the 2-year period of TSE intensified monitoring: all animals (except ARR animals) > 18 months which have died or been killed on the holding but which were not killed in the framework of a disease eradication campaign shall be tested for the presence of TSE.	In the case of an infected flock where either option 1 or 3 has been applied, during the 2-year period of TSE intensified monitoring: all animals > 18 months which have died or been killed on the holding but which were not killed in the framework of a disease eradication campaign shall be tested for the presence of TSE.
When atypical Scrapie is confirmed	During a period of 2 years of TSE intensified monitoring, all ovine animals > 18 months which have died or been killed on the holding.	During a period of 2 years of TSE intensified monitoring, all caprine animals > 18 months which have died or been killed on the holding.

PrP Gene Polymorphism and Eradication Program in Turkey and Cyprus

Turkey

A very high ARR / ARR genotype was observed in the Chios sheep while an important VRQ subspecies were found in the Imroz sheep in Turkey. The ARR / ARQ genotype was the most common genotype are found in Gökçeada breed and Chios breed whereas the ARQ / ARQ genotype was the highest is in Kıvırcık breed. ARQ / ARQ genotypes are in Gökçeada and Chios breeds and ARR / ARQ genotypes are found in Kıvırcık breed(Oner et al., 2011). Native breeds in Turkey (Kıvırcık, Chios and Imroz) were determined eight different polymorphism. Most of the different polymorphisms were observed in Kıvırcık sheep breeds (Un et al., 2008). The findings also support the opinion that the predominant allele of the native breeds of ARQ allele Turkey (Bulut et al., 2014).

The most durable Turkish goat race can be Damascus. The dominant proportion of the resistant PrP variants of the Damascus herds was found, while others such as the Imroz and Maltese breeds were not goat in this category. The non-native Saanen breed is cultivated in the southern part of Turkey, with seven kinds of species have emerged as the most variable species and hybridization with native breeds may be advantageous from the perspective Scrapie (Meydan et al., 2017).

Cyprus

1019 Scrapie epidemics have been diagnosed in Southern Cyprus since 1985. It has been reported that the majority of outbreaks are sheep and goats in mixed herds. There was a sudden increase in the number of outbreaks in 2002, 2003, 2004 and 2005 and the breeding program started in 2004 As a result of the breeding program applied to all herds that raised sheep, the resistance in the sheep have been observing to increase. In 2009, the implementation of a breeding program for Scrapie in the Cypriot goat was initiated (EU report, 2014). From 2009 to 2014 there are 722 Scrapie infected flocks were operating. These surveys represent 22.6% of total active sheep and goat farming. These numbers have been constantly changing because the old outbreaks have been closing and new outbreaks have added to the known infected herds (EU report,2014). The project for struggling with Scrapie in Cyprus has been successfully implemented in Agricultural Research Institute (ARI) with the use of genetic methods breeding in Chios sheep. There was Chios sheep unit in Athalassa where is natural park in Nicosia in South Cyprus. That herd has been transformed into a nucleus herd of Scrapie resistant genotypes. All the sheep in the herds has ARR/ARR genotypes which are considered to be 100% resistant to the disease. That sheep has been breeding in Athalassa Park and delivered to the farmers. At the end of both lambing season in a year, a large number of young rams and more females are given to the farmers to increase the genetic density and productivity of their herds and to increase the frequency of resistant genotypes in the population of Cypriot sheep. Over the last 15 years, more than 4,700 Scrapie-resistant sheep have been given to farmers for growth and milk production.

In mid-2008, a research program was launched to transform the Cyprus Damascus goat breed into 300 adapt-universal-resistant genotyping nuclei, through targeted mapping. This program allows ARI to give increasing number of animals to farmers. These animals have superior genetic stigma and are also considered to be resistant to the disease. In this context, ARI has contributed decisively to the national struggle against Scrapie in the Cypriot population (Republic Of Cyprus Agricultural Research Institute ,2018).

Evidence from Scrapie control studies of goats in Cyprus suggests that the S146 and D146 alleles protect against Scrapie (Papasavva-Stylianou et al, 2007) Animals that have been seized since 2009; animals with suspicious clinical indications consist of animals that were not slaughter off for human consumption due to the PrP genotype or age. As a result of the application of the breeding program for durability in sheep, the number of animals has been constantly decreasing. On the contrary, the number of seized goats has been increasing. Ram not having an ARR / ARR alleline under the breeding program in sheep are not used as studs. Ram who do

not have ARR alleles are either dealt with or culled (FAO,2013).The that kind of breeding program of Cyprus is unique for eradication program among to the EU countries.

There is still no official eradication program in Northern Cyprus but eradication program applied in 2003 and approximately 3000 sheep had killed and paid compensation to the farmers. After that this couldn't be sustainable because of the economical difficulties (Anonymous, 2018). The farmers where lives in Northern Cyprus have bought ram which has ARR/ARR genotypes from the farmers of Southern Cyprus as unofficial (Anonymous, 2017). Depending on this issue, the incidence of Scrapie disease is decreasing in Northern Cyprus. (Anonymous, 2017).

The project which was genetic identification of TRNC sheep breeds in terms of resistance to Scrapie disease had carried out in sheep and goats in Northern Cyprus with Turkey Food and Agriculture Ministry of Livestock and TRNC Food and Agriculture Ministry of Livestock. In accordance with the project results, 16 % very resistant ARR / ARR, 21% resistant single allele ARR genotype and 62% partially resistant genotype were found in the risk group (TAGEM, 2012). Allele frequencies in PrP and PrP gene in sheep were given in Table 2, 3 between sheep breeds in Northern Cyprus.

Table 2. Allele frequencies in PrP 136,154 and 171 codons associated with Scrapie disease in TRNC sheep

Gene	Hybrid (n:50)		Awassi (n:50)		Chios (n: 49)	
	Allel number	%	Allele number	%	Allele number	%
ARR	10	10	32	32,65	5	5
ARQ	72	72	62	63,26	69	69
ARH	18	18	4	4,08	22	22
AHQ	-	-	-	-	-	-
VRQ	-	-	-	-	2	2

n: sample number (TAGEM,2012).

Table 3. PrP gene in sheep breeds of TRNC

Risk Group	Genotype	Hybrid (n:50)		Chios (n: 49)		Awassi (n:50)		Total	
		n	%	n	%	n	%	n	%
R1	ARR/ARR	1	2	5	10.20	-	-	6	4.02
R2	ARR/AHQ	-	-	-	-	-	-	-	-
	ARR/ARH	2	4	2	4.08	2	4	6	4.02
	ARR/ARQ	6	12	20	40.81	3	6	29	19.46
R3	AHQ/AHQ	-	-	-	-	-	-	-	-
	AHQ/ARH	-	-	-	-	-	-	-	-
	AHQ/ARQ	-	-	-	-	-	-	-	-
	ARH/ARH	1	0.5	-	-	3	6	4	2.68
	ARH/ARQ	14	-	2	4.08	13	26	29	19.49
	ARQ/ARQ	26	-	20	40.81	27	54	73	-
R4	ARR/VRQ	-	-	-	-	-	-	-	-
R5	VRQ/ARH	-	-	-	-	1	2	1	0.67
	VRQ/AHQ	-	-	-	-	-	-	-	-
	VRQ/ARQ	-	-	-	-	1	2	1	0.67
	VRQ/VRQ	-	-	-	-	-	-	-	

R1: The most resistant sheep to Scrapie, R 2: Genetically resistant to Scrapie but careful selection should be made if it is used in the rearing, R 3: Genetically less resistant to Scrapie R 4: Genetically sensitive to Scrapie, R 5: Genetically sensitive to Scrapie (TAGEM,2012).

REFERENCES

Acin, C., Martin-Burriel, I., Goldmann, W., Lyahyai, J., Monzin, M., Bolea, R., Zaragoza, P. (2004). Prion protein gene polymorphisms in healthy and scrapie-affected Spanish sheep. *Journal of General Virology*. https://doi.org/10.1099/vir.0.80047-0

Acutis, P. L., Martucci, F., D'Angelo, A., Peletto, S., Colussi, S., Maurella, C., Lombardi, G. (2012). Resistance to classical scrapie in experimentally challenged goats carrying mutation K222 of the prion protein gene. *Veterinary*

Research. https://doi.org/10.1186/1297-9716-43-8.

Anonymous, (2006a.) Scrapie info. Alberta Sheep&Wool Commission,(Canada). http://www.absheep.com/scrapie.htm

Anonymous, (2017), Scrapie info Arsoy, interview to the farmers

Anonymous,(2018). Interview to the TRNC Veterinary Office

Belt, P. B. G. M., Muileman, I. H., Schreuder, B. E. C., Bos-de Ruijter, J., Gielkens, A. L. J., & Smits, M. A. (1995). Identification of five allelic variants of the sheep PrP gene and their association with natural scrapie. *Journal of General Virology*. https://doi.org/10.1099/0022-1317-76-3-509.

Billinis, C., Panagiotidis, C. H., Psychas, V., Argyroudis, S., Nicolaou, A., Leontides, S., … Sklaviadis, T. (2002). Prion protein gene polymorphisms in natural goat scrapie. *Journal of General Virology*, *83*(3), 713–721. https://doi.org/10.1099/0022-1317-83-3-713

Billinis, C., Psychas, V., Leontides, L., Spyrou, V., Argyroudis, S., Vlemmas, I., … Papadopoulos, O. (2004). Prion protein gene polymorphisms in healthy and scrapie-affected sheep in Greece. *Journal of General Virology*. https://doi.org/10.1099/vir.0.19520-0

Bucalossi, C., Cosseddu, G., D'Agostino, C., Di Bari, M. A., Chiappini, B., Conte, M., … Vaccari, G. (2011). Assessment of the Genetic Susceptibility of Sheep to Scrapie by Protein Misfolding Cyclic Amplification and Comparison with Experimental Scrapie Transmission Studies. *Journal of Virology*. https://doi.org/10.1128/JVI.00241-11

Bulut, Z., Nizamlıoğlu, M., & Kurar, E. (2014). Investigation of PrP locus polymorphisms in some native Turkish sheep breeds. *Eurasian Journal of Veterinary Sciences*, *30*(3), 145–145. https://doi.org/10.15312/EurasianJVetSci.201436514

Corbière, F., Perrin-Chauvineau, C., Lacroux, C., Costes, P., Thomas, M., Brémaud, I., … Andreoletti, O. (2013). PrP-associated resistance to scrapie in five highly infected goat herds. *Journal of General Virology*. https://doi.org/10.1099/vir.0.047225-0

EFSA,2016. The European Union summary report on data of the surveillance of ruminants for the presence of transmissible spongiform encephalopathies (TSEs)

EFSA, (2017). The European Union summary report on surveillance for the presence of transmissible spongiform encephalopathies (TSE) in 2016.

EU report, (2014). Transmissible Spongiform Encephalopathies (TSEs)

FAO,(2013). http://www.fao.org/3/i4787e/i4787e78.pdf

Fediaevsky, A., Calavas, D., Gasqui, P., Moazami-Goudarzi, K., Laurent, P., Arsac, J. N., … Moreno, C. (2010). Quantitative estimation of genetic risk for atypical scrapie in French sheep and potential consequences of the current breeding programme for resistance to scrapie on the risk of atypical scrapie. *Genetics Selection Evolution*. https://doi.org/10.1186/1297-9686-42-14

Hunter, N. (1996). Natural scrapie in a closed flock of Cheviot sheep occurs only in specific PrP genotypes. *Archives of Virology*. https://doi.org/10.1007/BF01718157

Hunter, N. (2007). Scrapie: uncertainties, biology and molecular approaches. *Biochimica et Biophysica Acta*. https://doi.org/10.1016/j.bbadis.2007.04.007

Hunter, N., Moore, L., Hosie, B. D., Dingwall, W. S., & Greig, A. (1997). Association between natural scrapie and PrP genotype in a flock of Suffolk sheep in Scotland. *Veterinary Record*. https://doi.org/10.1136/vr.140.3.59

Leontides, S., Psychas, V., Argyroudis, S., Giannati-Stefanou, A., Paschaleri-Papadopoulou, E., Manousis, T., & Sklaviadis, T. (2000). A survey of more than 11 years of neurologic diseases of ruminants with special reference to transmissible spongiform encephalopathies (TSEs) in Greece. *Journal of Veterinary Medicine, Series B*. https://doi.org/10.1046/j.1439-0450.2000.00348.x

Meydan, H., Pehlivan, E., Özkan, M. M., Yildiz, M. A., & Goldmann, W. (2017). Prion protein gene polymorphisms in Turkish native goat breeds. *Journal of Genetics*, *96*(2). https://doi.org/10.1007/s12041-017-0763-1

Oesch, B., Westaway, D., Wälchli, M., McKinley, M. P., Kent, S. B. H., Aebersold, R., … Weissmann, C. (1985). A cellular gene encodes scrapie PrP 27-30 protein. *Cell*. https://doi.org/10.1016/0092-8674(85)90333-2

Oner, Y., Yesilbag, K., Tuncel, E., & Elmaci, C. (2011). Prion protein gene (PrP) polymorphisms in healthy sheep in Turkey. *Animal*. https://doi.org/10.1017/S1751731111000942

Papasavva-Stylianou, P., Kleanthous, M., Toumazos, P., Mavrikiou, P., & Loucaides, P. (2007). Novel polymorphisms at codons 146 and 151 in the prion protein gene of Cyprus goats, and their association with natural scrapie. *Veterinary Journal*, *173*(2), 459–462. https://doi.org/10.1016/j.tvjl.2005.09.013

Papasavva-Stylianou, P., Windl, O., Saunders, G., Mavrikiou, P., Toumazos, P., & Kakoyiannis, C. (2011). PrP gene polymorphisms in Cyprus goats and their association with resistance or susceptibility to natural scrapie. *Veterinary Journal*. https://doi.org/10.1016/j.tvjl.2009.10.015

Republic Of Cyprus Agricultural Research Institute http://www.moa.gov.cy/moa/ari/ari.nsf/page24_en/page24_en?OpenDocument

Ricci, A., Allende, A., Bolton, D., Chemaly, M., Davies, R., Fernández Escámez, P. S., … Snary, E. (2017). Genetic resistance to transmissible spongiform encephalopathies (TSE) in goats. *EFSA Journal*, *15*(8). https://doi.org/10.2903/j.efsa.2017.4962

TAGEM, (2012). Genetic identification in TRNC sheep breeds in terms of resistance to scrapie disease

Ugarte E, Gabıña D., (2004). Recent developments in dairy sheep breeding, *Arch Tierz Dummerstorf*, 47(Special Issue), 10-17

Un, C., Oztabak, K., Ozdemir, N., Akis, I., & Mengi, A. (2008). Genotyping of PrP gene in native Turkish sheep breeds. *Small Ruminant Research*, *74*(1–3), 260–264. https://doi.org/10.1016/j.smallrumres.2007.06.002.

GENETIC EVALUATION OF REPRODUCTIVE TRAITS IN TEDDY GOATS

Zulfıqar Hussan KUTHU[1]

[1] Faculty of Veterinary & Animal Sciences, University of The Poonch Rawalakot Azad Kashmir, PAKISTAN

Corresponding author e-mail: zulfiqarkuthu@upr.edu.pk

Abstract

Data available on 20455 kidding and performance records of 5545 Teddy goats and progeny of 406 sires maintained as separate flocks at three different locations Livestock Experiment Stations Rakh Ghulaman, Rakh Khariewala and Chak Katora (1971-2008) Punjab, Pakistan were analyzed for documenting reproductive traits and genetic sources which influence these traits. The data was analyzed using the GLM procedure (General Linear Models) of the Statistical Analysis Systems (SAS, 2004) to study the various reproductive traits. The genetic parameter estimation was done using REML procedure fitting an Individual Animal Model. The Least squares means for age at first service, age at first kidding, weight at first service, weight at first kidding, services per conception, service period, kidding interval, were 245.65±0.73 days, 14.07±0.01 kg, 394.14±0.76 days, 18.06±0 kg, 1.24±0.004, 153.58±0.73 days, 327.53±1.12 days, respectively. The percentage of single births was 43 percent, while multiple births were 57 percent. The sex ratio was 51:49 males and females. The heritability estimates for age at first service, weight at first service, age at first kidding, weight at first kidding, services per conception, service period and kidding interval were 0.19±0.22, 0.21±0.01, 0.19±0.04, 0.20±0.04, 0.07±0.01, 0.06±0.05 and 0.05±0.03, respectively. The repeatability estimates for services per conception, service period and kidding interval were 0.02±0.05, 0.01±0.04 and 0.05±0.03, respectively. It is envisaged from the present study that over the 34 years period selection remained ineffective to bring the desired changes and it will remain so if random use of breeding animals is practiced. The possible use of ineffective selection could be unavailability of efficient techniques for the evaluation of animals and incorrect performance recording etc. It is therefore, necessary to correct all these discrepancies by taking corrective measures as discussed above.

Key words: *Teddy goats, genetic evaluation, genetic traits, Pakistan*

THE RELATIONSHIP BETWEEN MUSCLE METRIC MEASUREMENTS AND MUSCLE FIBERS NUMBERS OF LONGISSIMUS-DORSI AND SEMITENDINOSUS MUSCLES IN HAIR, ANGORA, HONAMLI AND KILIS KIDS

Ugur SEN[1], Emre SIRIN[2]

[1]Ondokuz Mayis University, Faculty of Agriculture, Department of Agricultural Biotechnology, 55139, Samsun, TURKEY
[2]Ahi Evran University, Faculty of Agriculture, Department of Agricultural Biotechnology, 40100 Kirsehir, TURKEY

Corresponding author e-mail: ugur.sen@omu.edu.tr

Abstract

This study was conducted to determine the relationship between muscle metric measurements and muscle fibers numbers in Longissimus dorsi (LD) and Semitendinosus (ST) muscles from kids of some Turkish native goat breeds. A total of 24 male kids were used as experimental pure breed goat of Hair (n = 6), Angora (n = 6), Kilis (n = 6) and Honamli (n = 6) breeds. All kids were slaughtered at 3 m of weaning age. Following slaughtered, a cross section from the mid-belly of the LD and ST muscles was taken on a paper for determination of muscle depth, length and cross-sectional area. After than LD and ST muscle samples were collected for determination of type I, IIA and IIB muscle fibers composition. Muscle cross-sectional area was determined by a direct grid reading and measurement of muscle depth and length was determined by digital caliper. Muscle fiber compositions were determined using myosin ATPase staining at pH 4.2. There were positive correlations between total muscle fiber number and muscle length (r = .869; P < 0.05) in LD muscle of Kilis kids and type I muscle fiber number and muscle length (r = .856; P < 0.05) in LD muscle of Angora kids. Positive correlations between type IIA muscle fiber number and muscle length (r = .886; P < 0.05) and total muscle fiber number and muscle length (r = .825; P < 0.05) were calculated in LD muscle of Hair kids. There were negative type I (r = -.750; P < 0.05) and type IIA (r = -.748; P < 0.05) muscle fiber number and muscle depth in ST muscle of Kilis kids. A negative correlations between type I muscle fiber number and muscle length (r = -.763; P < 0.05) was calculated in ST muscle of Honamli kids. In conclusion, muscle fibers composition is affected by metric measurements of muscle mass in kids of Turkish native goat breeds.

Key words: *Turkish native goat, kids, muscle fiber type, metric measurements, correlation*

INTRODUCTION

The skeletal muscle tissue characteristics such as muscle fiber types, metabolic and contractile features influence amount of muscle mass and meat quality (Joo et al., 2013). Moreover, type, number and diameter of muscle fibers have important effects on quality of the produced meat (Sen et al., 2016; Sirin et al., 2017). In addition, muscle fiber composition of the skeletal muscle tissue is one of the intrinsic properties of muscle and this has impact on eating quality characteristics of meat such as colour, odor, flavor, juiciness, tenderness, and texture (Büngera et al., 2009). Characteristics of skeletal muscle tissue may vary depending on various factors such as breed (Ryu et al., 2008), sex (Ozawa et al., 2000), and muscle location (Hwang et al., 2010).

Determination of muscle depths of longissimus dorsi (LD) and semitendinosus (ST) skeletal muscles is a method used to estimate the amount of meat on the carcass (Aksoy et al., 2016). The depths of the skeletal muscles of Longissimus dorsi (LD) and Semitendinosus (ST) on various livestock carcasses can be determined by various methods, so that the amount of meat the carcasses possess can be estimated in some countries, where animal husbandry has developed (Aksoy et al., 2016).

Turkey have about 11 million heads of goats with it is ranked first among European countries and twenty second place among World countries (TurkStat 2017). The majority of the goats population

in Turkey constitutes Hair, Angora, Kilis and Honamli native breeds (Atay et al., 2011). Goat or kid meat is one of the sources of red meat production in Turkey. However, almost all of the farmer in Turkey use the extensive husbandry system, so there is very limited information about fattening potential of the Turkish native goat breeds. Determination of muscle fiber traits and relationship with its muscle metric measurements in Turkish native goats breeds can help to determine the possible fattening potentially of kids born to Turkish native goats breeds. However, there are no information, to our knowledge, on relationship between metric measurements of skeletal muscle and muscle fiber composition and number, which may effect on muscling, growth, and fatness in muscles and economic importance in sheep industry.

This study was, therefore, conducted to determine the relationship between muscle metric measurements and muscle fibers numbers in Longissimus dorsi (LD) and Semitendinosus (ST) muscles from kids of Hair, Angora, Kilis and Honamli Turkish native goat breeds.

MATERIALS AND METHODS

A total of 24 kid were used as experimental pure breed animals of Hair (n = 6), Kilis (n = 6), Angora (n = 6) and Honamli (n = 6) breeds. All animals were provided from the national sheep and goat breeding project in Tokat (Hair), Kilis (Kilis), Ankara (Angora) and Antalya (Homanlı) provinces of Turkey. All kids were slaughtered at 3 m of weaning age. Following slaughtered, a cross section from the mid-belly of the LD and ST muscles was taken on a paper for determination of muscle depth, length and cross-sectional area. After than LD and ST muscle samples were collected for determination of type I, IIA and IIB muscle fibers composition. Muscle cross-sectional area was determined by a direct grid reading and measurement of muscle depth and length was determined by digital caliper. Type I, IIA and IIB muscle fibers composition in LD and ST muscles were determined using ATPase staining at pH 4.2 defined by Broke and Keiser (1970) and Sen et al. (2016). Muscle fibers were scanned using a microscope at × 200 magnification with a digital camera (Nikon Eclipse E600, Nikon Corporation, Tokyo, Japan) linked to image analysis software (Laica Q Win V3.4 Processing-Analysis Software).

The relationships between the between muscle metric measurements and muscle fibers numbers were determined with a Pearson correlation analysis at the 95% confidence interval.

RESULTS AND DISCUSSION

Pearson correlation coefficients between muscle fiber types and muscle metric measurements of Hair, Angora, Kilis and Honamli male kids is presented in Table 1. There were positive correlations between total muscle fiber number and muscle length ($r = .869$; $P < 0.05$) in LD muscle of Kilis kids and type I muscle fiber number and muscle length ($r = .856$; $P < 0.05$) in LD muscle of Angora kids. Positive correlations between type IIA muscle fiber number and muscle length ($r = .886$; $P < 0.05$) and total muscle fiber number and muscle length ($r = .825$; $P < 0.05$) were calculated in LD muscle of Hair kids. There were negative type I ($r = -.750$; $P < 0.05$) and type IIA ($r = -.748$; $P < 0.05$) muscle fiber number and muscle depth in ST muscle of Kilis kids. A negative correlations between type I muscle fiber number and muscle length ($r = -.763$; $P < 0.05$) was calculated in ST muscle of Honamli kids. There were no significant correlation coefficients for muscle depth and type I muscle fiber number, muscle area and type I muscle fiber number, muscle length and type IIA muscle fiber number, all muscle metric measurements and type IIB muscle fiber number in LD muscle in any breeds. Similarly, there were no significant correlation coefficients for muscle area and type I muscle fiber number, muscle area and type IIA muscle fiber number, all muscle metric measurements and type IIB muscle fiber number, all muscle metric measurements and total muscle fibers number in ST muscle in any breeds.

Greenwood et al. (2006) demonstrate that genetic selection formuscling in lambs based on post-weaning eye muscle depth results in differing cellular responses in different muscles.

Joo et al. (2013) reported that traits of muscle fibers such a stotal number of fibers, muscle fiber diameter and composition of muscle fiber types are related with meat quality. LD muscle metric measurements such as fat depth and muscle depthson carcass are vital traits in the sheep industry; therefore, most selection programs include these trait sand scientists and farmers try to improve them. In the present study, metric measurements of both LD both ST muscle from kids born to Hair, Kilis, Angora and Honamli goat breeds had relations at a high level muscle fiber type number.

Table 1. Pearson correlation coefficients between muscle fiber types and muscle metric measurements of Hair, Angora, Kilis and Honamli male kids.

	Fiber Type	Muscle Depth	Muscle Length	Muscle Area
LD muscle	Type I		0,856 (Angora)	
	Type IIA	0,886 (Hair)		0,886 (Hair)
	Type IIB			
	Total	0,825 (Hair)	0,869 (Kilis)	0,825 (Hair)
ST muscle	Type I	-0,750 (Kilis)	-0,763 (Honamlı)	
	TypeIIA	-0,748 (Kilis)	0,703 (Kilis)	
	Type IIB			
	Total			

LD=Longissimus dorsi, ST=Semitendinosus

The results of present study indicated that muscle fibers composition is affected by metric measurements of muscle mass in kids from Hair, Kilis, Angora and Honamli Turkish native goat breeds.

REFERENCES

Aksoy Y, Ulutas Z, Sen U, Sirin E, Sahin A. 2016. Estimates of genetic parameters for different body weights and muscle and fat depths of Karayaka lambs. Turk J Vet Anim Sci, 40: 13-20.

Atay O, Gökdal Ö, Konyalı A, Keskin M. 2011. Türkiye'de Yetiştirilen Keçi Genotipleri. Tarım Günlüğü (Agricultural Agenda), 1(3): 103-109.

Broke MM, Keiser K. 1970. Muscle fiber type; How many and what kind. Arch Neurol, 23: 369–370.

Büngera L, Navajasa EA, Stevensonb L, Lambea NR, Maltinc CA, Simma G, Fisherd AV, Change KC. 2009. Muscle fibre characteristics of two contrasting sheep breeds: Scottish Blackface and Texel. Meat Sci, 81: 372–381

Greenwood PL, Gardner GE, Hegarty RS. 2006. Indices of cellular development in muscles of lambs are influenced by sireestimated breeding values and pastoral nutritional system. Australian JAgriRes, 57: 651–659.

Hwang YH, Kim GD, Jeong JY, Hur SJ, Joo ST. 2010. The relationship between muscle fiber characteristics and meat quality traits of highly marbled Hanwoo (Korean native cattle) steers. Meat Sci, 86: 456–461.

Joo ST, Kim GD, Hwang YH, Ryu YC. 2013. Control of fresh meat quality through manipulation of muscle fiber characteristics. Meat Sci, 95: 828–836.

Ozawa S, Mitsuhashi T, Mitsumoto M, Matsumoto S, Itoh N, Itagaki K. 2000. The characteristics of muscle fiber types of longissimus thoracis muscle and their influences on the quantity and quality of meat from Japanese Black steers. Meat Sci, 54: 65–70.

Ryu YC, Choi YM, Lee SH, Shin HG, Choe JH, Kim JM, Hong KC, Kim BC. 2008. Comparing the histochemical characteristics and meat quality traits of different pig breeds. Meat Sci, 80: 363–369.

Sen U, Sirin E, Aksoy Y, Ensoy U, Ulutas Z, Kuran M. 2016. The effect of maternal nutrition level during mid-gestation on post-natal muscle fiber composition and meat quality in lambs. Anim Prod Sci, 56: 834–843.

Sirin E, Aksoy Y, Ugurlu M, Cicek U, Onenc A, Ulutaş Z, Sen U, Kuran M. 2017. The relationship between muscle fiber characteristics and some meat quality parameters in Turkish native sheep breeds. Small Rum Res, 150: 46–51.

TurkStat (Turkish Statistical Institute), 2017. Livestock Statistics. http://www.turkstat.gov.tr (accessed March 04, 2018).

THE EFFECT OF ENVIRONMENTAL TEMPERATURES ON MATURATION OF ANATOLIAN BUFFALO OOCYTES

Ugur SEN[1], Mehmet KURAN[1]

[1]Department of Agricultural Biotechnology, Faculty of Agriculture, Ondokuz Mayis University, 55139 Samsun, TURKEY

Corresponding author e-mail: ugur.sen@omu.edu.tr

Abstract

The success rate of in vitro embryo production in buffaloes has been low. In routine in vitro oocyte maturation temperature is 38.5 – 39.0 °C. However thermal environment of the preovulatory follicles is ~2°C cooler than body temperature in bovine. The study was therefore designed to examine the effect of decreased ambient temperature during IVM on nuclear maturation of Anatolian Buffalo oocytes. Oocytes were classified as good (n=86) and moderate (n=122) quality based on cumulus cell layer thickness. Good and moderate quality oocytes were separately cultured in tissue culture medium-199 (TCM-199) supplemented with 10% FCS for 22 hours filled with a humidified 5% CO2 in air at either 36.5°C or 38.5 °C. Nuclear status of bovine oocytes in both groups was determined by nuclear staining. There were no significant differences between good quality oocytes matured at 36.5°C or 38.5°C incubation temperatures with regard to oocytes reached to metaphase II (M II) and other stages (MI and TI). However, good quality oocytes had higher ($p<0.05$) percentage of oocytes reached to M II stage compare to moderate quality oocytes at both incubation temperatures. In conclusion decreasing the IVM temperature (36.5 °C) did not have effect on nuclear maturation of Anatolian Buffalo oocytes.

Key words: *Anatolian buffaloes, oocyte, nuclear maturation, incubation temperatures*

INTRODUCTION

Emerging reproductive biotechnology has gained an enormous advancement in the recent years like in vitro embryo production. Although several decades of research have gone into in vitro embryo production culture conditions are yet to be standardized (Pfeifer et al., 2008). Because, in vitro condition still cannot exactly mimic natural or in vivo conditions (Şen and Kuran, 2018).

Several factors affect in vitro mammalian embryo production process such as media components (serum, hormones, and nutrient content), humidity, oxygen and carbon dioxide balance or culture temperature (Pfeifer et al., 2008).

Although in vitro embryo production biotechnology has application on buffaloes, the success rate in embryo production has been low (Ravindranatha et al., 2003). Success of in vitro embryo production depends on successful nuclear and cytoplasmic oocytes maturation (Şen and Kuran, 2018).

Previous studies reported that the temperature of the preovulatory follicles' environment in the ovary is 2 or 3 °C lower than the core body temperature in cattle or pig (Hunter, 2005; Leese et al., 2008).

However, conventional in vitro maturation technology for large ruminants oocyte such as cattle or buffaloes is maintained at 38.5 or 39 °C core body temperature (Leese et al., 2008; Sen and Kuran, 2018). It is understood here that conventional in vitro maturation culture temperature is higher for oocytes maturation compared to within the ovarian follicular environment in vivo.

The existence of follicular cooling raises the question of whether oocytes maturation is advantageous at lower temperatures (Leese et al., 2008). Perhaps reduced temperature may be required for successful oogenesis or oocyte maturation in vitro.

The objective of this study was, therefore, to investigate whether low incubation temperature (36.5 °C) that mimics the thermal environment of the preovulatory follicles in vitro oocytes maturation improve nuclear maturation of Anatolian Buffaloes oocytes.

MATERIALS AND METHODS

All chemicals and media used in this study were purchased from Sigma-Aldrich, Turkey. In the present study, ovaries of Anatolian Buffaloes were collected from a local slaughterhouse. Cumulus-oocyte complexes were recovered from follicles 2–8 mm in diameter by aspiration, using an eighteen-gauge needle fixed to ten ml syringe. After than cumulus-oocyte complexes were washed two times with Hepes-buffered medium-199. cumulus-oocyte complexwere assessed morphologically and only oocytes with compact, intact cumulus cells around and homogeneous cytoplasm were selected for maturation.

A total of 208 cumulus-oocyte complex were subjected to in vitro maturation. Cumulus-oocyte complexes were separately placed in 500 µl of maturation medium covered with 300-µl mineral oil in four-well dishes approximately thirty cumulus-oocyte complexes per well. Maturation medium was sodium bicarbonate-buffered Medium 199 supplemented with ten percentage (10%) heat-inactivated fetal bovine serum.

Cumulus-oocyte complexes were matured for 22 hours filled with humidified 5% CO_2 in air at 36.5 °C(low) or 38.5 °C(conventional) culture temperatures.

In the present study, Cumulus cell expansions of cumulus-oocyte complexes were evaluated at the end of maturation period under a stereomicroscope. Cumulus-oocyte complexes with fully expanded cumulus cell layer considered as maturated oocytes. Nuclear phases of the oocytes was determined using fluorescent bisbenzimide (Hoechst) DNA staining. Nuclear phases were examined under a fluorescence microscope with UV filter at four hundred time magnification and oocytes reached to M II stage considered as maturated oocytes.

Treatment effects (temperature) on maturation parameters of bovine oocytes were analyzed by chi-square (χ^2) test. Statistical analyzes were done by the SPSS 17.0 package program (SPSS, Chicago, IL, USA).

RESULTS AND DISCUSSION

The results of present study show that culture temperature during in vitro maturation had no effect on cumulus cell expansions of Anatolian Buffalo oocytes. Approximately, cumulus cell expansions of Anatolian Buffalo oocytes was 90 % in both temperatures (36.5 °C; low or 38.5 °C; conventional, Figure 1).

Similarly, there were no significant differences between good or moderate quality Anatolian Buffalo cumulus-oocyte complexes matured at low or conventional culture temperatures with regard to reached to metaphase II (M II) stages. However, oocytes quality had significant effect on percentage of oocytes reached to metaphase II (M II) stages at both incubation temperatures.

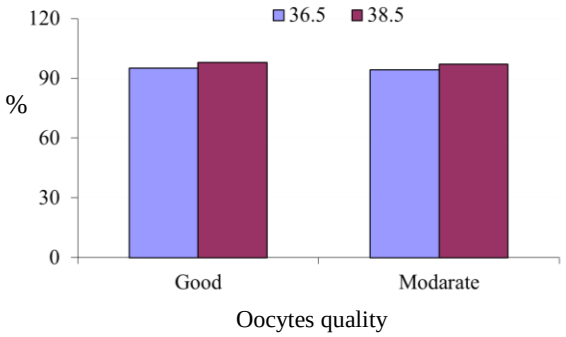


Figure 1. Percentage of Anatolian Buffalo oocytes cumulus cell expansions, matured in vitro at either 36.5 or 38.5 °C maturation temperatures.

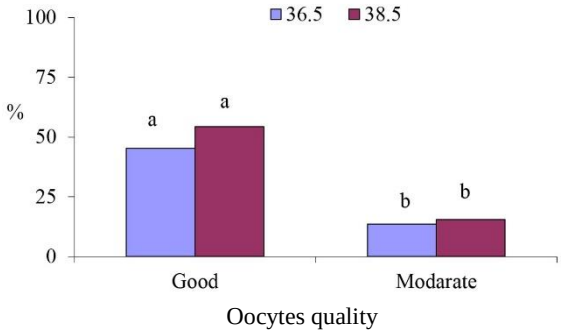


Figure 2. Percentage of Anatolian Buffalo oocytes reached to M II stage, matured in vitro at either 36.5 or 38.5 °C maturation temperatures.

In the present study an attempt was made to carry out IVM of Anatolian Buffalo oocytes at low temperature of 36.5 °C, which is considered to be the temperature of preovulatory follicles and at which

supposedly in vivo oocyte maturation occurs. The results for the Anatolian Buffalo oocytes showed that cumulus expansion rate and the proportion of oocytes reached to M II stage between the tested two maturation temperatures (36.5 °C or 38.5 °C) were similar. This suggests that low incubation temperature of 36.5°C during the maturation process does not alter the progress of Anatolian Buffalo oocytes. Similarly, previous studies have shown that low incubation temperature during IVM did not affect the rate of cumulus expansion (Lenz et al., 1983; Ravindranathaet al.,2003), first polar body formation (Lenz et al., 1983; Enget al.,1986; Ravindranathaet al.,2003) and proportion of oocytes that reached to M II stage (Shi et al.,1998; Lenz et al., 1983;Yeet al.,2007; Ravindranatha et al.,2003).

It has been suggested previously (Yeet al.,2007) that, lower follicular ambient temperature is advantageous to complete oocyte maturation or development, within the follicular microenvironment. However, our results for moderate quality Anatolian Buffalo oocytes have shown that low incubation temperature decreased the proportion of oocytes that reached to M II. These results suggest that lower temperatures do have negative impact on the maturation process, which in our study was not obvious in case of good quality Anatolian Buffalo oocytes but was present in the case of comparatively vulnerable moderate quality Anatolian Buffalo oocytes probably due to less cumulus cell layers which are known to assist in the nuclear maturation of mammalian oocytes (Maedomari et al.,2007).

The results of this study indicate that decreasing the in vitro maturation temperature (36.5 °C) did not have any effects on cumulus expansion and nuclear maturation of Anatolian Buffaloes oocytes. It was hypothesized that culture of buffaloes oocytes during in vitro maturation at a lower incubation temperature may provide a better thermal environment for the completion of nuclear and cytoplasmic maturation. Also, buffaloes oocyte maturation at a lower temperature may be useful to subsequent embryonic development. Further studies are required to determine the developmental competence of Anatolian Buffaloes oocytes matured at low temperature to the blastocyst stage in vitro.

REFERENCES

Eng LA, Kornegay ET, Huntington J, Wellman T. 1986. Effects of incubation temperature and bicarbonate on maturation of pig oocytes in vitro. J Reprod Fertil, 76: 657–662.

Hunter RHF. 2005. The Fallopian tubes in domestic mammals: how vital is their physiological activity? Reprod Nutr Dev, 45: 281–290.

Leese HJ, Baumann CG, Brison DR, McEvoy TG, Sturmey R.G. 2008. Metabolism of the viable mammalian embryo: quietness revisited. Molec Human Reprod, 14: 667–672.

Lenz RW, Ball GD, Leibfried ML, Ax RL, First NL. 1983. In vitro maturation and fertilization of bovine oocytes are temperature dependent processes. Biol Reprod, 29: 173–179.

Maedomari N, Kikuchi K, Ozawa M, Noguchi J, Kaneko H, Ohnuma K, Nakai M, Shino M, Nagai T, Kashiwazaki N. 2007. Cytoplasmic glutathione regulated by cumulus cells during porcine oocyte maturation affects fertilization and embryonic development in vitro. Theriogenology, 67: 983–993.

Pfeifer LFM, Schneider A, Correa MN. 2008. Factors that affect the in vitro production of bovine embryos: A review RevColomb Cienc Pecu, 21: 109–120.

Ravindranatha BM, Nandi S, Raghu HM, Reddy SM. 2003. In vitro maturation and fertilization of buffalo oocytes: effects of storage of ovaries, IVM temperatures, storage of processed sperm and fertilization media. Reprod Domest Anim, 38: 21–26.

Şen U, Kuran M. 2018. Low incubation temperature successfully supports the in vitro bovine oocyte maturation and subsequent development of embryos. Asian-Australas J Anim Sci, 31(6): 827-834.

Shi DS, Avery B, Greve T. 1998. Effects of temperature gradients on in vitro maturation of bovine oocytes. Theriogenology, 50: 667–674.

Ye J, Coleman J, Hunter MG, Craigon J, Campbell KH, Luck MR. 2007. Physiological temperature variants and culture media modify meiotic progression and developmental potential of pig oocytes in vitro. Reprod, 133: 877–886.

EFFECT OF SWEET CHESTNUT EXTRACT (FARMATAN®) ON GAS AND METHANE PRODUCTION OF ALFALFA HAY

Cagri Ozgur OZKAN[1], Adem KAMALAK[2]

[1]Kahramanmaras Sutcu Imam University, Goksun Vocational School, Organic Farming Department, Kahramanmaras, TURKEY
[2]Kahramanmaras Sutcu Imam University, Faculty of Agriculture. Department of Animal Science, Kahramanmaras, TURKEY

Corresponding author e-mail: cagri@ksu.edu.tr

Abstract

The aim of the current experiment was to determine the effect of sweet chestnut extract (Farmatan®, Tanin, Slovenia) on the gas and methane production of alfalfa hay. Sweet chestnut extract had a significant effect on the gas and methane production. Gas and methane production of alfalfa hay decreased in a dose dependent manner with increasing level of sweet chestnut extract. Gas production ranged from 33.56 to 41.76 ml. Methane production as ml ranged from 4.77 to 7.34 ml. The percentage of methane ranged from %14.22 to 17.57. Gas and methane productions of control group were significantly higher than the other treatment groups. The mean decrease in gas and methane production was 0.384 and 0.117 ml per unit Farmatan supplementation. Sweet chestnut extract had a significant effect on the gas and methane production. Gas and methane production of alfalfa hay decreased in a dose dependent manner with increasing level of sweet chestnut extract. However in the current experiment, the inclusion level of tannin is very high than the detrimental level of tannin to ruminant animals. Therefore the high level of tannin supplementation is not likely to be reasonable in the ruminant nutrition. The effect of sweet chestnut extract on ruminants should be tested before large implication.

Key words: *chesnutt tannin, gas production, methane, alfalfa*

INTRODUCTION

The methane production from ruminant animal has a considerable contribution to the global worming during the fermentation. It was also reported that during the ruminal fermentation 2- 12 % of dietary energy intake is lost as methane (Jonhson and Johnson 1995). Several studies showed that hidrolised and condensed tannin have anti-methanogenic activity, either by direct inhibiton of methagones or indirectly through inhibition of protozoa (Animut et al. 2008, Bhatta et al. 2009, Jayanegara et al. 2009). Recently *in vitro* gas production technique has been used to test the anti-methanogenic activity of some additives (Pellikaan et al. 2011, Hassanat and Benchar 2013). Therefore the aim of the current experiment was to determine the effect of sweet chestnut extract (Farmatan®, Tanin, Slovenia) on the gas and methane production of alfalfa hay using *in vitro* gas production technique.

MATERIALS AND METHODS

Alfalfa hay samples milled through a 1 mm sieve were incubated *in vitro* rumen fluid in calibrated glass syringes following the procedures of Menke and Steingass (1988). Rumen fluid was obtained from three fistulated sheep fed twice daily with a diet containing alfalfa hay (60%) and concentrate (40%). 0.200 gram dry weight of samples was weighed in triplicate into calibrated glass syringes of 100 mL. Chesnutt tannin (FARMATAN) was added on a dry matter basis as % 0, 5, 15, 20. Chesnutt tannin (FARMATAN) was obtained The syringes were prewarmed at 39 ^{o}C before the injection of 30 mL rumen fluid-buffer mixture into each syringe followed by incubation in a water bath at 39 ^{o}C for 24 h..The gas and methane production were detected from the syringes containing alfalfa and chestnut tannin samples to determine the net gas production at 24 h incubation. Net gas productions of alfalfa and chestnut tannin

samples were obtained after correction for blank and hay standard (University of Hohenheim, Germany). The methane contents of gas produced after 24 h incubation of TMR samples were determined using an infrared methane analyzer (Sensor Europe GmbH, Erkrath, Germany) (Goel et al., 2008).

Methane production (ml) = Total gas production (ml) X Percentage of Methane (%)

The effect of chestnut tannin on gas and methane production were determined using the one-way analysis of variance (ANOVA). Tukey's multiple range tests was employed to identify the significance between means. Mean differences were considered significant at $P<0.05$.

RESULTS AND DISCUSSION

The effect of chestnut tannin on gas and methane production was given in Table 1. Sweet chestnut extract had a significant effect on the gas and methane production. Gas and methane production of alfalfa hay decreased in a dose dependent manner with increasing level of sweet chestnut extract. Gas production ranged from 33.56 to 41.76 ml. Methane production as ml ranged from 4.77 to 7.34 ml. The percentage of methane ranged from %14.22 to 17.57. Gas and methane productions of control group were significantly higher than the other treatment groups.

Table 1. The effect of chestnut tannin on gas and methane production

	Doses						
Parameters	0	5	10	15	20	SEM	p
Gas(ml)	41.75^{a}	38.97^{b}	37.42^{bc}	36.13^{c}	33.56^{d}	0.640	0.000
Met(ml)	7.34^{a}	6.61^{ab}	6.07^{b}	5.87^{b}	4.77^{c}	0.269	0.000
Met(%)	17.57^{a}	16.97^{ab}	16.21^{bc}	15.56^{c}	14.22^{d}	0.411	0.000

^{a,b,c,d} *Row means with common superscripts do not differ (P<0.05); S.E.M. – standard error mean*

The relationship between gas production and level of Farmatan is given in Figure 1. As can be seen from Figure 1 there is a linear decrease in gas production with increasing level of Farmatan. The mean decrease in gas production was 0.384 ml per unit Farmatan supplementation.

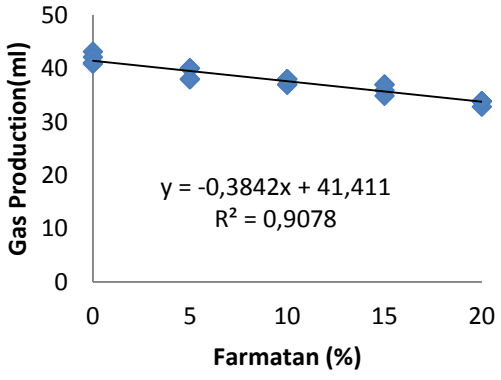


Figure 1. The relationship between gas production and level of Farmatan

The relationship between methane production (ml) and level of Farmatan is given in Figure 2. As can be seen from Figure 1 there is a linear decrease in methane production with increasing level of Farmatan. The mean decrease in methane production was 0.117 ml per unit Farmatan supplementation.

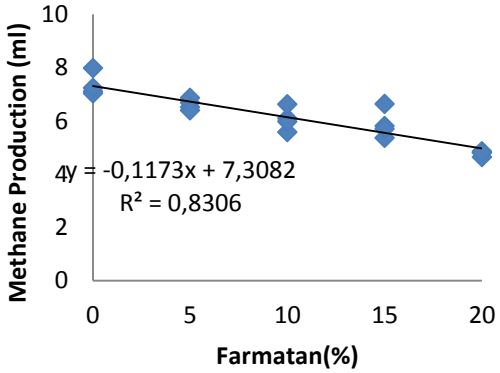


Figure 2. The relationship between methane production and level of Farmatan

The relationship between methane production (%) and level of Farmatan is given in Figure 3. As can be seen from Figure 1 there is a linear decrease in methane production with increasing level of Farmatan. The mean decrease in methane production (%) was 0.162 ml per unit Farmatan supplementation.

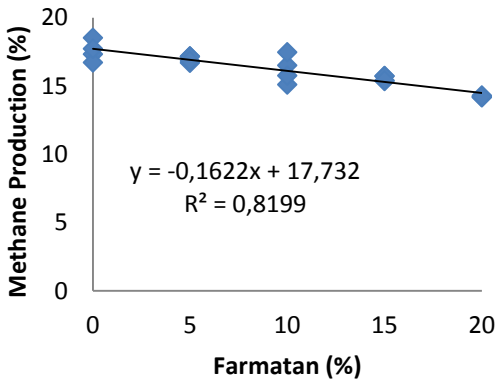


Figure 3. The relationship between methane production (%) and level of Farmatan

These results obtained in the current experiment are consistent with finding of Hassanat and Benchaar (2013) and Pellikaan et al. (2011) who showed that several tannins obtained from different sources have significant effect on the gas and methane production. They also indicated that the decrease in gas and methane production is possible associated with decrease in acetate concentration

CONCLUSIONS

Sweet chestnut extract had a significant effect on the gas and methane production. Gas and methane production of alfalfa hay decreased in a dose dependent manner with increasing level of sweet chestnut extract. However the inclusion level of tannin is very high than the detrimental level of tannin to ruminant animals. Therefore the high level of tannin supplementation is not likely to be reasonable in the ruminant nutrition.

REFERENCES

Animut G, Puchala R, Goetsch R, Patra AL, Sahlu AK, Varel VH, Wells J. 2008. Methane emission by goats consuming different sources of condensed tannins. Animal Feed Science and Technology,144,228-241.

Bhatta R, Uyeno Y, Tajima K, Takenaka A, Yabumoto Y, Nonaka I, Enishi O, Kurihara M, 2009. Difference in the nature of tannins on in vitro ruminal methane and volitile fatty acid production and methanogenic archaea and protozoal populations. Journal of Dairy Science. 92, 5512-5522.

Goel, G., H.P.S. Makkar, and K. Becker. 2008. Effect of *Sesbania sesban* and *Carduus pycnocephalus* leaves and Fenugreek (*Trigonella foenum-graecum* L) seeds and their extract on partitioning of nutrients from roughage and concentrate-based feeds to methane. Animal Feed Science and Technology 147 (1-3): 72-89.

Hassanat F, Benchaar C. 2013. Assessment of the effect of condensed (acacia and quebracho) and hydrolysable (chestnut and valonea) tannins on rumen fermentation and methane production *in vitro*. The Journal of the Science of Food and Agriculture,. 93:332-339.

Jayanegara A, Togtokhbayar N, Makkar HPS, Becker, K. 2009. Tannins determined by various methods as predictors of methane production reduction potential of plants by an *in vitro* rumen fermentation system. Animal Feed Science and Technology, 150,230-237.

Menke, K.H., and H. Steingass. 1988. Estimation of the energetic feed value obtained from chemical analysis and *in vitro* gas production using rumen fluid. Animal Research Development 28:7-55.

Pellikaan W, Stringano E, Leenaars J, Bongers DJGM, Shuppen S. Plant J, Mueller-Harvey I. 2011. Evaluating effects of tannins on extent and rate of *in vitro* gas and CH_4 production using an automated pressure evaluation system (APES). Animal Feed Science and Technology, 166-167:377-390.

Dwyer CM, Calvert SK, Farish M, Donbavand J, Pickup HE. 2005. Breed, litter and parity effects on placental weight and placentome number, and consequences for the neonatal behavior of the lamb. Theriogenology, 63: 1092–1110.

Echternkamp SE. 1993. Relationship between placental development and calf birth weight in beef cattle. AnimReprod Sci, 32, 1–13.

Greenwood P.L., Slepetis R.M., Bell A.W. 2000. Influences on fetal and placental weights during mid to late gestation in prolific ewes well nourished throughout pregnancy. Reprod Fertil Dev, 12:149–156.

Igwebuike UM. 2010. Impact of maternal nutrition on ovine foetoplacental development: A review of the role of insulin-like growth factors. Anim Reprod Sci, 121: 189–196.

Jenkinson CMC, Peterson SW, Mackenzie DDS, McDonald MF, McCutcheon SN. 1995. Seasonal effects on birth weight in sheep are associated with changes in placental development. New Zeal J Agric Res, 38: 337–345.

Konyali A, Tölü C, Daş G, Savaş T., 2007. Factors affecting placental traits and relationships of placental traits with neonatal behaviour in goat.Anim. Reprod Sci, 97: 394–401.

Mellor DJ, Stafford KJ. 2004. Animal welfare implications of neonatal mortality and morbidity in farm animals. Vet J, 168: 118–133.

Osgerby JC, Gadd TS, Wathes DC. 2003. The effects of maternal nutrition and body condition on placental and foetal growth in the ewe. Placenta, 24: 236–247.

Owens JA, Kind KL, Carbone F, Robinson JC, Owens PC. 1994. Circulating insulin-like growth factor-I and II and substrate in fetal sheep following restriction of placental growth. J Endocrinol, 140: 5–13.

Redmer DA, Wallace D, Reynolds LP. 2004. Effect of nutrient intake during gestation on fetal and placental growth and vascular development. Domest Anim Endocrinol, 27: 199–217.

Sen U, Sirin E, Kuran M. 2013. The effect of maternal nutritional status during mid-gestation on placental characteristics in ewes. Anim Reprod Sci, 137: 31–36.

Wallace J, Bourke D, Da Silva P, Aitken R. 2001. Nutrient partitioning during adolescent pregnancy. Reprod, 122: 347–357.

Wu G, Bazer FW, Cudd TA, Meininger CJ, Spencer TE. 2004. Maternal nutrition and fetal development. J Nutr, 134: 2169–2172.

DETERMINATION OF NUMBER AND POSITION OF KNOTS IN CUBIC SPLINE REGRESSION FOR MODELING INDIVIDUAL LACTATION CURVES IN THREE DIFFERENT BREED

Mustafa SAHIN[1], Hasan ONDER[2], Samet Hasan ABACI[2], Esra YAVUZ[1]

[1] Department of Animal Science, Faculty of Agriculture, Kahramanmaras Sutcu Imam University, Kahramanmaras, TURKEY
[2] Department of Animal Science, Faculty of Agriculture, University of Ondokuz Mayis, Samsun, TURKEY

Corresponding author e-mail: yavuz7346@gmail.com

Abstract

This study aimed to statistically determine the optimal position and number of knots in cubic spline regression used for modeling lactation curves. For this aim data of Jersey, Brown Swiss and Holstein Friesian breeds were used. Knots were taken as 60, 90, 120 and 150 days and combinations of them for every breed. To compare the models mean square error, Durbin Watson auto-correlation values, Akaike Information Criteria and coefficient of determination were used as comparison criteria. To compare the criteria Kruskal- Wallis H test was used and Man Whitney U test was used to form the groups. Results showed that four knot was sufficient for Jersey breed MSE: 0,640±0,0652, DW: 2,272±0,0232, AIC: 16,927±1,0649, R^2 *: 0,982±0,0020) and Brown Swiss (MSE: 0,131±0,0156, DW: 2,326±0,1093, AIC: 3,567±0,9193,* R^2 *: 0,985 ±0,0008), but three knot was sufficient for Holstein Friesian breed (MSE: 1,600±0,132, DW: 2,114±0,020, AIC: 28,596±0,783,* R^2 *: 0,972 ±0,002).*

Key words: *Cubic spline, numbers and position of knots, lactation curve*

INTRODUCTION

Lactation curve is a graphic presentation of variations in milk production throughout the lactation period (Anderson and Jenssen, 2011;Groot et. al., 2003; Silvestre et. al., 2006; White and Brotherstone, 1997). Lactation curves are one of the basic tools in animal breeding. Therefore, modeling of lactation curves with appropriate and accurate equations have a great importance to reach the achievements.

Various methods have been proposed for analyzing lactation period such as Wood, Ali Schaeffer, Wilmink, Random regression, etc (Cankaya et. al., 2014; Sahin et. al., 2014; Vargas et. al., 2000). Moreover, splines are a useful function-type used in regression when the relationship between a response and a set of covariates is not known in prior (Vargas et. al., 2000). for describing the lactation curve of dairy cows. So, cubic spline regression models have been used to model lactation period using test day milk yield instead of the others because cubic spline regressions have high compliance excellence in modeling of lactation curves. In addition, more flexible curves can be obtained with the increase in the number of nodes (Sahin and Efe, 2010). Superiority of Cubic Spline Regression model can be obtained only if determination of sufficient number of knots and position of them were successful. On the other hand, lactation curves obtained from flock mean can give only a guideline. Individual lactation curves are needed to evaluate individual performance of animals and use of them in selection (Adediran et. al., 2008; Cankaya et. al., 2014).

In this study, we tried to determine the sufficient number of knots and position of them for three different cattle breed.

MATERIALS AND METHODS

Lactation curves have different tendencies in different breeds. To examine the tendencies and differences jersey, Brown Swiss and Holstein Friesian breeds which are commonly raised were used in this study. The data

consisted of total 3480 test day record of 348 cattle in Jersey breed obtained from Karaköy Agricultural State Farm in Samsun Turkey, 3500 test day records of 350 cattle in Brown Swiss breed obtained from Sultansuyu Agricultural State Farm in Malatya Turkey and Holstein Friesian breed obtained from Ceylanpınar Agricultural State Farm in Şanlıurfa Turkey. Only animals had 10 test days record in second and third lactation were included in analysis. Totally 10480 test day records for 1048 animal were used.

In three different cattle breeds, the lactation measurements are analyzed by cubic spline regressions with different knots for description of the lactation curve using SAS statistical package (SAS , 1999; Sherchand et. al., 1995). The methods used for estimation parameters and comparison criteria in this study were introduced as follows.

Cubic Spline Regression

Splines are usually defined as piecewise polynomials of degree *n* with function values. The join points are called knots. Cubic splines are smooth at knots (function, first and second derivatives agree). Cubic spline regression, the knot points, usually from the inner or outer convex near the start or end points are selected. On the other hand, in cubic spline regression model fit, the number of knots affects the fitting rather than the position of the knots (Lopez-Villalobos et. al., 2005). When the number of knots increases, the number of parts increases. Therefore, increasing the number of knots usually increases the fit of the spline function for the data (Walker et. al., 2010; White and Brotherstone, 1997).

Cubic spline regression, without any requirement of an endpoint, the number of parameters needed, β_0 except, "$k+3$"is the number (Stone and Koo, 1985). In this case, one (a) knots cubic spline function regression occurs as follows.

$$Y(t) = \beta_0 + \beta_1 t + \beta_2 t^2 + \beta_3 t^3 + \beta_4 (t-a)^3 \quad (1)$$

A cubic spline regression model,

$$y = \beta_0 + \beta_1 t + \beta_2 t^2 + \beta_3 t^3 + \sum_{i=1}^{k} k(t-t_i)^3 \quad (2)$$

Where, t refers to days in milk at the test; β_0, β_1 and $\beta_3$are parameters to be estimated, and k is the number of knots in the splines

Comparison Criteria for Model

Goodness of the fit of models was evaluated according to criteria Mean Square Error (MSE), Durbin-Watson autocorrelation test (DW), Akaike Information Criteria (AIC), Coefficient of determination (R^2) (Burnham and Anderson, 2002)

Kruskal-Wallis H Test

Use the Kruskal-Wallis H test when you have one nominal variable and one ranked variable. It tests whether the mean ranks are the same in all the groups. The Kruskal Wallis H test statistic is defined as:

$$H = \frac{12}{n(n+1)} \sum \frac{R_i^2}{n} - 3(n+1) \quad (3)$$

Where, n is the total number of values, R is the sum of the ranks for each sample.

Mann-Whitney U test

This is a method for the comparison of two independent random samples. The Mann Whitney U test is defined as:

$$U = n_1 n_2 + \frac{n_2(n_2+1)}{2} - \sum_{i=n_1+1}^{n_2} R_i \quad (4)$$

Where, samples of size n_1 and n_2 are pooled and R_i are the ranks.

RESULTS

In this study, it was aimed to statistically determine the optimal position and number of knots in cubic spline regression used for modeling lactation curves. For this aim, 10 different knots and combinations of them in second and third lactation of Jersey, Brown Swiss and Holstein Friesian breeds were used and lactation curves were estimated. Determined knots and their positions were given in Table 1.

Table 1. Position and code of the knots for ten different cubic spline models

Code of knots	Position of knots (day)	Code of knots	Position of knots (day)
1	60	6	90, 120
2	90	7	120, 150
3	120	8	60, 90, 120
4	150	9	90, 120, 150
5	60,90	10	60, 90, 120, 150

Mean square error, Durbin Watson auto-correlation values, Akaike Information Criteria and coefficient of determination estimated for three different cattle breed for knots and combinations were given in Table 2. As easily seen in Table 2, increasing number of knots caused an observable increase on coefficient of determination and decrease on Mean square error and Akaike Information Criteria.

The mean square error, Akaike Information Criteria and coefficient of determination of models and the results of comparison Kruskal- Wallis H tests given in Table 3. MSE, AIC and R^2values are not normally distributed. So, we used the Kruskal- Wallis H tests for comparison of models with MSE, AIC and R^2 (Onder, 2018). Mann-Whitney U test was used to form the groups.

As seen in Table 3, in every cattle breeds, by means of MSE, AIC and R^2 values differences among knots were found statistically significant ($P<0.05$) according to Kruskal-Wallis H tests. In point of MSE the best position of knots were obtained from code of knots 10 for Jersey and Brown Swiss breeds. For Holstein Friesian breed the best position of knots were obtained from code of knots 3, 6, 8, 9 and 10. In point of AIC the best groups was code of knots 10 for Jersey and Brown Swiss breeds as MSE, For Holstein Friesian breed the best position of knots were obtained from code of knots 9 and 10. On the other hands, in point of R^2 the best knot combination were 5, 8 and 10 for Jersey breed, 5, 8, 9 and 10 for Brown Swiss breed, and 9 and 10 for Holstein Friesian breed according to Table 2.

When the autocorrelations examined it was understood that there was no autocorrelation in code of knots 10 in Jersey and Brown Swiss breeds and code of knots 9 and 10 for Holstein Friesian breed.

When the breeds evaluated together according to MSE, AIC, DW and R^2; in Jersey breed (MSE:$0,640^{c}\pm0,0652$, DW:$2,272\pm0,0232$, AIC:$16,927^{c}\pm1,0649$, R^2:$0,982^{a}\pm0,0020$) and Brown Swiss breed (MSE:$0,131^{e}\pm0,0156$, DW:$2,326\pm0,1093$, AIC:$3,567^{d}\pm0,9193$, R^2:$0,985^{a}\pm0,0008$) for code of knots 10, in Holstein Friesian breed (code of knots 9: MSE:$1,600^{b}\pm0,132$,DW: $2,114\pm0,020$, AIC: $22,596^{c}\pm0,783$, R^2:$0,972^{a}\pm0,002$, code of knots 10: MSE:$1,585^{b}\pm0,207$, DW:$2,244\pm0,026$, AIC:$21,120^{c}\pm1,004$, R^2:$0,976^{a}\pm0,003$) were yield best results.

Table 2. Knot positions (days in milking), the mean squares error for each model, Durbin Watson auto-correlation values, Akaike Information Criteria and coefficient of determination

Position of knots	$\bar{X} \pm S_{\bar{X}}$											
	Jersey				Brown Swiss				Holstein			
	MSE	*DW*	*AIC*	R^2	*MSE*	*DW*	*AIC*	R^2	*MSE*	*DW*	*AIC*	R^2
1	1,062^{a}±0,0877	2,677±0,0354	28,100^{a}±0,7407	0,928^{c}±0,0060	0,316^{a}±0,0236	2,511±0,0253	16,205^{a}±0,6199	0,965^{c}±0,0024	1,778^{ab}±0,129	2,599±0,025	30,196^{a}±0,773	0,945^{bc}±0,003
2	1,089^{a}±0,0876	2,738±0,0345	28,441^{a}±0,7375	0,926^{c}±0,0060	0,293^{ab}±0,0219	2,580±0,0255	15,682^{a}±0,6216	0,967^{c}±0,0021	1,805^{ab}±0,131	2,665±0,024	30,525^{a}±0,774	0,945^{bc}±0,003
3	0,800^{ab}±0,0650	2,858±0,0348	24,617^{ab}±0,8024	0,934^{c}±0,0058	0,245^{b}±0,0202	2,720±0,0243	13,253^{ab}±0,5608	0,976^{b}±0,0015	1,571^{b}±0,118	2,811±0,024	27,595^{ab}±0,851	0,948^{bc}±0,003
4	1,182^{a}±0,0874	2,820±0,0339	29,345^{a}±0,7403	0,918^{cd}±0,0064	0,267^{b}±0,0199	2,677±0,0259	14,778^{a}±0,5386	0,971^{ab}±0,0017	1,966^{ab}±0,142	2,769±0,023	32,286^{a}±1,228	0,939^{c}±0,003
5	0,690^{c}±0,0631	3,070±0,0303	21,184^{bc}±0,9064	0,972^{a}±0,0026	0,193^{d}±0,0150	2,958±0,0222	9,6303^{c}±0,6619	0,982^{a}±0,0010	1,733^{ab}±0,133	2,867±0,024	28,946^{ab}±0,906	0,952^{ab}±0,003
6	0,825^{ab}±0,0719	2,957±0,0352	24,469^{ab}±0,8364	0,956^{b}±0,0037	0,228^{c}±0,0189	2,819±0,0234	12,640^{ab}±0,5567	0,970^{b}±0,0014	1,535^{b}±0,118	2,916±0,023	27,190^{ab}±0,847	0,962^{ab}±0,002
7	1,392^{a}±0,1207	2,826±0,0325	30,354^{a}±0,7799	0,908^{d}±0,0074	0,258^{c}±0,0196	2,721±0,0252	14,639^{a}±0,5294	0,971^{ab}±0,0016	2,158^{a}±0,158	2,800±0,021	31,969^{a}±0,756	0,936±0,004
8	0,674^{c}±0,0617	3,175±0,0292	21,057^{bc}±0,8919	0,972^{a}±0,0027	0,253^{c}±0,0128	3,088±0,0188	8,897^{c}±0,6190	0,983^{a}±0,0009	1,548^{b}±0,124	3,102±0,019	24,722^{b}±0,906	0,952^{ab}±0,001
9	0,994^{ab}±0,0907	3,171±0,0290	26,434^{ab}±0,8118	0,947^{b}±0,0046	0,195^{d}±0,0139	3,066±0,0203	11,464^{bc}±0,5643	0,979^{a}±0,0013	1,600^{b}±0,132	2,114±0,020	22,596^{c}±0,783	0,972^{a}±0,002
10	0,640^{c}±0,0652	2,272±0,0232	16,927^{c}±1,0649	0,982^{a}±0,0020	0,131^{e}±0,0156	2,326±0,1093	3,567^{d}±0,9193	0,985^{a}±0,0008	1,585^{b}±0,207	2,244±0,026	21,120^{c}±1,004	0,976^{a}±0,003

MSE: Mean Square Error, R^2 : Coefficient of Determination, *AIC*: Akaike Information Criteria, DW: Durbin-Watson Statistic (The critical value: 3.121)

Table 3. The results of Kruskal- Wallis H test for comparison of models with MSE and R^2

Cattle Races	Model Comparison	Kruskal- Wallis H	
		X^2	Sig.
Jersey cows	*MSE*	344.996	0.000
	AIC	27.015	0.000
	R^2	69.743	0.000
Brown Swiss cows	*MSE*	133.35	0.000
	AIC	59.128	0.000
	R^2	280.55	0.000
Holstein cows	*MSE*	47.599	0.000
	AIC	145.12	0.000
	R^2	282.432	0.000

X^2 statistic, Sig.; level of importance.

Cubic spline regression and individual lactation curves generated using the control days given in Figure 1, Figure 2 and Figure 3. Increase in the number of knots, in point spread, it is causes to obtain a more flexible curve and can express the better of distribution shown in Figure 1, Figure 2 and Figure 3.

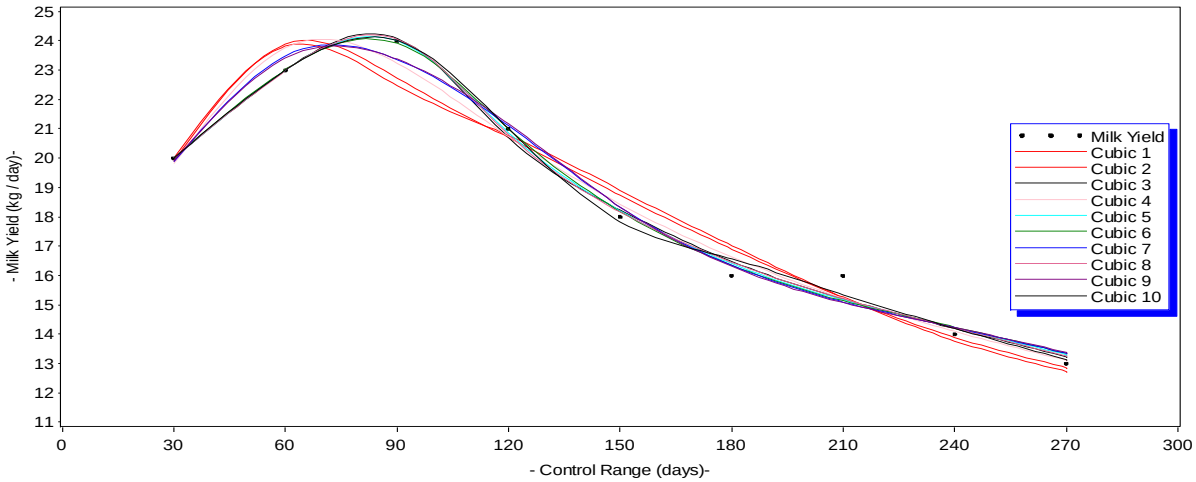


Figure 2. For Brown Swiss cows, individual lactation curves with different knots

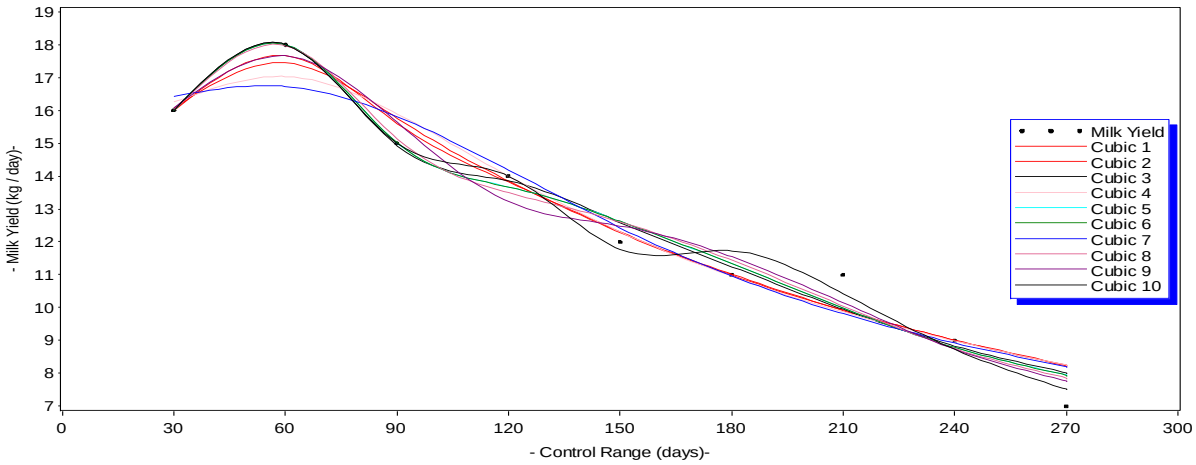


Figure 1. For jersey cows, individual lactation curves with different knots

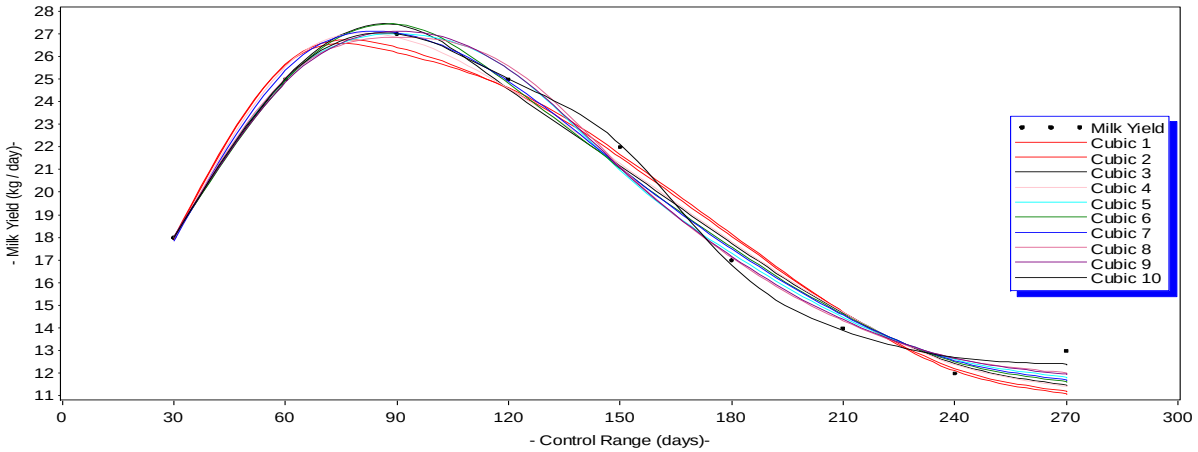


Figure 3. For Holstein cows, individual lactation curves with different knots

DISCUSSION

Mean square error, Durbin Watson auto-correlation values, Akaike Information Criteria and coefficient of determination estimates showed that the best knots were position of knots 10 (60, 90, 120 and 150 days) for Jersey and Brown Swiss breeds, for Holstein Friesian breed the best knots were position of knots 9 (90, 120 and 150 days) and position of knots 10 (60, 90, 120 and 150 days). Obtained results coincided with the results of (Bohmanova et. al., 2007; Quinn et. al., 2006; Gipson et. al., 2010; Jamrozik et. al., 2009; Makram et. al., 2011). Concurrently, values of comparison criteria were coincided with the results of researchers Cankaya et. al., 2014; Makram et. al., 2011 ; Koncagul and Yazgan, 2011).

As a general result, four knots (60, 90, 120 and 150 days) for Jersey and Brown Swiss breeds and three knots (90, 120 and 150 days) for Holstein Friesian breed were sufficient to estimate lactation curve by Cubic Spline Regression model.

Use of Cubic Spline Regression to estimate lactation curves should be evaluated for other cattle breeds and milking animals such as goat and sheep.

REFERENCES

Adediran S. A., Ratkowsky D. A., Donaghy D. J., Malau-Aduli A. E. O. (2008) Modelling the effect of stocking rate on the lactation profiles of grazing Holstein-Friesian dairy cows using cubic splines. Current Topics in Dairy Production, 13: 25-32.

Anderson F., Jenssen M. (2011) Use of the lactation curve in the production management of Norwegian dairy cattle. Journal of Animal & Plant Sciences, 24(4): 1045-1049.

Burnham K. P., Anderson D.R. (2002) Model Selection and Multi model Inference, 2nd edition. Springer, New York, 353 pp.

Bohmanova J., Jamrozik J., Miglior F., Misztal I., Sullivan P.G. (2007) Legendre polynomials versus linear splines in the Canadian test-day model. Interbull Bulletin, 37.

Bohmanova J., Miglior F., Jamrozik J., Misztal I., Sullivan P.G. (2008) Comparison of Random Regression Models with Legendre Polynomials and Linear Splines for Production Traits and Somatic Cell Score of Canadian Holstein Cows. J. Dairy Sci., 91:3627–3638.

Çankaya S., Sahin M., Abacı S.H. (2014). Comparision of wood and cubic splıne models for the fırst lactatıon curve of Jersey cows. Journal of Animal and Plant Sciences, 24(4): 1045-1049.

De Groot B. J., Keown J. F., Kachman S. D., Vleck D. V. (2003) Cubic Splines for Estimating Lactation Curves and Genetic Parameters on First Lactation Holstein Cows Treated with Bovine Somatotropin. Annual Conference on Applied Statistics in Agriculture. http://newprairiepress.org/agstatconference/2003/proceedings/12.

Gipson T., Rovai M., Capuco A., Sahlu T., Dawson L. (2010) Effect of Number and Placement of Cubic Spline Knots in the Lactation Curve of Extended Lactations. 10th International Conference on Goats. Brazil, 11-27.

Jamrozik J., Bohmanova J., Schaeffer L. R. (2009) Selection of locations of knots for linear splines in random regression test day models. J. Anim. Breed. Genetics, 127 (2): 87-92.

Koncagul S., Yazgan K. (2011) Comparison of spline and Legendre polynomial functions with conventional methods for describing lactation curves of Holstein dairy cows. J. Anim. Production, 52(1): 17-23.

Quinn I. L., Killen L., Buckley F. (2006) Empirical algebraic modelling of live weight of Irish dairy cows over lactation. Livestock Science, 103(2): 141-147.

Lopez-Villalobos N., Mc Naughton L. R., Spelman R. J. (2005) The relationship between lactation persistency and reproductive performance in New Zealand dairy cattle.56th Annual Meeting of the EAAP, June 5-8, Uppsala, Sweden, Session 35 CPh6.4.

Makram J. G., Jeffrey F. K., Dale V. V. (2011) Cubic-spline interpolation to estimate effects of inbreeding on milk yield in first lactation Holstein cows. Genet Mol. Biol, 34(3): 443–450.

Onder, H. (2018). Nonparametric statistical methods used in biological experiments, Black Sea Journal of Engineering and Science, 1(1): 1-6.

Sahin M., Efe E. (2010) Use of cubic spline regressions in modeling dairy cattle lactation curves. KSU. J. Natural Sci., 13 (2): 17-22.

SAS (1999) Institute Inc., SAS Online Doc®, Version 8, Cary, NC.

Sherchand L., Mcnew R. W., Kellogg D. W., Johnson Z. B. (1995) Selection of a mathematical model to generate lactation curves using daily milk yields of Holstein cows. J. Dairy Sci., 78 (11): 2507-2513.

Silvestre A. M., Petim-Batista T., Colaço J. (2006) The accuracy of seven mathematical functions in modeling dairy cattle lactation curves based on test-day records from varying sample schemes. J. Dairy Sci., 89 (5): 1813-1821.

Stone C. K., Koo C. Y. (1985) Additive splines in statistics, In Proceedings of the Statistical Computing Section. American Statistical Association, 45-48.

Şahin A., Ulutaş Z., Yıldırım A., Yüksel A., Genç S. (2014) Comparison of Different Lactation Curve Models of Anatolian Buffaloes. Kafkas University Faculty of Veterinary, 20 (6): 847-855.

Vargas B., Koops W. J., Herrero M., Van Arendonk J. A. M. (2000) Modeling extended lactations of dairy cows. J. Dairy Sci., 83 (6): 1371-1380.

Walker C. G., O'Sullivan M. J., Zhu Y., Hsu S. (2010) Regression spline fitting with applications. Proceedings of the 45th Annual Conference of the ORSNZ: 271-280.

White I., Brotherstone S. (1997) Modelling lactation curves with cubic splines. Interbull Bulletin, (16), 80.

White I. M. S., Thompson R., Brotherstone S. (1999) Genetic and environmental smoothing of lactation curves with cubic splines. J. Dairy Sci., 82 (3): 632-638.

THE EFFECT OF SEASON ON DEVELOPMENTAL COMPETENCE OF BOVINE EMBRYOS IN VITRO

Ugur SEN[1]

[1]Ondokuz Mayis University, Faculty of Agricultural, Department of Agricultural Biotechnology, TR55139, Atakum, Samsun, TURKEY

Corresponding author e-mail: ugur.sen@omu.edu.tr

Abstract

The aim of this study was to investigate the effects of season on the developmental competence of bovine embryos in vitro. Bovine oocytes were maturated in bicarbonate-buffered TCM–199 for 22 hours in a humidified atmosphere of 5% CO_2 in the air at 38.5°C during the autumn-winter months (AW) or the spring-summer (SS) months. In vitro matured bovine oocytes were fertilized in glucose-free modified TALP fertilization media and then cultured in synthetic oviduct fluid media at 38.5°C, 5% CO_2, 5% O_2 and 90% N_2 atmosphere with high humidity for 8 days. In vitro fertilization was considered as 0 day. On day 3 of development the proportion of zygotes cleaved was recorded. Morula and blastocyst development the proportion of zygotes were evaluated on days 5 and 8, respectively. There were no significant differences between AW and SS groups in terms of percentage of cleavage, and zygotes developed to morulae and blastocyst stage. Also, morulae to cleavage and blastocyst to cleavage ratios for AW and SS embryos were similar. The results of present study showed that seasonal changes have no significant effect on the developmental competence of bovine embryos in vitro.

Key words: *bovine, season, in vitro fertilization, embryo development, blastocyst*

INTRODUCTION

In vitro production of bovine embryos including in vitro maturation, fertilization and embryo culture has been utilized for embryology research and commercial purposes of embryo transferring (Suthar and Shah, 2009; Suzuki et al., 2010). Many researchers have investigated conditions required to improve in vitro oocytes maturation, fertilization and subsequent development of bovine oocytes (McDowall et al., 2004; Cevik et al., 2011; Sen and Kuran, 2018). Bovine IVP can be performed throughout the year, because bovine ovaries are available from slaughterhouses at any time of the year.

Heat stress induces low developmental competence in bovine embryos and low conception rates (Zeron et al., 2001; Al-Katanani et al., 2002; De Rensis and Scaramuzzi, 2003). It is well recognized that environmental influences, such as high temperature and humidity, are associated with marked seasonal declines in the reproductive efficiency of bovine in hot climates (Zeron et al., 2001, Al-Katanani et al., 2002). Therefore, seasonal infertility may be strongly related to high atmospheric temperatures. Previous studies reported that heat stress have negative effects on cytoskeletal organization and meiotic stage and developmental competence of oocyte (Suzuki et al., 2010). All these situations shows that efficiency of in vitro production of bovine embryos may be influenced by seasonal changes. To our knowledge, however, the effects of seasonal changes on the efficacy of in vitro production of bovine embryos have not been investigated in Turkey. In the present study, we investigated the effects of seasonal changes on in vitro embryonic development of in vitro matured bovine oocytes following in vitro fertilization throughout the year.

MATERIALS AND METHODS

All chemicals and media used in this study were purchased from Sigma-Aldrich, Turkey.A total of 568 bovine cumulus-oocyte complexes (COCs) were used for in vitro embryo production during the

autumn-winter months (AW; n= 273) or the spring-summer (SS; n=295) months. During the autumn-winter and spring-summer months were done experimental 12 replicates. COCs were obtained by aspirating antral follicles (2 to 5 mm in diameter) of bovine ovaries obtained from a local slaughterhouse. In vitro maturation of bovine COCs was conducted in bicarbonate-buffered TCM–199 for 22 h in a humidified atmosphere of 5% CO_2 in air at 38.5°C described by Sen (2015). In vitro fertilization of maturated bovine oocytes was conducted in glucose-free modified Tyrode's albumin lactate pyruvate for 22 hours in a humidified atmosphere of 5% CO_2, 5% O_2, and 90% N_2 in air at 38.5°C described by Sen and Kuran (2018). Culture of the putative zygotes was conducted in synthetic oviduct fluid embryo culture media during 8 days in a humidified atmosphere of 5% CO_2, 5% O_2, and 90% N_2 in air at 38.5°C described by Sen and Kuran (2018).Zygotes cleaved were determined on day 3 of development. Percentages of zygotes developed to morula and blastocyst stages were evaluated on days 5 and 8, respectively.

Effects of season on developmental competence of bovine embryos were analyzed by the general linear model of the SPSS 17.0 package program (SPSS, Chicago, IL, USA) after than arcsine-transformation and logl0 transformation (cleaved embryos, morula and blastocyst yields were done arcsine-transformation; cell numbers of blastocyst were logl0 transformation). Duncan's test was used to determine differences between means, using a p value of 0.05 and untransformed mean ± standard error of the mean values were presented in Table and Figure.

RESULTS AND DISCUSSION

Developmental competence of bovine embryos in different seasons is presented in Table 1. There were no significant differences between AW and SS groups in terms of percentage of cleavage, and zygotes developed to morulae and blastocyst stage. In addition, morulae to cleavage and blastocyst to cleavage ratios for AW and SS embryos were similar (Figure 1).

Table 1. Developmental competence of bovine embryos in different seasons.

	COCs	PZ	Developmental competence of bovine embryos (%)		
			Cleaved	Morula	Blastocyst
AW	295	277	75.26 ± 2.75	41.13 ± 3.18	30.47 ± 3.04
SS	273	250	71.50 ± 1.96	40.20 ± 2.25	27.93 ± 2.12

AW = the autumn-winter months, SS = the spring-summer months, COCs = cumulus-oocyte complexes, PZ = putative zygotes.

The in vitro developmental competence of bovine oocytes is still lower compared with that of in vivo produced embryos, although many efforts have been made to improve bovine in vitro embryo production technologies (Sen and Kuran, 2018). Previous studies reported that higher environmental temperatures or hotter climates decreases fertility rate of bovine especially during the summer mounts (Zeron et al., 2001; Al-Katanani et al., 2002). Additionally, Wolfenson et al. (2002) reported that plasma concentrations of progesterone in bovine were higher in winter mounts than in summer mounts. These seasonal variations in the quality of oocytes and the production of progesterone have been attributed to heat stress (Silva et al., 2006). However, cooling the cows for 42 days during the summer did not alleviate the seasonal effect (Al-Katanani et al., 2002). Silva et al. (2006) observed a reduction in the quality of oocytes between March and May and not in the hottest summer months. Furthermore, the seasonal variations in the quality of the oocytes affected the yields of blastocysts (Silva et al., 2006). Moreover, Laven and Drew (1999) reported that a short-term decrease in pregnancy rates in dairy herds during spring in the UK.

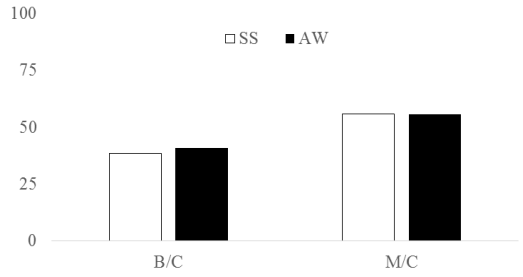


Figure 1. Blastocyst to cleavage (B/C) and morulae to cleavage (M/C) ratios of bovine embryos in different seasons. AW = the autumn-winter months, SS = the spring-summer months.

Suzuki et al. (2010) demonstrated that the in vitro developmental competence of porcine oocytes up to the blastocyst stage was different among seasons, with the highest efficiency occurring in winter. Additionally, Suzuki et al. (2010) reported that a negative correlation between the atmospheric temperatures and the blastocyst rates. The results of Suzuki et al. (2010) suggest that one of the dominant factors determining the in vitro embryonic development of porcine IVP is the monthly atmospheric temperature. Previous studies reported that summer heat stress reduces the developmental competence of bovine oocytes (De Rensis and Scaramuzzi, 2003; Zeron et al., 2001; Al-Katanani et al., 2002). Additionally, heat stress was found to change the numbers of follicles and their diameters and to modify the fatty acid and protein composition of the porcine oocyte plasma membrane (Zeron et al., 2001; Suzuki et al., 2010). Furthermore, heat stress induces reactive oxygen species and results in apoptosis of granulosa cells in laboratory animals (Matsuzuka et al., 2005). In the present study, seasons did not influence developmental competencies such as cleavage, morulae and blastocyst rates of bovine oocytes. Moreover, morulae to cleavage and blastocyst to cleavage ratios of embryos obtained from the different seasons were similar. Similar, Rivera et al. (2000) indicated that season did not affect cleavage rates or the subsequent development of bovine embryos. In contrast, Silva et al. (2006) reported that the blastocyst rates of in vitro matured bovine oocytes were significantly higher in autumn than other seasons for a period of two years. It is extremely difficult to maintain consistent laboratory conditions throughout the year, but the impact of any procedural variation insufficient to mask the effect of the season when the oocytes are collected on their developmental competence (Silva et al., 2006). The reason for these contradictory findings is not clear, but at least, the present study has indicated that the seasonal changes not affect bovine in vitro embryo production performance.

In conclusion, the present results showed that bovine embryos could be produced throughout the year and the in vitro production efficiency was not affected by season. Furthermore, the results showed that in vitro bovine blastocyst production to be carried out without seasonal effect throughout the year in the province of Samsun, Turkey.

REFERENCES

Al-Katanani YM, Paula-Lopes FF, Hansen PJ. 2002. Effect of season and exposure to heat stress on oocyte competence in Holstein cows. 85(2):390-396.

Cevik M, Sen U, Kocyigit A, Soydan E, Kuran M. 2011. Effects of serum, gonadotropins, epidermal growth factor and estradiol 17-beta on cumulus expansion and nuclear maturation of bovine oocytes. Kafkas Univ Vet Fak Derg, 17: 1009-1014.

De Rensis F, Scaramuzzi RJ. 2003. Heat stress and seasonal effects on reproduction in the dairy cow-a review. Theriogenology, 60(6): 1139-1151.

Laven RA, Drew SB. 1999. Dietary protein and the reproductive performance of cows. Vet Rec, 145(24): 687-695.

Matsuzuka T, Ozawa M, Nakamura A, Ushitani A, Hirabayashi M, Knai Y. 2005. Effects of heat stress on the redox status in the oviduct and early embryonic development in mice. J Reprod Dev, 51: 281-287.

McDowall MLS, Gilchrist RB, Thompson JG. 2004. Cumulus expansion and glucose utilisation by bovine cumulus–oocyte complexes during in vitro maturation: the influence of glucosamine and follicle-stimulating hormone. Reprod, 128:313-319.

Rivera RM, Al-Katanani YM, Paula-Lopes FF, Hansen PJ. 2000. Short communication: seasonal effects on development of bovine embryos produced by in vitro fertilization in a hot environment. J Dairy Sci, 83(2): 305-307.

Sen U, Kuran M. 2018. Low incubation temperature successfully supports the in vitro bovine oocyte maturation and subsequent development of embryos. Asian-Australas J Anim Sci, 31(6):827-834.

Sen U. 2015. Effects of sperm from different bulls on developmental competence, blastosist quality and cell number of bovine embryos in vitro. Kafkas Univ Vet Fak Derg, 21 (3): 339-344.

Silva CC, Rosa HJ, Knight PG. 2006. Seasonal variations in the developmental competence of bovine oocytes matured in vitro. Vet Rec, 158(14): 473-475.

Suthar VS, Shah RG. 2009. Bovine in vitro embryo production: An overview. Vet World, 2, 478-479.

Suzuki Y, Watanabe H, Fukui Y. 2010. Effects of seasonal changes on in vitro developmental competence of porcine oocytes. J Reprod Dev, 56(4): 396-399.

Wolfenson D, Sonego H, Bloch A, Shaham-Albalancy A, Kaim M, Folman Y, Meidan R. 2002. Seasonal differences in progesterone production by luteinized bovine thecal and granulosa cells. Domest Anim Endocrinol, 22(2): 81-90.

Zeron Y, Ocheretny A, Kedar O, Borochov A, Sklan D, Arav A. 2001. Seasonal changes in bovine fertility: relation to developmental competence of oocytes, membrane properties and fatty acid composition of follicles. Reprod, 121(3): 447-454.

THE EFFECT OF PMSG AND FSH ADMINISTRATION ON PLASMA HORMONES CONCENTRATION IN AKKARAMAN EWES

Ugur SEN[1], Erkan PEHLIVAN[2], Emre SIRIN[3]

[1]Ondokuz Mayis University, Faculty of Agriculture, Department of Agricultural Biotechnology, 55139, Samsun, TURKEY
[2]Ankra University, Faculty of Agriculture, Department of Animal Science, 06110, Ankara, TURKEY
[3]Ahi Evran University, Faculty of Agriculture, Department of Agricultural Biotechnology, 40100 Kirsehir, TURKEY

Corresponding author e-mail: ugur.sen@omu.edu.tr

Abstract

The aim of the present study was to determine the effect of estrus synchronization with pregnant mare serum gonadotropin (PMSG) and follicle stimulating hormone (FSH) on plasma progesterone (P_4), estrogen (E_2) and luteinizing hormone (LH) at breeding and out of breeding seasons in Akkaraman ewes. In the present study Akkaraman ewes were used as experimental animal at breeding (September-November, n = 10) and out of breeding (April-June, n = 10) seasons. The vaginal CIDR device containing 0.30 g natural progesterone was inserted into all ewes and withdrawn following 12 days. Ewes were allocated randomly into two treatment groups in both seasons; first group were injected 600 IU PMSG and second group were injected twice 300 µl (20 mg/ml) FSH at 12 hours intervals. In both seasons, blood was taken from jugular vena from all ewes on CIDR application (day 0), withdrawn (day 12), days 2 and 5 after FSH or PMSG injections. Plasma P_4, E_2 and LH concentration were determined using commercial ELISA kits. In breeding season, PMSG administered sheep had higher ($p<0.05$) plasma P_4 concentration than those of FSH on days 2 and 5 after hormones administration, but there were no significant differences in out of breeding season. Similarly, although PMSG increased ($p<0.05$) the concentration of plasma E_2 compare to FSH on day 2 after hormones administration, there were no significant differences in out of breeding season. PMSG tended to increase ($p=0.095$) plasma LH concentration compare to FSH on day 2 after hormones administration in breeding season. In conclusion, PMSG administration for estrus synchronization of Akkaraman ewes had more effect on plasma hormone concentration in breeding season compare to out of breeding season.

Key words: *estrus synchronization, season, PMSG, FSH, plasma hormones, Akkaraman*

INTRODUCTION

Estrus synchronization is a useful tool for improving and maintaining the production of milk and meat, as well as reducing the labour force or cost, shortening the breeding season, throughout the year in small ruminants (sheep and goat) farms (Quintero-Elisea 2011; Nur et al. 2013; Andrabi et al. 2015). Additionally, estrus synchronization in sheep is practical for optimizing the function of reproduction (Titi et al. 2010). Therefore, estrus synchronization is extensively applied in the reproductive management of sheep (Titi et al. 2010).

Plasma concentrations of reproductive hormones are the greatest indicators of ovarian activity and reproductive performance in sheep (Hafez, 1993). However, the reproductive performance of the animals after estrus synchronization is determined by the rate of estrus, the number of mating, the pregnancy rate and the number of born lambs (Sen and Sirin, 2017). All these inspections for determining the reproductive performance take a long time and can give misleading results because of the environmental factors such as temperature, maintenance, feeding etc. cannot be completely removed. Thus, the effects of estrus synchronization applications on ovarian activity can be clearly demonstrated by determining changes in plasma hormone concentrations

of P4, E2 and LH, which are effective on reproductive performance.
For all these reasons, the aim of the present study was to determine the effect of estrus synchronization with pregnant mare serum gonadotropin (PMSG) and follicle stimulating hormone (FSH) on plasma progesterone (P4), estrogen (E2) and luteinizing hormone (LH) at breeding and out of breeding seasons in Akkaraman ewes.

MATERIALS AND METHODS

Estrus of Akkaraman ewes, which had similar age (ranging from 3 to 4 years of age) and body weight (51.3 ± 1.5), were synchronized at the breeding season (September, n = 10) and non-breeding seasons (April, n = 10) of sheep in Turkey. Forty-eight hours prior to of estrus synchronization in both seasons, intramuscular injection of 1 cc $PGF_{2\alpha}$ was performed to lutalyse the corpus luteum (CL) on the ovary in all ewes. The animals were then treated with an intravaginal controlled internal drug-releasing (CIDR) device containing 0.30 g natural progesterone for 12 days. Following, withdrawal of CIDR ewes were allocated randomly into two treatment groups balanced for body weight. Ewes in first group were injected 600 IU PMSG and ewes in second group were injected twice 300 µl (20 mg/ml) FSH at 12 hours intervals.
In both seasons, blood was taken from jugular vena from all ewes on CIDR application (day 0), withdrawn (day 12), days 2 and 5 after FSH or PMSG injections. Blood samples were collected in sodium ethylenediaminetetraacetic acid (sodium heparin) containing vacutainer tubes and plasma was separated following centrifugation at 2500 × g for 10 min at 4°C and then stored at −20°C until analyzed for hormones. All the hormone concentrations were determined in duplicate and plasma concentrations of P_4, E_2 and LH were determined using commercial enzyme linked immunosorbent assay (ELISA) kits as suggested by the manufacturer.
To analyse the data, Mann-Whitney U-test and one-way ANOVA were performed according to the structure of the data by use of the SPSS 17.0 package program (SPSS, Chicago, IL, USA).

RESULTS AND DISCUSSION

Effect of PMSG (pregnant mare serum) and FSH (follicle stimulating hormone) treatments on plasma P4, E2 and LH levels of Akkaraman sheep at various days during breeding (a) and out of breeding (b) seasons are present in Figure 1, 2 and 3, respectively. Determination of the P4 hormone level in blood plasma is an important indication for monitoring and controlling ovarian activity (Kawu et al., 2007). In the present study, PMSG administered sheep had higher ($p<0.05$) plasma P4 concentration than those of FSH on day 2 (14 days) and day 5 (17 days) after hormones administration in breeding season. Contrast to there were no significant differences in terms of plasma P4 concentration between experimental groups in out of breeding season. The results of the present study are consistent with the results of Horoz et al. (1997) on the Kıvırcık sheep breed. It is thought that PMSG hormone administration in breeding season may result in an increase in plasma P4 concentration, by affecting the hypothalamus region for promoting gonadotropin releasing hormone (GnRH) production, resulting in early CL formation and increasing the amount of P4 naturally produced from the ovary

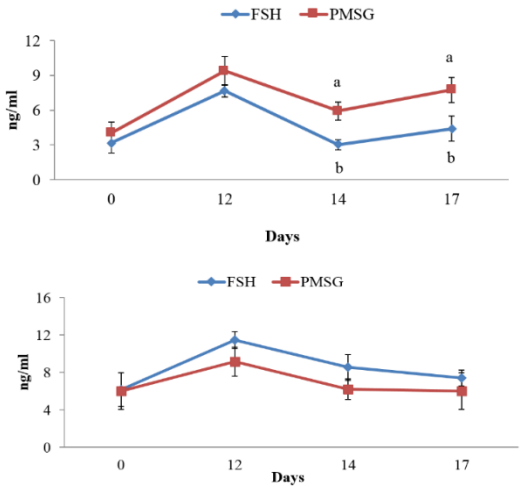


Figure 1. Effect of PMSG (pregnant mare serum) and FSH (follicle stimulating hormone) treatments on plasma P4 levels of Akkaraman

sheep at various days during breeding (a) and out of breeding (b) seasons.

The high level of plasma E2 hormone in the follicular phase of the estrus cycle is the most obvious indication of effectiveness of estrus (Çam, 2004; Davies, 2005). In the present study, PMSG administration increased ($p<0.05$) the concentration of plasma E2 compare to FSH on day 2 (14 days) after hormones administration in breeding season, but there were no significant differences in terms of plasma E2 concentration between experimental groups in out of breeding season. Previous studies showed that increase in the number of follicles during the follicular phase increases the amount of plasma E2 and leads to earlier behavioral estrus (Hafez 2016). Results of present study indicated that PMSG application increases the plasma E2 hormone concentration in the period when potential anger behaviors may be exhibited according to FSH application in breeding season in Akkaraman sheep breed.

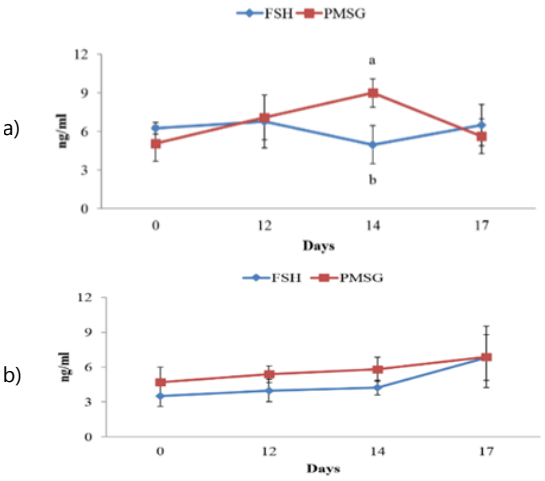


Figure 2. Effect of PMSG (pregnant mare serum) and FSH (follicle stimulating hormone) treatments on plasma E2 levels of Akkaraman sheep at various days during breeding (a) and out of breeding (b) seasons.

Rawling et al. (1977) reported that the plasma LH concentration and release frequency were lower in sheep towards the end of the breeding season and in the early anestrus period than breeding season. In the present study, PMSG tended to increase ($p=0.095$) plasma LH concentration compare to FSH on day 2 after hormones administration in breeding season. However, plasma LH concentration were similar between PMSG and FSH administered sheep in out of breeding season. The tendency of PMSG administration to increase the plasma LH concentration during the breeding season may be due to the fact that it is more effective on follicular activity than FSH hormone. Previous studies reported that early development of follicles with PMSG stimulating increase secretion of follicular estrogen, which may have result in an increase in LH release and frequency with positive feedback effects on the hypothalamus (Hafez 2016). The results of study of Driancourt and Fry (1992) support the conclusion of the present study that the PMSG hormone has an earlier and higher effect on the follicular development and activity of the ovary relative to the FSH hormone.

The results of present study indicated that PMSG administration following estrus synchronization application in Akkaraman ewes had more effect on plasma P4, E2 and LH hormones concentration in breeding season compare to out of breeding season.

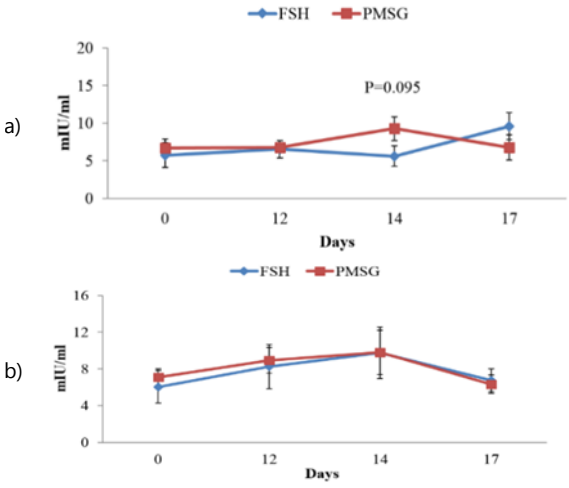


Figure 3. Effect of PMSG (pregnant mare serum) and FSH (follicle stimulating hormone) treatments on plasma LH levels of Akkaraman sheep at various days during breeding (a) and out of breeding (b) seasons.

REFERENCES

Andrabi SMH, Anwar M, Mehmood A. 2015. Efficacy of short-term estrus synchronization protocols and timed artificial insemination in subtropical goats. J Anim Plant Sci, 25(1): 298-300.

Çam MA, Kuran M, Selçuk E. 2004. The effect of GnRH administration on plasma progesterone and reproductive performance in ewes. Turk J. Vet. Anim Sci, 28: 1065- -1070.

Davies KL. 2005. ovarian antral follicular dynamics and regulation in sheep, MSc thesis, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, Canada.

Driancourt MA, Fry RC. 1992. Effect of superovulation with pFSH or PMSG on growth and maturation of the ovulatory follicles in sheep. Anim Reprod Sci, 27(4), 279-292.

Hafez, E.S.E. 2016. Reproduction in farm animals. 7th Edition. Copyright © 2000 Lippincott Williams & Wilkins, Print ISBN:9780683305777, USA.

Horoz H, Ak K, Kaşıkçı G, Baran A, Sönmez C, İleri K. 1997. The serum progesterone, Estradiol-17β and LH levels of Kıvırcık ewes, which were synchronized by various techniques during breeding season. Kafkas Üniv Vet Fak Derg, 3 (1): 85-92.

Kawu M, Eduvie L, Lakpini C, Ayo J. 2007. Peripheral serum progesterone profile in multiparous Nigerian Red Sokoto goats between day one and 30 postpartum. Veterinarski Arhiv, 77 (6): 543-550.

Nur Z, Nak Y, Nak D, Ustuner B, Tuna B, Simsek G, Sagirkaya H. 2013. The use of progesterone-supplemented co-synch and Ovsynch for estrus synchronization and fixed-time insemination in nulliparous Saanen goat. Turkish J Vet Anim Sci, 37:183-188.

Quintero-Elisea JA, Macías-Cruz U, Álvarez-Valenzuela FD, Correa-Calderón A, González-Reyna A, Lucero-Magaña FA, Soto-Navarro SA, Avendaño-Reyes L. 2011. The effects of time and dose of pregnant mare serum gonadotropin (PMSG) on reproductive efficiency in hair sheep ewes. Trop Anim Health Prod, 43(8):1567-1573.

Rawling NC, Kennedy S, Chang C, Henricks DM. 1977. Onset of seasonal anestrous in the ewe. J Anim Sci, 44(5): 791-797.

Sen U, Sirin E. 2017. The effect of natural and synthetic progestagen applications on some reproductive performance in Akkaraman ewes. Book of Abstracts of 1th ICAFOF Conference, 1: 479.

Titi HH, Kridli RT, Alnimer MA. 2010. Estrus synchronization in sheep and goats using combinations of GnRH, progestagen and prostaglandin F2alpha. Reprod Domest Anim, 45(4): 594-599.

MUSIC'S EFFECT OF NUTRITION PERFORMANCE IN BROILERS

Tolga TOLUN[1], Tulin CICEK RATHERT[1]

[1]Kahramanmaras Sütcü Imam University, Faculty of Agricultural, Department of Animal Science, Kahramanmaras, TURKEY

Corresponding author e-mail: tuci@ksu.edu.tr

Abstract

This study was conducted in the Research Centre at Kahramanmaras Sutcu Imam University, Faculty of Agriculture to investigate the effects of music on feedlot performance, carcass and meat quality characteristics, food crop rate and effects of the rate of the chemical composition of carcass meat in broilers. The study was conducted with 630 broiler chicks. One hundred five broiler chicks were randomly distributed into six groups with 105 birds in each. Of these, three groups were treatment groups and three groups were control groups. The animals in the experimental group were exposed to 78 dB music in intervals of 5 minutes and 5 minute-breaks. A standard supply program was applied in the study. The animals in the study were weighed every week and the increase of the body weight was determined. The effect of the treatment between the groups was not statistically significant (P>0.05). At the end of the sixth week, live weight of animals in the experimental and control groups were found as 2953,4 ± 48,7 and 3028,9 ± 25,2 gr, carcass weights were 2136.0 ± 208.2 and 2198.3± 263.7 gr, leg weights were 594.3 ± 74.5 and 622.4 ± 96.7 gr, chest weights were 688.5 ± 75.9 and 692.1 ±90.1 gr, heart weights were 22.4 ± 5.1 and 18.9 ± 4.4 gr, liver weights were 84.9 ± 12.9 and 76.1 ± 11.1 gr, gizzard weights were 82.2 ± 22.8 and 81.7 ± 19.2 respectively. The differences between the heart and liver weights of control and experiment groups were statistically very significant (P<0.01). Also the composition of the meat sample was determined by chemical analysis taken from the treatment and control groups. According to the analysis, the following results were found for the control and treatment groups, respectively: crude protein (CP) 24.9% ± 0.5 and 24.2% ± 0.3. either extracts (EE) 2.0% ± 0.8 and 2.9% ± 0.6. Dry matter (DM) 27.1% ± 0.4 and 27.2% ± 0.9. crude ash (CA) 1.6% ±0.3 and 1.5% ±0.3. pH ratio 5.8 ±0.07 and 5.9 ± 0.02. Group differences in CP, which is a quality criterion of meat, were statistically very significant (P<0.01). Group differences in EE were also statistically significant (P<0.05). Group differences in DM and CA were statistically insignificant (P>0.05).

Key words: *broilers, music, chemical composition*

INTRODUCTION

Chickens in the zoological system; are the creatures of the vertebrates, the class of birds, the chickens' family, the phasianidae family, the chicken breeder, the domestic chicken (gallus domesticus). There is no definite information on when the chickens were domesticated. However, it is believed that they had domesticated at the same time period with sheep. Along with the increasing world population, the need for nutrition has also increased in parallel, in this context the importance of chicken meat and eggs with cheaper fare and high quality animal protein has also increased. With the increasing demand for chicken meat and eggs, world chicken production has entered the growth process since the 1940s, and after 1960s, technology became an industry in which technology was used most effectively (Algers et al., 1978; AOAC, 1990). After these years, egg and chicken meat production has developed as a separate industry branch. The fact that chicken meat is not banned by any belief or culture in the world has had a great impact on the development of this industry. Researchers have headed for alternative care and nutrition methods and alternative production models other than selection and hybridization in order to carry chicken meat and egg production from today to tomorrow and to further increase their yields. One of these trends has also been investigated for the effects of music on animals (Pollock et, all., 1978, Uetake et. all., 1997, Singh, 1963).

MATERIALS AND METHODS

Materials

The research was carried out in poultry units at the Animal Production Research and Application Center of Kahramanmaraş Sütçü Imam University, Faculty of Agriculture.

In the study, pre-built enclosed poultry coops were used as cage material. Poultry cages were built as reinforced concrete in the North - South direction. Ventilation has been provided only from the windows. Placement frequency of animals used in the experimentwas designed to have a maximum of 12 broiler chicks per 1 m2 area declared in the "Regulation on Organic Farming Principles and Practices". Activity was conducted 3 times. For this reason, for the treatment and control group, 6 compartments were formed by using braided wires, designed to leave 16 m space in each compartment.

Methods

This study, which is conducted in May and June, was carried out using a total of 630 broilers. The randomly selected broilers were taken into the orientation session during the first week, and then placed in two compartments in the enclosed area, including the treatment and control groups. The groups were separated into 3 recurrences with 105 broilers among them and placed in the divisions. The group, which was divided as a treatment group, was given listening performanceat 78 dB frequency, 5 minutes music, 5 minutes break. At the end of the study, statistical analyzes were carried out using binary T test. Weekly Feed Consumption of Animals, Feed Benefit Performance of Animals, Performance datas of Animals, Chemical Composition of the meat, Color Quality Characteristics of the meat, Death rates of Groups were examined in the experiment.

RESULTS

The CA avarages of the first week of control and treatment groups was 180.5 ± 2.6, 183.3 ± 0.6, the second week CA average; 529.4 ± 6.4, 533.0 ± 12.2, Averages of the third week; 1029.2 ± 24.1, 1052.2 ± 15.7, CA average of the fourth week; 1656.8 ± 3.1, 1695.7 ± 16.9, CA average of the fifth week; 2385.0 ± 7.9, 2402.5 ± 16.1 and CA averages of the sixth week; 2953.4 ± 48.7, 3028.9 ± 25.2 grams.

The weekly CA averages are shown in the table 1. Live weights of the groups at 6 weeks, Weekly Feed Consumption of animals, Feed Benefit rates, The carcass, chicken leg, wing, chest, heart, liver and weights obtained after the cutting, color intensities in the chest meat obtained and the mortality rates of the groups were obtained in Table 1, Table 2, Table 3, Table 4, Table 5, Table 6, Table 7, respectively.

Table 1. Weekly CA averages of the animals

W	Groups	$\bar{X} \pm S$	T	P
1	Control	180.5 ± 2.6^{a}	-1.753	0.154
	Treatment	183.3 ± 0.6^{a}		
2	Control	529.4 ± 6.4^{a}	-0.448	0.677
	Treatment	533.0 ± 12.2^{a}		
3	Control	1029.2 ± 24.2^{a}	-1.380	0.240
	Treatment	1052.2 ± 15.7^{a}		
4	Control	1656.8 ± 3.1^{a}	-3.915*	0.017
	Treatment	1695.7 ± 16.9^{b}		
5	Control	2385.0 ± 7.9^{a}	-1.686	0.10
	Treatment	2402.5 ± 16.1^{a}		
6	Control	2953.4 ± 48.7^{a}	-2.382	0.076
	Treatment	3028.9 ± 25.2^{a}		

W= weeks
*P<0.05; a,b,c; the differences between the avarages which are indicated by different letters are important.

Table 2. Weekly feed consumption of animals

Groups	N	$\bar{X} \pm S$	T	P
Control	3	$5137{,}4 \pm 95{,}38$		
Treatment	3	$5192{,}8 \pm 47{,}23$	-0.901	0.419

*P<0.05; a,b,c; the differences between the avarages which are indicated by different letters are important.

Table 3. Feed benefit performance of animals

Groups	N	$\bar{X} \pm S$	T	P
Control	3	1.77 ± 0.2		
Treatment	3	1.67 ± 0.5	3.216*	0.032

*P<0.05; a,b,c; the differences between the avarages which are indicated by different letters are important.

Table 4. Performance datas of the animals

	Groups		$\bar{X} \pm S$	T	P
Carcass	C	30	2136.0 ± 208[a]	-1.015	0.314
	T	30	2198.3 ± 263[a]		
Chicken leg	C	30	594.3 ± 74.5[a]	-1.260	0.213
	T	30	622.4 ± 96.7[a]		
Wing	C	30	181.3 ± 22.8[a]	0.501	0.618
	T	30	178.4 ± 22.9[a]		
Cheast	C	30	688.5 ± 75.9[a]	-0.169	0.867
	T	30	692.1 ± 90.1[a]		
Heart	C	30	22.4 ± 5.1[a]	2.763**	0.008
	T	30	18.9 ± 4.4[b]		
Liver	C	30	84.9 ± 12.9[a]	2.837**	0.006
	T	30	76.1 ± 11.1[b]		
Gizzard	C	30	82.2 ± 22.8[a]	0.085	0.932
	T	30	81.7 ± 19.2[a]		

*P<0.05; a,b,c; the differences between the avarages which are indicated by different letters are important.

Table 5. At the end of the treatment, the chemical composition of the meat

	Group	N	$\bar{X} \pm S$	T	P
Protein (%)	Control	9	24.9 ± 0.5[a]	2.995**	0.009
	Treatment	9	24.2 ± 0.3[b]		
HY (%)	Control	9	2.0 ± 0.8[a]	-2.656*	0.017
	Treatment	9	2.9 ± 0.6[b]		
KM (%)	Control	9	27.1 ± 0.4[a]	-3.383	0.707
	Treatment	9	27.2 ± 0.9[a]		
HK (%)	Control	9	1.6 ± 0.3[a]	0.206	0.839
	Treatment	9	1.5 ± 0.3[a]		
pH	Control	9	5.8 ± 0.07[a]	-2.933	0.010
	Treatment	9	5.9 ± 0.02[a]		

*P<0.05; a,b,c; the differences between the avarages which are indicated by different letters are important.

Table 6. The color intensities of the groups

	Group	N	$\bar{X} \pm S$	T	P
L	Control	30	44.5 ± 3.5[a]	0.510	0.612
	Treatment	30	44.1 ± 3.3[a]		
a	Control	30	6.9 ± 2.0[a]	-1.609	0.113
	Treatment	30	7.7 ± 1.8[a]		
b	Control	30	4.0 ± 1.9[a]	-0.419	0.677
	Treatment	30	4.2 ± 1.6[a]		

*P<0.05; a,b,c; the differences between the avarages which are indicated by different letters are important.

Table 7. Death rates of the groups

Groups	N	$\bar{X} \pm S$	T	P
Control (%)	3	11.7 ± 2.2		
Treatment (%)	3	11.1± 1.4	0.417	0.698

*P<0.05; a,b,c; the differences between the avarages which are indicated by different letters are important.

DISCUSSION AND CONCLUSIONS

Since the results can be obtained in a short time, a lot of research has been done on Broilers. However, while investigating the effects of music on the dairy cattles, laying hens, fish, and humans, the effects on broiler chickens have not been investigated.

In this study, the effect of the music on the broiler chickens was investigated. Broiler chicks separated 6 groups that each group was consisting of 105 broilers from the 2nd week. The groups were separated into 3 recurrent treatment and control groups. The animals in the treatment groups were listened to music in 78 decibels for 5 minutes and 5 minutes break.

The standard feeding program was applied at the experiment. As a result of the analysis at the end of the experiment, the live weight gains of the animals except the fourth week were not significant (P> 0.05). When the performance data were analyzed, the differences between the liver and heart weights were statistically significant (P <0.01).

When we analyzed the chemical analysis of the samples taken from the chest flesh of the broilers after cutting, it was found that meat was very important (P <0.01) in terms of protein and pH and significant (P <0.05) in terms of crude oil. The other parameters which are examined were found statistically insignificant (P> 0.05).

When it's generally evaluated,as a result of the obtained data, For the treatment and control groups although there was a difference between live weight and feed utilization rates They were determined statistically insignificant, In order to stimulate feed consumption in today's broiler farming, workers frequently go to the method of lifting animals.

In our study we have made, with the stimulant effect of the musicon the animals, we aimed to increase the animal's tendency to feed and water, thus eliminating labor costs andtheirintervations, as well as increasing the feding performances of the animals (Vural, 2006, Yıldırım et. all., 2007).

When the findings were evaluated, the weight and FCR averages of the treatment group showed a positive effect according to the control group. From this point of view our study has achieved it's goal and it may provide reference work for the future studies. In the studies to be made after that, experiments can be done using different types of music, different frequencies of music, different music makams and different rhythm variations (Vasantha et al., 2003, Wells et al., 2006).

REFERENCES

Algers, B., Ekesbo, I., Sromberg, S. 1978. The İmpact of Continuous Noise on Animal Health. *Acta Vet. Scand*. 68: 1–26.

AOAC 1990. Official Method of Analysis. Association of Official Analytical Chemists. 15th.edition. Washington, DC. USA. s.66-88.

Pollock, W.E., and Hurnik, J.F., 1978. Effect Of Calf Calls On Rate Of Milk Release Of Dairy Cows. J. Dairy Sci., 61:1624-1626.

Singh, T.C., 1963 On the Effect of Music and Dance on Plants" *Bihar Agricultural College Magazine*, Vo1.13, No.1, 1962-63.

Uetake, K., Hurnik, J.F., and Jahnson, L., 1997. Effect Of Music on Voluntary Approach of Dairy Cows to An Automatic Milking System. Appl.Anim.Behav.Sci., 53.175- 182.

Vasantha, L., Jeyakumar, A., Pitchai, M. A. 2003. Influence of Music on The Growth Of Koi Carp, Cyprinus Carpio (Pisces: Cyprinidae). NAGA: World Fish Center Quarterly, 26(4):25-26.

Vural, F. 2006. Koroner Arter Bypass Greft Uygulamasında Düşleme ve Müziğin Iyileşme Sürecine Etkisi. Marmara Üniversitesi Sağlık Bilimleri Enstitüsü, Doktora Tezi.

Yıldırım, S. ve Gürkan A. 2007. Müziğin, Kemoterapi Yan Etkilerine ve Kaygı Düzeyine Etkisi. *Anadolu Psikiyatri Dergisi*; 8:37-45.

Wells,D.L.,D.Coleman, and G. Challis, 2006. A Note on The Effect Of Auditory Stimulation on The Behaviour And Welfare of Zoo-Housed Gorillas. *App. Anim. Behav.Sci.*, 100:327-332.

ZOOMETRICAL BODY MEASUREMENT AND THEIR RELATION WITH LIVE WEIGHT IN JAPANESE QUAIL

Haci TOPCU[1], Tulin CICEK RATHERT[1]

[1]Kahramanmaras Sütcü Imam University, Faculty of Agricultural, Department of Animal Science, Kahramanmaras, TURKEY

Corresponding author e-mail: tuci@ksu.edu.tr

Abstract

This study was carried out to determine zoometrical body measurement and their relation with live weight in japanese Quail. It was executed in quail production rooms in Kahramanmaraş University Research Farm. A total of 60 quail- 32 grain of female and 28 grain of male quail- were experimented. İn this experiment by measuring head length, chest length, chest depth, chest girth, head diameter, wing length, body length, chest width, beak length and metatarsus length was researched the relationship between this measurements and live weight.
According to measurement results for female and male quails were found statistically significant respectively live weight, head lenght, chest lenght, chest depth and chest girth. For live weight in 4., 5. and 6. weeks of age, for head length in 6. week of age, for chest length in 2. and 5. weeks of age, for chest depth in 1. week of age and for chest girth in 6. week of age were found statistically significant (P<0,05). Head diameter, beak length, wing length, body length, chest width and metatarsus length were found statistically not significant (P>0,05).

Key words: *Japanese quail, live weight, zoometrical measurements*

EFFECT OF OAK TANNIN EXTRACT (ARTUTAN) ON GAS PRODUCTION KINETICS OF ALFALFA HAY

Adem KAMALAK[1], Cagri Ozgur OZKAN[2]

[1]Kahramanmaras Sutcu Imam University, Faculty of Agriculture. Department of Animal Science, Kahramanmaras, TURKEY
[2]Kahramanmaras Sutcu Imam University, Goksun Vocational School, Organic Farming Department, Kahramanmaras, TURKEY.

Corresponding author e-mail: akamalak@ksu.edu.tr

Abstract

The aim of the current experiment was to determine the effect of oak tannin extract (Artutan) on the gas production kinetics of alfalfa hay. There is significant differences among treatment groups in terms term of gas production after 48 h incubation whereas there is no significant differences among treatments at early incubation times. Gas production rate (c) ranged from0.072 to 0.088. The gas production rate of alfalfa hay incubated with %4 and 5 of oak tannin extract were higher than that of alfalfa hay incubated with %3 of oak tannin extract. The potential gas production of alfalfa hay treated with %5 of oak tannin extract was significantly lower than that of alfalfa hay treated with %1 of oak tannin extract. the effect of oak tannin extract on the gas production kinetics is generally very low and can be ignored. It is likely to say that the inclusion level of oak tannin extract should be increased to obtain the substantial effect. However high inclusion level (higher than %5 of oak tannin extract may be detrimental effect on the animal. Before large implication the high inclusion level of oak tannin extract should be tested.

Key words: *Oak tannin extract, Gas production kinetics, Alfalfa*

INTRODUCTION

The manipulation of rumen fermentation to increase the efficiency of rumen metabolism and ultimately the productivity of animals has been a important goal for nutritionists and rumen microbiologist (Patra and Saxena 2011). Recently considerable attention has been given to use of different tannin sources such as hydrolysable and condensed tannin to manipulate the ruminal fermentation (Pellikaan et al. 2011, Hassanat and Benchar 2013). *In vitro* gas production technique is one of the most important methods to test the potential of previously uninvestigated tannin sources in manipulating of ruminal fermentation (Pellikaan et al. 2011, Hassanat and Benchar 2013). *In vitro* gas production technique is based on determination of gas produced during the fermentation (Menke et al. 1979). Therefore the aim of the current experiment was to determine the effect of effect of oak tannin extract (Artutan) on the gas production kinetics of alfalfa hay using *in vitro* gas production technique.

MATERIALS AND METHODS

Alfalfa hay samples milled through a 1 mm sieve were incubated *in vitro* rumen fluid in calibrated glass syringes following the procedures of Menke and Steingass (1988). Rumen fluid was obtained from three fistulated sheep fed twice daily with a diet containing alfalfa hay (60%) and concentrate (40%). 0.200 gram dry weight of samples was weighed in triplicate into calibrated glass syringes of 100 mL. oak tannin extract (Artutan was added on a dry matter basis as % 0, 1, 2, 3, 4 and 5. The syringes were prewarmed at 39 ^{o}C before the injection of 30 mL rumen fluid-buffer mixture into each syringe followed by incubation in a water bath at 39 ^{o}C for 24 h. The gas production were detected from the syringes containing alfalfa and chestnut tannin samples to determine the net gas production before incubation (0) and 3, 6, 12, 24, 48, 72 and 96 h after incubation. Net gas productions of alfalfa and chestnut tannin samples were obtained after correction for blank and hay standard (University of Hohenheim, Germany).

Cumulative gas production data were fitted to non-linear exponential model as: $Y= A(1-exp^{-ct})$
Where Y is gas production at time 't', A is the potential gas production (ml/200 mg DM), c is the gas production rate constant (h-1) and t is the incubation time (h). The effect of chestnut tannin on gas production kinetics were determined using the one-way analysis of variance (ANOVA). Tukey's multiple range tests was employed to identify the significance between means. Mean differences were considered significant at $P<0.05$.

RESULTS AND DISCUSSION

The effect of oak tannin extract (Artutan) on the gas production was given in Figure 1. Oak tannin extract had a significant effect on the gas production. As can seen from Figure 1, there is significant differences among treatment groups in terms term of gas production after 48 h incubation whereas there is no significant differences among treatments at early incubation times.

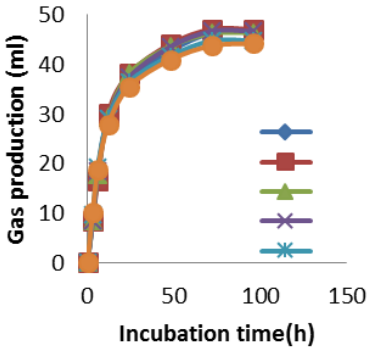


Figure 1. The effect of oak tannin extract (Artutan) on the gas production

The effect of oak tannin extract (Artutan) on the gas production kinetics is given in Table 1. The oak tannin extract had a significant effect on the gas production kinetics. Gas production rate (c) ranged from0.072 to 0.088. The gas production rate of alfalfa hay incubated with %4 and 5 of oak tannin extract were higher than that of alfalfa hay incubated with %3 of oak tannin extract. The potential gas production of alfalfa hay treated with %5 of oak tannin extract was significantly lower than that of alfalfa hay treated with %1 of oak tannin extract.

Table 1. The effect of oak tannin extract on gas production kinetics of alfalfa hay

	Doses (%)							
	0	1	2	3	4	5	SEM	*p*
c	0.798^{abc}	0.0765^{bc}	0.079^{abc}	0.072^{c}	0.088^{a}	0.086^{ab}	0.003	0.002
A	45.22^{ab}	46.55^{a}	45.82^{ab}	46.09^{ab}	43.67^{ab}	42.96^{b}	1.077	0.021

$^{ab\ c}$Row means with common superscripts do not differ ($P<0.05$); S.E.M. – standard error mean., c: gas production rate (%), A: Potential gas production(ml)

As can be seen from Table 1, the effect of oak tannin extract on the gas production kinetics is generally very low and can be ignored. It is likely to say that the inclusion level of oak tannin extract should be increased to obtain the substantial effect. However high inclusion level (higher than %5 of oak tannin extract may be detrimental effect on the animal. Before large implication the high inclusion level of oak tannin extract should be tested.
These results obtained in the current experiment are consistent with finding of Hassanat and Benchaar (2013) and Pellikaan et al. (2011) who showed that several tannins obtained from different sources have significant effect on the gas production. They also indicated that the decrease in gas and methane production is possible associated with decrease in acetate concentration. It has been reported that tannin decreases cumulative gas production, probably

by formation of tannin–macromolecule complexes which inhibit microbial enzymes and/or nutrient utilization by ruminal anaerobes (McSweneney et al. 2001, Makkar 2003). Similar results were obtained by El-Waziry et al. (2005) who found that adding tannic acid to SBM decreases gas production.

CONCLUSIONS

Oak tannin extract (Artutan) had a significant effect on the gas production.

Oak tannin extract can be used to manipulate the ruminal fermentation. However the effect of oak tannin extract on volatile fatty acid and nitrogen metabolism should be tested to determine the optimum inclusion level of oak tannin extract.

REFERENCES

El-Waziry AM, Nasser MEA, Sallam SMA. 2005. Processing methods of soybean meal: 1-effect of roasting and tannic acid treated-soybean meal on gas production and rumen fermentation in vitro. Journal of Applied Science, 1(3):313–320.

Hassanat F, Benchaar C. 2013. Assessment of the effect of condensed (acacia and quebracho) and hydrolysable (chestnut and valonea) tannins on rumen fermentation and methane production *in vitro*. The Journal of the Science of Food and Agriculture,. 93:332-339.

Makkar H. 2003. Effects and fate of tannins in ruminant animals, adaptation to tannins, and strategies to overcome detrimental effects of feeding tannin-rich feeds. Small Ruminant Research, 49:241–256.

Mc Sweeney CS, Palmer B, McNeill DM, 2001. Microbial interactions with tannins: Nutritional consequences for ruminants. Animal Feed Science and Technology, 2001;91:83–93.

Menke, K.H., L. Raab, A. Salewski, H. Steingass, D. Fritz, Schneider W 1979. The estimation of the digestibility and metabolizable energy content of ruminant feedingstuffs from the gas production when they are incubated with rumen liquor in vitro. Journal of Agricultural Science (Camb) 93:217-222.

Menke KH, Steingass H. 1988. Estimation of the energetic feed value obtained from chemical analysis and in vitro gas production using rumen fluid. Animal Research Development 28:7-55.

Patra AK, Saxena J. 2011. Exploitation of dietary tannins to improve rumen metabolism and ruminant nutrition. The Journal of the Science of Food and Agriculture, 91:24-37.

Pellikaan W, Stringano E, Leenaars J, Bongers DJGM, Shuppen S. Plant J, Mueller-Harvey I. 2011. Evaluating effects of tannins on extent and rate of in vitro gas and CH4 production using an automated pressure evaluation system (APES). Animal Feed Science and Technology, 166-167:377-390.

MUSCLE FIBER CHARACTERISTICS INFLUENCE SOME MEAT QUALITY PARAMETERS IN TURKISH NATIVE GOAT BREEDS

Emre SIRIN[1], Ugur SEN[2]

[1]Ahi Evran University, Faculty of Agriculture, Department of Agricultural Biotechnology, 40100 Kirsehir, TURKEY
[2]Ondokuz Mayıs University, Faculty of Agriculture, Department of Agricultural Biotechnology, 55100 Samsun, TURKEY

Corresponding author e-mail: emre.sirin@ahievran.edu.tr

Abstract

This study was conducted to determine muscle fiber characteristics and its effect on some meat quality parameters in Longissimus dorsi (LD) and Semitendinosus (ST) muscles from kids of some Turkish native goat breeds. Male kids were used as experimental animals of Hair (n = 6), Angora (n = 6), Kilis (n = 6) and Honamli (n = 6) pure breeds. All kids were slaughtered at 3 m of weaning age and muscles samples were collected for determination of type I, IIA and IIB muscle fibers and some meat quality parameters. Type IIA fiber number of Hair and Honamli kids were higher than those of other breeds in LD muscle. Similarly, Hair kids had higher number of type IIA in ST muscle compared to other breeds. Generally, there were negative correlations between tenderness, pH and number of muscle fiber types in LD and ST muscles of all breeds. Also, there were positive correlations between intra muscular fat and number of muscle fiber types in LD muscles of all breeds. In conclusion, kids of Turkish native goat breeds had different muscle fiber characteristics and these differences can affect meat quality.

Key words: *Turkish native goat, kids, muscle fiber type, meat quality, correlation*

INTRODUCTION

Meat quality has always been more important to the consumer, and it is critical subject for the meat industry in the today. Consumer demand for quality meat is increasing day by day in most countries. Within this, the meat industry should continue to produce quality, tasty and healthy meat. In order to produce high quality meat, meat quality characteristics and factors affecting them must be known (Joo et. al., 2013). Although, the demand for goat meat is still not at the desired level, consumption of goat meat has shown rise in all world countries due to low fat content (Banskalieva et. al., 2000). In particular, for this reason, strategies to increase meat quality in the goats should be developed. At this point, the programming of skeletal muscle fiber composition can be exploited. Fresh meat quality can be directly influenced by muscle fiber characteristics such as muscle fiber composition, cross-sectional area (CSA) and metabolic activity properties due to the muscle fibers constitute the majority of the skeletal muscle mass structure (Kim et al., 2013). The skeletal muscle mass has different composition of myosin heavy chain isoforms such as type I, IIA and IIB in muscle fibers, which have shown different contractile or metabolic characteristics (Lee et al., 2010).

The muscle fiber characteristics affect pH, color, water holding capacity, texture and intra-muscular fat ratio of consumable meat (Joo et. al., 2013). Differences in the muscle fibers composition and number, and myoglobin content of the muscle mass can change the preferable color stability ofthe fresh meat in pork (Kim et al., 2010; Kim et al., 2013) and beef (Renerre, 1990). The composition of muscle fibers is associated with water holding capacity in meat of different species (pig, Kim et al., 2013; Larzul et al. 1999; sheep, Sirin et al., 2017). Previous studies showed that muscle fiber characteristics influence the content of intra muscular fat of the pork meat (Larzul et al. 1999; Joo et al., 2013; Kim et al. 2013). Meat tenderness affected by heterogeneity of muscle fiber composition in different muscle (Maltin et al., 2003).

Increasing muscle fiber diameter or CSA can cause tougher meat in pig (Karlsson et al., 1993) and cattle (Renand, 2001). The muscle fiber properties are associated with the muscle pH, which is regarded as an indication of pig (Ryu and Kim, 2006; Choi et al. 2007; Joo et. al., 2013) and sheep (Sirin et al., 2017) meat quality. The differences in muscle fiber composition affect meat muscle tenderness (Xiong et al., 2007; Picard et al., 2015). The meat tenderness can be improved by changing muscle fibers composition and number (Hwang et al., 2010; Sirin et al., 2017). However, several studies demonstrated that muscle characteristics (including fiber type, collagen, intramuscular lipids) can only explain up to 30% of the variability in tenderness (Chriki et al., 2013). All the above mentioned studies were carried out in cattle, sheep and pig except for goat. Therefore, determining of muscle fiber characteristics in goat meat, especially native breeds, raises the question of whether improvement of goat meat quality by muscle fiber characteristics. Turkey has about 10 million goats and 9 different breeds (Turkstat, 2016). Therefore, the goats are an important source for meat production. The most commonly raised native goat breeds in Turkey are Hair, Kilis, Angora and Honamli breeds. Generally, male kids of these breed are preferred in meat production. Numerous studies have examined the muscle fiber characteristics and meat quality of sheep, cattle and pig. However, no studies comparing studies on the determination of meat quality and muscle fiber characteristics of goat breed have been reported. Therefore, the purpose of the current study was to determine muscle fiber characteristics and its correlation with some meat quality traits (cooking loss, intra muscular fat, tenderness, water holding capacity, pH and color) in Longissimus dorsi (LD) and Semitendinosus (ST) muscles from kids of Hair, Kilis, Angora and Honamli Turkish native goat breeds.

MATERIALS AND METHODS

A total of 24 kid were used as experimental pure breed animals of Hair (n = 6), Kilis (n = 6), Angora (n = 6) and Honamli (n = 6) breeds. All animals were provided from the national sheep and goat breeding project in Tokat (Hair), Kilis (Kilis), Ankara (Angora) and Antalya (Homanlı) provinces of Turkey. All kids were slaughtered at 90 days of weaning age.

Following slaughter, approximate 50–75 g Longissimus dorsi (LD) and Semitendinosus (ST) muscles samples from the right side of carcass were taken from mid-sections of the whole muscles within 30 min for histochemical analysis of muscle fibers. Subcutaneous fat and fascia were removed from these muscle samples and immediately frozen in liquid nitrogen and stored at −80 °C until ATPase staining of muscle fibers. All carcasses were chilled for 24 h at 4 °C. Following chilling, approximate 150 g of LD and ST muscle samples from the left side of carcass were taken from the central parts of the mid-section of the whole muscles and subcutaneous fat and fascia were removed from these muscle samples. These muscle samples were stored at 4 °C for determination of meat quality parameters.

Cooking loss (CL), intra muscular fat (IMF), tenderness, water holding capacity (WHC), pH and color values (L; lightness, a; redness and b; yellowness) of LD and ST muscles samples were measured as defined by Sen et al (2011). Type I, IIA and IIB muscle fibers composition in LD and ST muscles were determined using ATPase staining at pH 4.2 defined by Broke and Keiser (1970) and Sen et al. (2016). Muscle fibers were scanned using a microscope at × 200 magnification with a digital camera (Nikon Eclipse E600, Nikon Corporation, Tokyo, Japan) linked to image analysis software (Laica Q Win V3.4 Processing-Analysis Software). Four areas were selected randomly from the three sections to determine composition of myofibre types and cross-sectional area (CSA) of myofibre. CSA of myofibre was measured from ~20 fibers of each fiber type from each area counted. Images of muscle fibers from LD and ST muscles stained for ATPase (pH 4.2) are presented in Figure 1.

(a) (b)

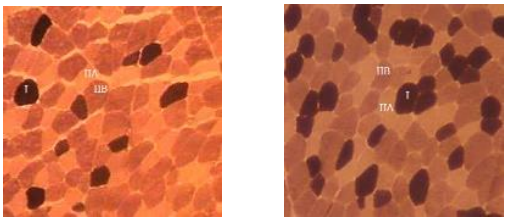


Figure 1. Pictures of myosin ATPase staining (pH 4.2) of Longissimus dorsi (a) and Semitendinosus (b) muscles. The darkest muscle fiber is type I, intermediate muscle fiber is type IIB and the lightest muscle fiber is type IIA

The effect of breed on muscle fiber characteristics analyzed as a complete randomized design using the general linear model procedure of Minitab Version 12.11. Relationships between the muscle fiber characteristics and meat quality parameters were determined with a Pearson correlation analysis at the 95% confidence interval. The differences in the mean values were compared by the Tukey's multiple comparison tests and results were computed as mean ± SEM. Statistical significance was considered at P<0.05.

RESULTS AND DISCUSSION

The numbers and CSA of type I, IIA, IIB muscle fibers in LD muscle from Hair, Kilis, Angora and Honamli male kids are presented Table 1. There were no significant between kids born to Kilis, Homanli, Hair and Angora goat breeds in terms of type I muscle fiber number in LD muscle. However, type IIA and total muscle fiber number of Honamli and Hair kids were higher (P < 0.05) than those of Kilis and Angora kids. Also, Angora kids had lower (P < 0.05) type IIB muscle fiber number than those of Kilis, Honamli and Hair kids. Kilis, Homanli, Hair and Angora kids had similar type I, type IIB and average muscle fiber CSA in LD muscle, but Angora kids had higher (P < 0.05) type IIA muscle fiber CSA than those of Kilis, Honamli and Hair kids.
The numbers and CSA of type I, IIA, IIB muscle fibers in ST muscle from Kilis, Homanli, Hair and Angora male kids are presented Table 2.

Table 1. The mean numbers and cross-sectional areas of type I, IIA and IIB muscle fibers in Longissimus dorsi muscle

	The number of muscle fibers (per mm²)			
Breeds	**Type I**	**Type IIA**	**Type IIB**	**Total**
Kilis	214.3±33.4	713.1±87.3^{b}	754.1±78.5^{a}	1681.5±97.8^{b}
Honamli	178.3±28.1	1449.0±269.1^{a}	825.2±43.0^{a}	2453.0±300.2^{a}
Hair	305.6±50.7	1637.0±367.0^{a}	720.0±75.8^{a}	2663.0±414.2^{a}
Angora	219.4±24.6	391.4±67.2^{b}	581.9±49.2^{b}	1193.0±144.0^{b}
	Cross-sectional area (µm²/per fiber)			
Breeds	**Type I**	**Type IIA**	**Type IIB**	**Average**
Kilis	59.38±7.98	14.1±3.3b	14.6±1.42	29.36±2.72
Honamli	69.21±7.69	8.9±1.31b	12.4±1.7	30.19±2.40
Hair	60.0±12.50	9.5±1.86b	16.2±2.48	28.56±4.01
Angora	50.95±5.73	38.3±8.02a	18.3±1.47	35.84±4.28

^{a,b} Different letters in the same column indicate significant difference

Hair kids had higher (P < 0.05) type IIA and total muscle fiber number (except for Homanlı kids) in ST muscle compare to other breeds. However, there were no significant between kids born to Hair, Kilis, Angora and Homanli goat breeds in terms of type I and IIB muscle fiber number in ST muscle. Hair kids had lower (P < 0.05) type I and IIA muscle fiber CSA than those of Honamli kids. Similarly, Hair kids had lower (P < 0.05) average muscle fiber CSA than those of Honamli and Angora kids. However, there were no significant between kids born to Kilis, Angora and Homanli goat breeds in terms of type I, IIA and average muscle fiber CSA in ST muscle. All kids born to Kilis, Homanli, Hair and Angora breeds had similar type IIB muscle fiber CSA in ST muscle.

Table 2. The mean numbers and cross-sectional areas of type I, IIA and IIB muscle fibers in Semitendinosus muscle

	Thenumber of musclefibers (per mm²)			
Breeds	**Type I**	**Type IIA**	**Type IIB**	**Total**
Kilis	270.2±50.4	634.8±50.1^{c}	676.0±36.3	1311±31.3^{b}
Honamli	232.2±41.6	865.0±144^{b}	780.0±53.0	1878.2±160.0^{a}
Hair	271.1±20.2	1464.0±140.0^{a}	652.1±38.1	2388.2±293.0^{a}
Angora	206.3±14.3	523.1±87.1^{c}	671.6±40.7	1401.0±59.4^{b}
	Cross-sectional area (µm²/per fiber)			
Breeds	**Type I**	**Type IIA**	**Type IIB**	**Average**
Kilis	47.7 ± 6.7^{ab}	16.9 ± 1.6^{a}	15.2 ± 0.8	26.6 ± 2.5^{ab}
Honamli	68.8 ± 10.8^{a}	15.9 ± 3.4^{a}	26.3 ± 10.2	36.0 ± 7.5^{a}
Hair	38.9 ± 3.07^{b}	7.9 ± 0.5^{b}	15.8 ± 0.9	19.9 ± 0.8^{b}
Angora	51.0 ± 4.1^{ab}	25.8 ± 8.0^{a}	15.3 ± 0.8	31.4 ± 2.4^{a}

^{a,b,c}Differences between the meanings indicated by different letters in the same column were found significant

In this study, muscle fiber characteristics and its relationship with some meat quality traits in LD and ST muscles of Kilis, Honamli, Hair and Angora Turkish native goat breeds' kids have been identified and the results demonstrate that muscle fiber characteristics of male kids of Turkish native goat breeds differ and muscle fiber characteristics influence some meat quality traits.

Compositions of muscle fiber type, size and total number of fibers in skeletal muscle tissue are affected by factor of breed in different species (Renand et al., 2001; Kim et al., 2013; Sirin et al., 2017). An important part of studies related to muscle fiber characteristics carried out in sheep (Sirinet. al, 2017) or pig breeds (Ryu et al., 2008). However, there has been no comparative information about muscle fiber characteristics and meat quality in goat. Previous studies showed that Berkshire pig breed has more type I fiber than that of Yorkshire and Landrace pig breeds in LD muscle (Ryu et al., 2008). Also, Wimmers et al. (2008) reported that high muscularity in different pig breeds is highly correlated with high ratio in myosin heavy chain transcripts of type IIB muscle fiber. Therefore, it should be underlined that an increase in carcass lean percentage of different breeds can be attributed to muscle fiber characteristics. Consequently, with regard to breeds within a species, there is a strong relationship between muscle fiber composition and growth performance. In this study, Honamli and Hair kids had higher type IIA and total muscle fiber numbers in mm2 muscle CSA of LD muscle compared to Kilis and Angora kids. Also, Type IIA muscle fiber numbers in mm2 muscle CSA of ST muscle of Hair kids were higher than those of other breeds. Moreover, Angora kids had lower type IIB muscle fiber number in mm^2 muscle CSA of LD muscle compared to other breeds. These results may indicate that the muscle development of kids may be affected by breed. Perhaps, these differences among kids from Turkish goat breeds may also be due to maternal nutrition level during gestation, because the number of skeletal muscle fibers especially type II muscle fibers are affected from environmental factors, especially maternal mal-nutrition during gestation (Dwyer et al., 1994; Faheyet al., 2005; Sen et al., 2016). Moreover, decreasing in the number of secondary muscle fibers (IIA and IIB) is caused by the low level of maternal nutrition (Wigmore and Stickland, 1983). Unfortunately, observations regarding to maternal nutrition level during gestation were not recorded in the present study which may help to interpret whether these had any effect on the muscle fiber characteristics of kids born to Turkish goat breeds.

Postnatal environmental factors such as maintenance, nutrition and mobility do not affect the composition or number and the type of muscle fibers in skeletal muscle of offspring due to hyperplasia or proliferation of fetal muscle fibers in small ruminants such as sheep and goat begins ~30 or 32 days of gestation and is completed ~85–90 days of gestation (Wilson et al., 1992; Rehfeld et al.,2004; Fahey et al., 2005; Brameld and Daniel 2008; Sen et al., 2016). Following this term, there are only changes in the diameter or CSA of the muscle fibers. Also, diameter or CSA of muscle fibers is affected by environmental factors especially nutrition and mobility during postnatal period in offspring (Fahey et al., 2005). In this study, Angora kids had higher type IIA muscle fiber CSA compare to Kilis, Honamli and Hair kids. Additionally, Hair kids had lower type I, IIA and average muscle fiber CSA than those of Honamli and Angora kids. All experimental animals were slaughtered same weaning age to minimized environmental impact on muscle fiber CSA, but the results of present study showed that kids born to different breeds were exposed to different environmental conditions from birth to weaning.

There were positive and negative correlations between type I, IIA and IIB muscle fiber characteristics (muscle fibers number and CSA) and meat quality parameters (CL, IMF, tenderness, WHC, pH, Lab color values) in different levels ($P < 0.05$ and $P < 0.01$).

The analysis of Pearson correlation coefficients on the pooled data of ST muscle for all breeds showed that there were positive correlations between WHC and type IIA muscle fiber number ($P<0.05$),

WHC and type IIB muscle fiber CSA (P< 0.05). There were negative correlations between type I muscle fiber number and CL (P<0.05), type IIB muscle fiber number and pH and L color value (P<0.05), total muscle fiber number and L color value (P < 0.05), type IIA muscle fiber CSA and WHC and CL (P < 0.05), type IIB muscle fiber CSA and CL and IMF (P < 0.05).

Joo et al. (2013) reported that muscle fiber characteristics are related with fresh meat quality. Maltin et al. (2003) reported that the meat tenderness affected by the composition of muscle fiber types in different muscles. Previous studies showed that increasing muscle fiber diameter, especially type IIB muscle fiber, exhibit tougher meat in pig (Karlsson et al., 1993) and cattle (Renand, 2001). Similarly, Hwang et al. (2010) reported that meat tenderness can be improved by increasing the ratio of type I muscle fibers and decreasing the ratio of type IIB muscle fibers in muscle composition in cattle. Moreover, Sirin et al. (2017) reported that positive correlations between type I and type IIA muscle fiber diameter and tenderness in LD and ST muscles in sheep. Kovanen et al. (1984) also reported that type I (slow-twitch) muscle fibers have more collagen, which leads to a decrease in tenderness of meat. In the present study, it has been found that the tenderness decreases as the number of muscle fibers increases and also tenderness increases as the CSA of muscle fibers increases in all kid breeds. These observations are in agreement with the argument of previous studies.

Muscle fiber characteristics as fiber composition and area may influence pH, meat color and WHC in meat (Joo et al., 2013; Sirin et al., 2017). Previous studies reported that compositions and size of muscle fiber characteristics are strongly relationship meat quality parameters in meat producing species (Renerre, 1990; Larzul et al., 1999; Klont et al., 1998; Choi et al. 2007; Ryu and Kim, 2006; Kim et al., 2010; Kim et al., 2013; Sirin et al., 2017). Our results indicated that muscle fiber characteristics had a significant effect on meat quality traits in different levels. The understanding of the impact of muscle fiber characteristics on meat quality traits can provide useful information for improve of muscle growth and meat quality in goat breeds. Consequently, the results observed in the present study suggest that muscle fiber characteristics of Turkish native goat breeds may be used as an important indicator of the fresh meat quality.

CONCLUSIONS

Muscle fiber characteristics and its effects on some meat quality parameters were firstly determined in Kilis, Honamli, Hair and Angora Turkish native goat breeds. In conclusion, the results of the present study suggest that breed is an important factor affecting skeletal muscle fiber characteristics in goat. Differences in muscle fiber characteristics may influence kid meat production and quality. To determination of skeletal muscle fiber characteristics in different goat breeds will help improve meat quality of Turkish goat breeds with breeding strategies.

ACKNOWLEDGEMENT

The authors acknowledge the financial support by General Directorate of Agricultural Researches and Policies of Turkey (TAGEM/15/AR-GE/24) to carry out this study.

REFERENCES

Anderson, M.J. (2000): NPMANOVA: a FORTRAN computer program for non-parametric multivariate analysis of variance (for any two-factor ANOVA design) using permutation tests. Department of Statistics, University of Auckland 2, 177-188.

Broke, M.M., Keiser, K. (1970): Muscle fiber type; How many

Choi, Y.M., Ryu, Y.C., Kim, B.C. (2007): Influence of myosinheavy- andlightchainisoforms on earlypostmortemglycolytic rate andporkquality. Meat. Sci. 76, 281–288.

Dwyer, C.M., Stickland, N.C., Fletcher, J.M. (1994): Theinfluence of maternalnutrition on muscle fiber numberdevelopment in theporcinefetusand on subsequentpostnatalgrowth. J Anim. Sci. 72, 911–917.

Fahey, A.J., Brameld, J.M., Parr T., Buttery, P.J. (2005): The effect of maternalundernutritionbeforemuscledifferentiation on themuscle fiber development of thenewbornlamb. J. Anim. Sci. 83, 2564–2571.

Hwang, Y.H., Kim, G.D., Jeong, J.Y., Hur, S.J., Joo, S.T. (2010): Therelationshipbetweenmuscle fiber characteristicsandmeatqualitytraits of highlymarbledHanwoo (Koreannativecattle) steers. MeatSci. 86, 456–461.

Joo, S.T., Kim, G.D., Hwang, Y.H., Ryu, Y.C. (2013): Control of freshmeatqualitythroughmanipulation of muscle fiber characteristics. MeatSci. 95, 828–836.

Karlsson, A., Enfalt, A.C., Essen-Gustavsson, B., Lundstrom, K., Rydhmer, L., Stern, S. (1993): Musclehistochemicalandbiochemicalproperties in relationtomeatqualityduringselectionforincreasedleantissuegrowth rate in pigs. J. Anim. Sci. 71, 930–938.

Kim, G.D., Jeong, J.Y., Jung, E.Y., Yang, H.S., Lim, H.T., Joo, S.T. (2013): Theinfluence of fiber size distribution of type IIB

on carcasstraitsandmeatquality in pigs. MeatSci. 94, 267–273.

Kim, G.D., Jeong, J.Y., Hur, S.J., Yang, H.S., Jeon, J.T., Joo, S.T. (2010): Therelationshipbetweenmeatcolor (CIE L* and a*), myoglobincontent, andtheirinfluence on muscle fiber characteristicsandporkquality. KoreanJournalforFoodScience of AnimalResources, 30, 626–633.

Klont, R.E., Brocks, L., Eikelenboom, G. (1998). Musclefibretypeandmeatquality. MeatScience, 49, 219–229.

Koluma, N., Görgülü, M., Göncü, S., Daşkıran, İ. (2016). Sürdürülebilir Keçi Yetiştiriciliği: Keçi Eti.

Kovanen, V., Suominen, H., Heikkinen, E. (1984): Mechanicalproperties of fastandslowskeletalmusclewithspecialreferencetocollagenandendurancetraining. J. Biomech. 17, 725–735.

Larzu, C., Lefaucheur, L., Ecolan, P., Gogu, J., Talmant, A., Sellier, P. (1997): Phenotypicandgeneticparametersforlongissimusmuscle fiber characteristics in relationtogrowth, carcass, andmeatqualitytraits in largewhitepigs. J. Anim. Sci. 75, 3126–3137.

Larzul, C., Le Roy, P., Gogue, J., Talmant, A., Jacque, B., Lefaucheur, L. (1999): Selectionforreducedmuscleglycolyticpotential in Large White pigs. II. Correlatedresponses in meatqualityandmusclecompositionaltraits. Genetics, Selection, Evolution, 31, 61–76.

Lee, S.H., Joo, S.T., Ryu, Y.C. (2010). Skeletalmuscle fiber typeandmyofibrillarproteins in relationtomeatquality. MeatSci. 86, 166–170.

Maltin, C., Balcerzak, D., Tilley, R., Delday, M. (2003): Determinants of meatquality: Tenderness. Proc. Nutr. Soc. 62, 337–347.

Onder, H., Cebeci, Z. (2009). Useandcomparison of permutationtests in linearmodels. Anadolu J. Agric. Sci. 2, 93–97.

Onder H. (2007). Using permutationteststoreducetype I and II errorsforsmallruminantresearch. J. Appl. Anim. Res. 32, 69–72.

Rehfeld, C., Fiedler, I., Stickland, N.C. (2004): Numberand size of musclefibres in relationtomeatproduction. Pas, MFW te; Everts ME, Haagsman HP. Muscledevelopment of livestockanimals, 1–38. Wallingford, UK: CABI Publishing.

Renand, G., Picard, B., Touraille, C., Berge, P., Lepetit, S. (2001): Relationshipbetweenmusclecharacteristicsandmeatqualitytraits of youngCharloisbulls. MeatSci. 59, 49–60.

Renerre M. (1990): Factorsinvolved in thediscoloration of beefmeat. Inter. J. FoodSci. Tech. 25, 613–630.

Ryu, Y.C., Choi, Y.M., Lee, S.H., Shin, H.G., Choe, J.H., Kim, J.M., Hong, K.C., Kim, B.C. (2008): Comparingthehistochemicalcharacteristicsandmeatqualitytraits of differentpigbreeds. MeatSci. 80, 363–369.

Sen, U., Sirin, E., Aksoy, Y., Ensoy, U., Ulutas, Z., Kuran, M. (2016): The effect of maternalnutritionlevelduringmid-gestation on post-natalmuscle fiber compositionandmeatquality in lambs. Anim. Prod. Sci. 56, 834–843.

Sen, U., Sirin, E., Ulutas, Z., Kuran, M. (2011): Fatteningperformance, slaughter, carcassandmeatqualitytraits of Karayaka lambs. Trop. Anim. HealthProd. 43, 409–416.

Şirin, E., Aksoy, Y., Uğurlu, M., Çicek, U., Önenç, A., Ulutaş, Z., Şen, U., Kuran, M. (2017). Therelationshipbetweenmuscle fiber characteristicsandsomemeatqualityparameters in Turkishnativesheepbreeds. Small RuminantResearch 150, 46–51.

TurkStat (Turkish Statistical Institute). (2016): LivestockStatistics. http://www.tuik.gov.tr (accessedNovember 19, 2016).

Wigmore P.M.C., Stickland, N.C. (1983): Muscledevelopment in largeandsmallpigfetuses. J. Anat. 137 235–245.

Wimmers, K., Ngu, N.T., Jennen, D.G.J., Tesfaye, D., Murani, E., Schellander, K., Ponsuksili, S. (2008): Relationshipbetweenmyosinheavychainisoformexpressionandmuscling in severaldiversepigbreeds. J. Anim. Sci. 86, 795–803.

Xiong, Y.L., Mullins, O.E., Stika, J.F., Chen, J., Blanchard, S.P., Moody, W.G. (2007): Tendernessandoxidativestability of post-mortemmusclesfrommaturecows of variousages. MeatScience, 77, 105–113.

EFFECT OF SPECIES ON CHEMICAL COMPOSITION, DRY MATTER DIGESTIBILITY, FEED INTAKE AND RELATIVE FEED VALUE OF SAINFOIN HAY

Cagri Ozgur OZKAN[1], Adem KAMALAK[2]

[1]Kahramanmaras Sutcu Imam University, Goksun Vocational School, Organic Farming Department, Kahramanmaras, TURKEY
[2]Kahramanmaras Sutcu Imam University, Faculty of Agriculture. Department of Animal Science, Kahramanmaras, TURKEY

Corresponding author e-mail: cagri@ksu.edu.tr

Abstract

The aim of the current experiment was to determine the effect of species on chemical composition and relative feed value of sainfoin hay. Species had significant effect on chemical composition, dry matter digestibility (DMD), dry matter intake (DMI) and relative feed value (RFV) of sainfoin hays. Dry matter (DM) content of sainfoin hays ranged from %22.98 to 36.01. Crude ash (CA) contents ranged from %5.52 to 8.31. Crude protein (CP) contents of sainfoin hays ranged from %12.46 to 18.59. Crude protein content of hay from O.oxyodonta was significantly lower than the others. Neutral detergent fiber (NDF) and Acid detergent fiber (ADF) contents of O.oxyodonta were significantly higher than the others. The DMD, DMI and RFV of sainfoin from O.oxyodonta were significantly lower than the other sainfoin species. As a conclusion, it is likely that sainfoin hays from O.caput-galli and O.sulphurea may provide more nutrients to ruminant animals due to their superior nutritive value. However in vivo experiment is required to be more conclusive.

Key words: *feed intake, sainfoin hay, relative feed value, digestibility*

INTRODUCTION

Forages are one of the important components of ruminants diets. Ruminants animals meet most parts of their requirements through grazing in the pasture. Sainfoin is one of the important legume species. Recently there are several researchers who carried out some investigation on the chemical composition and digestibility (Kaplan 2011, Kaplan et al. 2014) who indicated that harvesting stage and growing site had a significant effect on the chemical composition and potential nutritive value of sainfoin hays. Information about the chemical composition and nutritive value of plants would be useful in pasture management decision. Despite the importance of pasture in ruminant nutrition, there is a lack of information chemical composition and nutritive value of sainfoin species in pasture. Rohweder et al (1978) suggested that DMD, DMI and RFV of forages can be estimated using the cell wall content such as NDF and ADF contents. It is well known that NDF and ADF contents of forages are negatively correlated with nutritive value of forages. Therefore the aim of the current experiment was to determine the effect of species on chemical composition and DMD, DMI and RFV of sainfoin hays.

MATERIALS AND METHODS

Sainfoin hay *from Onobrychis caput-galli*, *Onobrychisoxyodonta* and *Onobrychissulphurea* species obtained from ten different plants at the flowering stage from excremental field in Kahramanmaras. Dry matter (DM), crude ash (CA), crude protein (CP) and ether extract (EE) contents of sainfoin hays were analyzed according to AOAC (2005). Neutral detergent fiber (NDF) and ADF contents of sainfoin hays using the method described by Van Soest and Wine (1967) and Van Soest (1963) respectively. All chemical analyses were carried out in triplicate.

RFV of sainfoin hays was calculated from the estimates of DDM and DMI (Rohweder et al 1978).
% DDM = 88.9 - (0.779 * %ADF),
DMI % of BW = 120 / %NDF,
RFV = (%DDM * %DMI) /1.29,
DDM = Dry matter digestibility,
ADF = acid detergent fibre (% of DM),
DMI = Dry matter intake (% of BW),
RFV = Relative feed value
The effect of species on chemical composition and relative feed value of sainfoin hay were determined using the one-way analysis of variance (ANOVA). Tukey's multiple range tests was employed to identify the significance between means. Mean differences were considered significant at P<0.05.

RESULTS AND DISCUSSION

The effect of species on the chemical composition of sainfoin hays is given in Table 1. Species had a significant effect on the chemical composition of sainfoin hays. Dry matter content of sainfoin hays ranged from %22.98 to 36.01. Crude ash content ranged from %5.52 to 8.31. Crude protein contents of sainfoin hays ranged from %12.46 to 18.59. Crude protein content of hay from *O.oxyodonta*was significantly lower than the others.NDF and ADF contents of *O.oxyodonta* were significantly higher than the others. The CP content of sainfoin hay from *O.caput-galli*was considerably higher than that reported by Kaplan et al. (2014) who reported that the crude protein content of sainfoin hay from*O.caput-galli*was %15.67.
ADF content of sainfoin from*O.caput-galli* was similar to that reported by Kaplan et al. (2014) who reported that ADF content was %37.33. On the other hand NDF content of sainfoin from*O.caput-galli*was significantly lower than that reported by Kaplan et al. (2014) who reported that NDF content of sainfoin hay from*O.caput-galli*was %47.73. Crude ash content of *O.caput-galli*was lower than that reported byKaplan et al. (2014) who showed that crude ash was % 7.10. On the other hand ether extract of *O.caput-galli*was higher than that reported by Kaplan et al. (2014) who showed that ether extract of *O.caput-galli*was % 1.40.

Table 1. The effect of species on the chemical composition of sainfoin hays

	Species				
	O.caput-galli	***O.oxyodonta***	***O.sulphurea***	**SEM**	***p***
DM	22.98^{c}	30.75^{b}	36.01^{a}	0.402	0.000
CA	8.31^{a}	5.52^{c}	6.65^{b}	0.167	0.000
CP	18.59^{a}	12.46^{b}	18.40^{a}	0.370	0.000
NDF	41.30^{b}	55.38^{a}	42.26^{b}	1.289	0.000
ADF	36.65^{b}	45.46^{a}	33.68^{b}	1.643	0.001
EE	1.76^{b}	2.15^{ab}	2.42^{a}	0.205	0.051

$^{ab\,c}$Row means with common superscripts do not differ (P<0.05); S.E.M. – standard error mean., CA: Crude ash(%), CP: Crude protein (%), NDF: Neutral detergent fiber (%), ADF: acid detergent fiber (%), EE: Ether extract (%).

The effect of species on dry matter digestibility, dry matter intake and relative feed value of sainfoin hays id given in Table 2. Species had significant effect on DMD, DMI and RFV of sainfoin hays. The DMD, DMI and RFV of sainfoin from *O.oxyodonta*were significantly lower than the other sainfoin hays. Species is not only factor but also harvesting stage affecting DMD, DMI and RFV of hay. Canbolat et al. (2006) showed that DMD, DMI and RFV of alfalfa hays decreased with advancing maturity. Therefore the information about factors affecting DMD, DMI and RFV of hays would be very important in pasture management decision.

Table 2. The effect of species on dry matter digestibility, dry matter intake and relative feed value of sainfoin hay

	Species				
	O.caput-galli	*O.oxyodonta*	*O.sulphurea*	SEM	p
DMD	60.34^{a}	53.48^{b}	62.65^{a}	1.278	0.000
DMI	2.90^{a}	2.16^{b}	2.84^{a}	0.076	0.000
RFV	135.97^{a}	89.89^{b}	138.25^{a}	5.752	0.000

$^{ab\,c}$Row means with common superscripts do not differ (P<0.05); S.E.M. – standard error mean., CA: DMD: Dry matter digestibility (%), DMI: dry matter intake of BW, RFV: Relative feed value.

As can be seen from Table 1 and 2, there are considerable variation among sainfoin spaces in terms of chemical composition, dry matter digestibility, dry matter intake and relative feed value. These variations among sainfoin species are possibly associated with differences in stem: leaf ratio of hays. It is well known that the leaf is very rich in protein and poor in cell wall contents when compared with stem.

CONCLUSIONS

Species had a significant effect on the chemical composition, dry matter digestibility, dry matter intake and relative feed value of sainfoin hays. It is likely that sainfoin hays from *O.caput-galli* and *O.sulphurea* may provide more nutrients to ruminant animals due to their superior nutritive value. However in vivo experiment is required to be more conclusive.

REFERENCES

AOAC. 2005. Official Methods of Analysis. 18th edn. Association of Official Analytical Chemists; Arlington, VA, USA.

Kaplan M, 2011. Determination of potential nutritive value of sainfoin (*Onobrychis sativa*) hays harvested at flowering stage. Journal of Animal and Veterinary Advances,10(15): 2028-2031.

Canbolat O, Kamalak A, Ozkan C O, Erol A, Sahin M, Karakas E, Ozkose E 2006. Prediction of relative feed value of alfalfa hays harvested at different maturity stages using *in vitro* gas production. Livestock Research for Rural Development. Volume18, Article #27. Retrieved August 3, 2018, from http://www.lrrd.org/lrrd18/2/canb18027.htm

Kaplan M, Kamalak M, Ozkan CO, Atalay A. 2014. Vejetasyon döneminin yabani korunga otunun potansiyel besleme değerine, metan üretimine ve kondense tanen içeriğine etkisi. Harran Üniversitesi Veteriner Fakültesi Dergisi, 3(1):1-5.

Rohweder DA, Barnes RF, Jorgensen N. 1978. Proposed hay grading standards based on laboratory analyses for evaluating quality. Journal of Animal Science 47, 747-759.

Van Soest, P.J., Robertson, J.B. Lewis, B.A., 1991. Methods for dietary fiber, neutral detergent fiber, and nonstarch polysaccharides in relation to animal nutrition. Journal of Dairy Science, 74(10), 3583-3597.

COMPARISON OF POISSON REGRESSION ESTIMATION METHODS

Muslume MEMIS[1], Hasan ONDER[2]

[1]Atatürk University, Faculty of Agricultural, Department of Animal Science, Yakutiye, Erzurum, TURKEY
[2]Ondokuz Mayis University, Faculty of Agricultural, Department of Animal Science, Atakum, Samsun, TURKEY

Corresponding author e-mail: muslumememis@gmail.com.tr

Abstract

The aim of many scientific studies is to explain relationships between response variable and explanatory variables with mathematical models and to acquire prudential predictions with these models. Poisson regression models are commonly used for analyzing the data based on counting processes. This study aimed to guide the researchers for determining appropriate Poisson regression estimation method (Poisson Maximum Likelihood and Generalized Linear Model). In comparison of methods, artificial data were used with sample size of 100, 500 and 1000. It was concluded that there were no differences among parameter estimation methods in terms of goodness of fit. However, it was detected that generalized linear models method was more reliable than maximum likelihood method because maximum likelihood estimator produced high standard error for the parameters. In addition, generalized linear models were more reliable for small sample sizes because of estimated lover standard errors. As a result, it was suggested that generalized linear models should be used in Poisson regression analysis.

Key words: *poisson regression, generalized linear models, maximum likelihood*

INTRODUCTION

Regression analysis, which is widely used in many fields such as biology, medicine, economics, physics, chemistry and social sciences, is a statistical analysis method which is used to model the relationship between two or more variables with causal relationship between them (Vural, 2007). Variables examined in regression analysis may be continuous or intermittent, and different regression models should be used depending on the data structure (Özarıcı, 1996). The main purpose of regression analysis which is to explain the relationship between response variable and explanatory variables with mathematical model, to use these models to obtain forecasts for the future. There are many statistical methods developed in this regard (Karadavut et al., 2005) and the data structure that has the basic criterion variables in selecting the method to be used. The Poisson regression model is widely used in many areas in the analysis of data obtained based by count. Poisson regression analysis explains the relationship between explanatory variables and response variability based on counting. In the Poisson regression, the link function connecting the linear structure of the explanatory variables to the expected value of the response variable is expressed by the logarithmic transformation (Frome, 1983). Analyzes using linear regression are problematic in two respects if data are interrupted in some studies. The first one is the estimation of the negative parameter which is not possible theoretically and the second is that the distribution is skewed to the right because most of the values are zero (Frome et al., 1973, Cox, 1983; SAS, 2005).

MATERIALS AND METHODS

The data used in the study was artificially produced in sized of 100, 500 and 1000 samples using MINITAB 12.0. The obtained data were reanalyzed by the Kolmogorow-Smirnow single sample test and the suitability for Poisson distribution was tested. The first type error values obtained for sample size according to the analysis results are obtained as 0.997, 0.965 and 0.975 respectively and it is understood that the produced data show Poisson distribution.

The Poisson regression is applied to the problems in the explanatory variables determined during the events that occur during the desired time period to be examined. The model that due to contents of the discontinuous and nonnegative countable data, is based on the assumption that the logarithms of the expected numbers are a linear function of the exponential variables. There are cases where the response variable has an intermittent value such as 0, 1, 2, ..., n but is not categorical. The intermittent and uncategorized response-variable model associated with rare events is called the Poisson regression model under some assumptions. This model is mainly used to analyze counting data (Akın, 2002). Although the model is an exponential model, it is a disadvantage of creating difficulties and complexity in coefficient interpretation, the response is a model that can be an alternative to linear regression analysis in cases where the variable consists of counting data (Deniz, 2005). The Poisson regression is the second generalized model, which is most common after the logistic regression. The most prominent feature of this model is that the mean and the variance are equal. In most applications, however, this equality is not possible. Poisson distribution; it is known as overdispersion that the variance is larger than the average and underdispersion when the variance is smaller than the average. The Y dependent variable, which is the number of events of interest in the Poisson regression; assuming that the independent variables are given, have Poisson distribution. In this case, the Poisson mean μ is assumed to be a linear function of the independent variables of the logarithm (SAS, 2005; Yeşilova et al., 2006). Poisson regression model according to the function;

$$\log(\mu) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \ldots + \beta_m X_m \quad 1$$

is given the form. Equation μ is an exponential function of independent variables. The μ;

$$\mu = \exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 \ldots + \beta_m X_m) \quad 2$$

can be written in the form. The Poisson distribution is as given below;

$$P(y;\mu) = \frac{\mu^y e^{-\mu}}{y!}, \; y = 0, 1, 2, \ldots \quad 3$$

In this equation, y_i is the number of occurrences of the desired events, and the parameter of the distribution is μ_i. $E(y_i) = \mu_i$ is the conditionally expected value of the Poisson distribution. The Poisson regression model is obtained when μ_i is defined depending the explanatory variables. μ_i is usually defined as $\mu_i = e^{x'\beta}$. Here, x is the vector of explanatory variables and β is the parameter vector to be estimated. Average of Poisson distribution;

$$\mu_i = E(y_i / x_i) = \exp(x_i'\beta) \quad 4$$

is shown shaped. In statistical literature this model is expressed as log-linear model. The mean-variance is equal in the Poisson distribution each other.

$$\mu_i = E(y_i / x_i) = V(y_i / x_i) \quad 5$$

Equality of mean and variance is called equal spread. In practice, however, counting variables are usually over-dispersed because they have a greater variance than the average.

In the Poisson regression analysis, the method of calculating the $\hat{\beta}$ estimators varies according to the distribution of the response variable y_i. The most likelihood method and the generalized linear model are the most commonly used and most known of these methods. The standard estimator of the Poisson regression model is the Maximum Likelihood estimator. For independent observations, maximum likelihood function;

$$L(y,\beta) = \prod_{i=1}^{n} f(y_i) = \prod_{i=1}^{n} \frac{e^{-\mu_i}\mu_i^{y_i}}{(y_i)!} = \frac{\left(\prod_{i=1}^{n}\mu_i^{y_i}\right) e^{-\sum_{i=1}^{n}\mu_i}}{\prod_{i=1}^{n}(y_i)!} \quad 6$$

ıs given the form. Log-likelihood function;

$$\ell(\beta) = \sum_{i=1}^{n} y_i x_i'\beta - \sum_{i=1}^{n} e^{x_i'\beta} - \sum_{i=1}^{n} \ln(y_i!) \quad 7$$

it becomes like the equation (Arıcan,2010). According to this, the Poisson MLE $\hat{\beta}_p$ value;

$$\sum_{i=1}^{n} x_i (y_i - \exp(x_i'\beta)) = 0 \quad 8$$

calculated from the equation. $\hat{\beta}$ is calculated by taking the derivative from the first degree (order). The variance value, in the direction of the applied models and the information given is calculated from the following formula (Deniz, 2005).

$$V_{ML}\left[\hat{\beta}_P\right] = \left(\sum_{i=1}^{n} \mu_i x_i x_i'\right)^{-1} \quad 9$$

GLM makes parameter estimation by the ML method based on the original distribution of the data with the standard linear model given (Yeşilova et al., 2006). Probability density function of observation values in GLM;

$$f(y_i, \theta_i, \phi) = \exp\left\{\left[\frac{y_i\theta_i - b(\theta_i)}{\alpha(\phi)}\right] + c(y_i, \phi)\right\} \quad 10$$

is as above. a b and c determine what the distribution is. Here, θ is the natural and ϕ is scale parameter. The Poisson estimator $\hat{\beta}_{GLM}$, calculated with the help of generalized linear models, is calculated from the following equation (Cameron ve Trivedi, 1998).

$$\sum_{i=1}^{n} \frac{1}{\phi}(y_i - \exp(x_i'\beta))x_i = 0 \quad 11$$

Variance is calculated from the following equation.

$$V_{GML}\left[\hat{\beta}_P\right] = \phi\left(\sum_{i=1}^{n} \mu_i x_i x_i'\right)^{-1} \quad 12$$

In linear regression models, the criterion to which the regression line is compatible with the data can be named as the goodness of fit of adaptation of a regression line adapted to a data set (Gujaratti, 1999). After the parameters are estimated, the distributions of the observations around the shape of the model should be measured. Because the closer the observations are to the predicted model, will be the better the goodness of fit of the model. In testing the goodness fit of the Poisson regression model; Pearson χ^2, deviation statistic, artificial R^2 measurement, Akaike Information Measure (AIC) and Bayes Information Measure (BIC) are widely used criteria.

RESULTS AND DISCUSSION

According to the analysis results obtained for 100, 500 and 1000 sample sizes using artificial data; the regression constant, regression coefficient, belong to this standard error values and related coefficients significance test statistics produced by maximum likelihood (ML) and generalized linear models (GLM) methods It is given in Table 1.

Table 1. Analysis results obtained from Poisson regression methods for different sample sizes**.**

	S		C	Standard error	χ^2	*P*
ML	N=100	b_0	1.1953	0.1441	68.77	<0.0001
		b_1	0.5820	0.0793	53.90	<0.001
	N=500	b_0	1.2061	0.0673	321.46	<0.0001
		b_1	0.5730	0.0366	244.88	<0.0001
	N=1000	b_0	1.1756	0.0470	625.71	<0.0001
		b_1	0.5901	0.0257	528.80	<0.0001
GLM	N=100	b_0	2.3590	0.0231	10472.9680	<0.0001
		b_1	0.5820	0.0479	147.403000	<0.0001
	N=500	b_0	2.3520	0.0105	50488.4750	<0.0001
		b_1	0.5730	0.0229	623.720000	<0.0001
	N=1000	b_0	2.3560	0.0072	108309.602	<0.0001
		b_1	0.5900	0.0154	1462.52700	<0.0001

S=Sample size, ML=maximum likelihood, GLM=generalized
linear models, C= coefficients

When Table 1 is examined, it is seen that b_0 values, which are regression constants of Poisson maximum likelihood and Poisson generalized linear model methods, show numerical differences but they produce the same results in terms of regression coefficient b_1 values. However, when the values of the parameter importance test are examined, it is observed that the values obtained from the GLM method are much higher than those obtained from the ML method and they are compatible with the results of Demidenko (2007). This is the case with Russo et al. (2012) suggests that the type I error probability is much lower in the results obtained by the GLM method than in the ML method.

The standard error values for b_0 and b_1, in order to better interpret the standard error values of the coefficients as suggested by Demidenko (2007), are plotted respectively in Figure 1 and Figure 2. When Figure 1 and Figure 2 are examined, it is observed that as the sample size increases, the standard error values for b_0 and b_1 decrease as expected for both methods. For both coefficients, it is seen that standard error values obtained from GLM method obtained lower than as to obtained ML method in all sample sizes. Russo et al. (2012) also showed that the type I error probability is much lower in the results obtained by the GLM method than in the ML method. Faria and Soromenho (2012) stated that the standard error values obtained from the ML method are higher and support the present results. Additionally, when Figure 1 is examined that the standard error value obtained for b_0 shows a rapid decrease in the ML method depending on the sample size but it is understood that the standard error values obtained from the GLM method are shown to be lower depending on the sample size. In Figure 2, it can be said that the standard error values obtained for b_1 are similar for both methods depending on the sample size, which suggests that the GLM method can also make more reliable estimates for small sample sizes. The reason of this as demonstrated by Oral (2011) study may be due to the fact that the GLM method which uses canonical linking functions is more reliable, The GLM method is basically based on the ML method and results in iteration (Bolker et al., 2009). Russo et al. (2012) reported that both methods gave the same results in the case of large specimens, but the GLM method is more reliable and supports the current research findings.

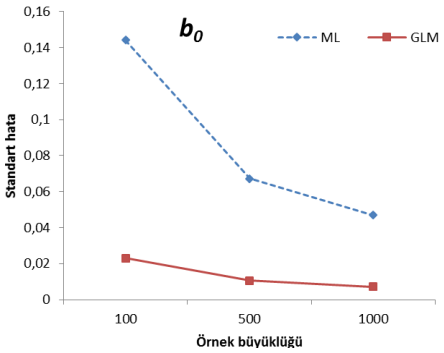


Figure 1. Standard error values obtained from ML and GLM methods for b_0 in different sample sizes.

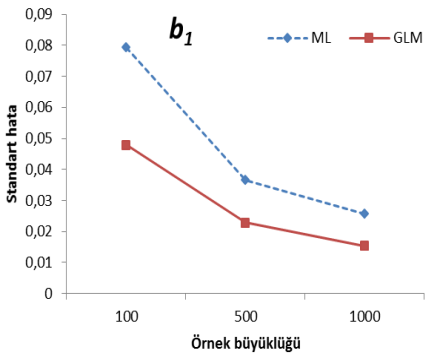


Figure 1. Standard error values obtained from ML and GLM methods for b_1 in different sample sizes.

The model fit goodness statistics used to compare ML and GLM methods are given in Table 2. The results of the deviation statistic, Pearson, AIC and BIC measures were evaluated for testing the fit of the regression model. That the propagation parameters obtained in both methods have values around 0.3 and in this case It is clear said that Poisson's regression analysis is an appropriate method. When the AIC and BIC criteria are examined, it is observed that there is no difference in the goodness of fit between the two methods at different sample sizes. When the standard error values produced by both methods are interpreted, it can be said that the GLM

method can be suggested as described by Wang and Fameo (1997).

CONCLUSIONS

When the results of this study are examined, it is seen that values obtained from the maximum likelihood and the generalized linear model methods are the same in estimating b1 coefficients in all sample sizes. Comparing the models according to AIC and BIC values, it can be said that the two methods are similar in terms of the goodness of fit. However, the fact that the standard error values of the coefficients obtained from the GLM method are lower and this method can make estimates with lower standard error in the case of the small sample shows that in the present of the response variable obtained by counting the GLM method can be suggested for the Poisson regression analysis. In future studies on the subject, it can be said that the effects of measurement errors and the evaluation of extreme or low spread situations will be useful.

Table 2. Goodness of model fit results for different sample sizes

	S	Sapma Yayılım Parametresi(ϕ)	Pearson χ^2 Yayılım Parametresi(ϕ)	AIC	BIC
ML	N=100	0.3685	0.3657	439.30680	444.5172
	N=500	0.3856	0.3926	2198.8691	2207.2983
	N=1000	0.3587	0.3616	4360.0526	4369.0646
GLM	N=100	0.368	0.366	439.307	444.517
	N=500	0.386	0.393	2199.3	2207.3
	N=1000	0.359	0.362	4360.3	4370.3

S=Sample size, ML=maximum likelihood, GLM=*generalized linear models, AIC= Akaike Information Measure, BIC= Bayes Information Measure.*

REFERENCES

Akın, F., 2002. Kalitatif Tercih Modelleri Analizi, Bursa, Ekin Kitabevi, s.125.

Arıcan, E., 2010. Nitel Yanıt Değişkene Sahip Regresyon Modellerinde Tahmin Yöntemleri, Çukurova Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi.

Bolker, B. M., Brooks, M. E., Clark, C. J., Geange, S. W., Poulsen, J. R., Stevens, M. H. H., White, J. S., 2009. Generalized linear mixed models: a practical guide for ecology and evolution. Trends in Ecology and Evolution, 24(3): 127 – 135.

Cameron, A. C., Trivedi, P. K., 1998. Regression Analysis of Count Data. Cambridge UniversityPress. s. 411, UK.

Cox, R., 1983. Some Remarks on Overdispersion. Biometrika, 70: 269-274.

Demidenko, E., 2007. Poisson Regression for Clustered Data. International Statistical Review, 75(1): 96–113.

Deniz, Ö., 2005. Poisson Regreyon Analizi, İstanbul Ticaret Üniversitesi Fen Bilimleri Dergisi, 4(7): 59-72.

Faria, S., Soromenho, G., 2012. Comparison of EM and SEM Algorithms in Poisson Regression Models: A Simulation Study. Communications in Statistics - Simulation and Computation, 41: 497–509.

Frome, E. D.,Kutner, M. H., Beauchamp, J. J., 1973. Regression Analysis of Poisson-Distributed Data. Journal of American Statistical Association, 68(344): 935-940.

Frome, E. L., 1983. The Analysis of Rates Using Poisson RegressionModels, Biometrics, 39:665-674.

Gujaratti, D. F., 1999. Temel Ekonometri, Çev. Ümit Şenesen ve Gülay Günlük Şenesen, İstanbul: Literatür Yayıncılık, s. 74.

Gürsakal, N., 1997. Bilgisayar Uygulamalı 1, Bursa: Marmara Kitabevi, s. 238.

Karadavut, U., Genç, A., Tozluca, A., Kınacı, İ., Aksoyak, Ş., Palta, Ç., Pekgör, A., 2005. Nohut (Cicer Arietinum L.) Bitkisinde Verime Etki Eden Bazı Karakterlerin Alternatif Regresyon Yöntemleriyle Karşılaştırılması. Tarım Bilimleri Dergisi 2005, 11 (3) 328-333.

Oral E., 2011, Parameter Estimation in Generalized Linear Models through Modified Maximum Likelihood, Bulletin of the International Statistical Institute.

Özarıcı, Ö. 1996. Farklı Not Sistemlerinde Öğrencinin Başarılı Olma OlasılığınınProbit Regresyon Analiziyle değerlendirilmesi, Osmangazi Üniversitesi Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi.

Russo, S., Flender, D., da Silva, G. F., 2012. Poisson Regression Models for Count Data: Use in the Number of Deaths in the Santo Angelo (Brazil). Journal of Basic & Applied Sciences, 8: 266 – 269.

SAS, 2005. SAS/STAT Software: Hangen and Enhanced. SAS, Inst. Inc., USA.

Yeşilova, A., Yılmaz, A., Kaki, B., 2006. Norduz Erkek Kuzularının Bazı Kesikli Üreme Davranış Özelliklerinin Analizinde Doğrusal Olmayan Regresyon Modellerin

Kullanılması, Yüzüncü Yıl Üniversitesi, Ziraat Fakültesi, Tarım Bilimleri Dergisi (J. Agric. Sci), 16(2):87-92.

Vural, A. 2007. Aykırı Değerlerin Regresyon Modellerine Etkileri ve Sağlam Kestiriciler. Marmara Üniversitesi, Sosyal Bilimleri Enstitüsü, Yüksek Lisans Tezi, İstanbul.

Wang, W., Famoye F., 1997. Modeling Household Fertility Decisions With Generalized Poisson Regression. J Popul Econ, 10: 273-283.

EFFECT OF FLUSHING ON FERTILITY OF HEAT SYNCHRONIZED HAIR GOATS IN SEASON

Emre SIRIN[1], Ercan SOYDAN[2], Ugur SEN[2]

[1]Ahi Evran University, Agricultrual Faculty, Department of Agricultural Biotechnology, 40250, Kırşehir, TURKEY
[2]Ondokuz Mayıs University, Agricultrual Faculty, Department of Agricultural Biotechnology, 55200, Samsun, TURKEY

Corresponding author e-mail: ugur.sen@ahievran.edu.tr

Abstract

The aim of this study was to determine the effect on fertility of flushing at heat synchorized Hair Goats in season. The goats are divided into two groups which control (n=175) and flushing (n=125). Flushing group was fed wheat (200 gr/head) during 30 days before heat synchronization. All Hair goats was synchronized as follow; intravaginal sponge (30 mg flugestone acatate) for 14 days followed by an IM injection 600 IU PMSG. In groups (control and flushing) were determined single, twin, triplet and quadruple birth rate 49, 42 %, 39, 41 %, 11, 15 % and 1, 2 % respectively (P>0.05). As a result, it has been determined that flushing application has no effect on fertility when heat synchronization is performed.

Key words: *hair goats, flushing, heat syncronization, PMSG, birth rate*

INTRODUCTION

Turkish Hair goat is a breed dating back to history of Anatolia and integrated with these territories. Turkish Hair goat is regarded not only as a farm animal in Anatolia but also as a piece of the system from which numerous cultural values are originated. In Turkey, Turkish Hair goat is the most raised goat breed, supposing 98.2% of more than 10 million goats. Turkish Hair goats are raised in every part of Anatolian geography and are also identified with extensive breeding. It can maintain its life under mountain, plateau, and plain conditions and in pastures, meadow, forest, brush, and maquis areas. Its enormous ability of adaptation has allowed this goat to live in such wide areas. Both its survival and productivity in an environment where no other farm animals can inhabit indicate its endurance under the harshest conditions (Elmaz and Saatci, 2018)

Synchronization of estrus is a useful tool for improving and maintaining the production of milk and meat, as well as reducing the labour force or cost, shortening the breeding season, throughout the year in goat farms (Nur et al. 2013, Andrabi et al. 2015). Additionally, estrus synchronization in goats is practical for optimizing the function of reproduction (Ahmad et al. 2014). Therefore, estrus synchronization is extensively applied in the reproductive management of goats. Intravaginal sponge containing progesterone applications in small ruminants include goat are used worldwide for synchronization and/or the induction of estrus (Kridli et al. 2002). Flugestone acetate is a synthetic analogue of progesterone and used for estrus synchronization of goats throughout the breeding and non-breeding periods. Additionally, intramuscular injection of a pregnant mare's serum gonadotropin (PMSG) at withdrawal of progestagen sponge is used for multi-ovulation (Nasr et al. 2002, Whitley & Jackson, 2004). However, multi-ovulation causes multiple gestations and may increase the mortality rate of kids due to low birth weight or insufficient milk production by the mother for the consumption of each kid in equal amounts or insufficient maternal care.

Productivity of goats is fostered by the efficient utilization of nutrients which is possible with an adequate supply of energy. Energy requirements are affected by age, body size, physiological state,

environmental factors, hair growth, muscular activity, and relationships with other nutrients. Weather conditions such as temperature, humidity, sunshine, and wind velocity may increase or decrease energy needs depending upon the region. Stress of any kind may increase energy requirements (NRC 1981). Although goats tolerate high temperatures and humidity of the tropics, they do experience reproductive problems associated with nutritional deficiencies, particularly from low quality forages. In a grazing situation, animals having the highest nutritional requirements should have access to lush, leafy forage or high quality browse. Additionally, goats should be supplemented with a concentrate feed when the forage that they are grazing does not contain the necessary nutrients to cover their nutritional requirements (Luginbuhl and Poore 1998). Deposition of lipids is the main form of energy storage in goats and is important in determining body condition score (BCS). When goat nannies present poor BCS, they often have low conception rates, low twinning rates and kids with low birth and weaning weights (Cissé et al 1992; Luginbuhl 1998). Goats lose body condition with the progressive deterioration of pasture in the dry season. This condition can be improved with a sufficient level of concentrate supplementation. A common practice in females of different species is to prepare them for the breeding season by flushing. In goats, this practice consists of an increase in the level of energy offered from prior to introduction of the buck to until approximately 21 days thereafter (Luginbuhl and Poore 1998). Several studies in small ruminants have shown that with flushing ovulation and fetal implantation in the uterus are improved (Kusina et al 2001; Acurero 2000; Martínez et al 1986).

There have been numerous studies investigating the effects of estrus synchronization on reproductive performance such as estrus behaviour, ovulation rate, fertility, gestation rate and kidding rate. However, to our knowledge, no studies determining the effect of estrus synchronization on parturition and kidding characteristics and mortality rates of both goats and kids have been reported. The objective of the present study was therefore to determine the effect of flushing on fertility of synchronized Hair goats in breeding season.

MATERIALS AND METHODS

The study was conducted within the normal seasonal breeding cycle of hair goats in Turkey (September). Experimental animals, ranging from 2 to 4 years of age, were obtained from a private farm in Amasya, Turkey. The goats are divided into two groups which control (n=175) and flushing (n=125). Flushing group was fed wheat (200 gr/head) during 30 days before heat synchronization. All Hair goats was synchronized as follow; intravaginal sponge (30 mg flugestone acatate) for 14 days followed by an IM injection 600 IU PMSG. . Fortyeight hours after removing the sponges, all goats including goats in groups were introduced to Hair bucks (approximately 1 buck for every 25 goats). Birth types (quadruplets, triplets, twins and single) of kids were recorded immediately after kidding.

All data have benn applied to proportions in MINITAB 12.0.

RESULTS AND DISCUSSION

Birth types rate of Hair goats in estrus synchronization programmes is shown in Table 1.

Table 1. Birth types rate of Hair goats in estrus synchronization programmes

Traits	Groups	
	Control	Flushing
Single	49	42
Twice	39	41
Triplet	11	15
Quadruple	1	1

The birth types rate of goats in all groups was similar (P>0.05).

The intravaginal progesterone sponge has been the most common choice of treatment for estrus synchronization of small ruminants in the world (Freitas et al. 1997). These sponges usually contain about 30–40 mg of synthetic progesterone and are left in place for 9–12 days (Wildeus, 2000). The most common synthetic progesterone used in sponges is flugestone acetate (Whitley & Jackson 2004). In order

to improve the success, sponges are widely used with PMSG for tighter synchronization and/or to induce a superovulatory response (Wildeus 2000, Whitley and Jackson, 2004). There was no significant difference between flushing treatments in number of kids born per animal (Acerro-cemelo et. al. 2008). In this study, flushing did not affect the birth type rates. In conclusion, birth types are effected by flushing in hair goats.

REFERENCES

Acero-Camelo A. Valencia E. Rodríguez A. and Randel PF. 2008. Effects of flushing with two energy levels on goat reproductivePerformance. Livestock Research for Rural Development 20 (9), p:1-8.

Acurero M. 2000. Estrategias de suplementación en ovejas. Centro de Investigaciones Agropecuarias del Estado de Zulia. FONAIAP Divulga No. 66

Ahmad N, Javed K, Abdullah M, Hashmi AS, Ali A. 2014. Estrus induction in beetal goats during lowbreeding season. J Anim Plant Sci. 24(5):1283–1287.

Andrabi SMH, Anwar M, Mehmood A. 2015. Efficacy of short-term estrus synchronization protocols and timed artificial nsemination in subtropical goats. J Anim Plant Sci 25(1):298–300.

Cissé M, M'Baye I, Sane I, Corréa A. and N'Diaye I. 1992. Seasonal changes in body condition of the Senegalese Sahel goat: relationship to reproductive performance. Proceedings of the Second Biennial Conference of the African Small Ruminant Research Network AICC, Arusha, Tanzania 7-11 December/1992 http://www.fao.org/Wairdocs/ILRI/x5472B/x5472b0y.htm

Elmaz Ö. And Saatçi M., 2018. Turkish Hair Goat, the Main Pillar of Goat Population in Turkey. Sustainable Goat Production in Adverse Environments: Volume II pp 113-130.

Freitas VJF, Baril G, Saumande J. 1997. Estrus synchronization in dairy goats: use of fluorogestone acetate vaginal sponges or norgestomet ear implants. Anim Reprod Sci. 46(3–4):237–244.

Kridli RT, Abdullah AYM, Husein Q. 2002. Protocols for estrus synchronization in awassi ewes under arid environmental conditions. Asian Australas J Anim Sci. 15(7):957–962.

Kusina N T, Chinuwo T, Hamudikuwanda H, Ndlovu L R and Muzanenhamo S. 2001. Effect of different dietary energy levelintakes on efficiency of estrus synchronization and fertility in Mashona goat does. Small Ruminant Research 39 (3):283-288

Luginbuhl JM. 1998. Preparing meat goats for the breeding season. North Carolina State University College of Agriculture and Life Sciences. ANS 00-602MG. Raleigh, NC.

Luginbuhl JM and Poore M. 1998. Nutrition of Meat Goats. Department of Animal Science, North Carolina State University.Raleigh, NC.

Martínez de Acuero M, Mazzarri G, Rodríguez J, Quintana H and Chicco C. 1986. Suplementación energética y proteica pre-servicio en ovejas west african. Zootecnia Tropical, Volume 4 (1 y 2):19-28 http://www.ceniap.gov.ve/pbd/RevistasCientificas/ZootecniaTropical/zt0412/texto/suplementacion.htm

Nasr RE, Haddad SG, Al-Karablieh EK. 2002. Economic assessments of hormonal and nutritional treatments for improvement of Awassi sheep production in Jordan. Asian Australas J Anim Sci. 15(8):1110–1114.

Nur Z, Nak Y, Nak D, Ustuner B, Tuna B, Simsek G, Sagirkaya H. 2013. The use of progesterone-supplemented co-synch and Ovsynch for estrus synchronization and fixed-time insemination in nulliparous Saanen goat. Turkish J Vet Anim Sci. 37:183–188.

Whitley NC, Jackson DJ. 2004. An update on estrus synchronization in goats: A minor species. J Anim Sci. 82:270–276.

Wildeus S. 2000. Current concepts in synchronization of estrus: Sheep and goats. J Anim Sci. 77:1–14.

COMPARATIVE EFFECT OF TWO PROGESTERONE SOURCES ON REPRODUCTIVE PERFORMANCE, LAMB BIRTH WEIGHT AND LAMB SURVIVAL RATE IN AKKARAMAN EWES

Ugur SEN[1], Emre SIRIN[2]

[1]Ondokuz Mayis University, Faculty of Agriculture, Department of Agricultural Biotechnology, 55139, Samsun, TURKEY
[2]Ahi Evran University, Faculty of Agriculture, Department of Agricultural Biotechnology, 40100 Kirsehir, TURKEY

Corresponding author e-mail: ugur.sen@omu.edu.tr

Abstract

The aim of this study was to compare the effect of two progesterone sources (natural and synthetic) on reproductive performance, lamb birth weight and lamb survival rate in Akkaraman ewes. A total of 40 Akkaraman sheep breed, ranging from 2 to 3 years of age, with similar live weights (51.3 ± 1.5 kg) and body condition score (2.95 ± 0.15) was used as experimental animals. Ninety-six hours prior to estrus synchronization application, intramuscular injection of 1 cc PGF2α was performed to lutalyse the corpus luteum on the ovary in all ewes. The ewes were allocated randomly into two groups according to body weight. Estrus of ewes in the first group (n=15) were synchronized with intra-vaginal CIDR device containing 0.30 g natural progesterone. Estrus of ewes in the second group (n=25) were synchronized with intra-vaginal sponges containing 30 mg flugestone acetate. CIDR and sponges were withdrawn following 12 days and 600 IU PMSG were injected intramuscularly. After 24 hours from PMSG injection, all ewes were introduced to Akkaraman rams and ewes in estrus were recorded. Birth types, body weight and the sex of lambs were recorded within 12 h after parturition in both groups. Pregnancy rate, length of pregnancy, lambing period were calculated for ewes in both groups. Additionally, the survive rate of lambs until the weaning age was determined in both groups.There were no significant differences between natural and synthetic progestagen applications in terms of estrus rate, pregnancy rate, length of pregnancy and lambing periodin Akkaraman ewes. Additionally, lamb birth weight and lamb survival rates were similar in both experimental groups. However, application of natural progestagen increased total and multiple lamb birth rates of Akkaraman ewes (P<0.05). These results show that application of natural progestagen with PMSG may increase multiple lamb birth rate of Akkaraman ewes in breeding season.

Key words: *Akkaraman, estrus synchronization, progesterone sources, reproductive performance, lamb production*

INTRODUCTION

Ewes show seasonal reproductive activity, returning to cyclicity after the summer solstice due to an increase in melatonin secretion by the pineal gland, which is higher during periods of declining daylight (Boland et al., 1990; Dogan and Nur, 2006). In the longer days of spring, there is a break in the reproductive period, whereas the shorter days of autumn are associated with the onset of estrus (Dogan and Nur, 2006). Thus, reproductive seasonality is an important factor that limits the productivity of small ruminants (Zarazaga et al., 2003).

There are various techniques to control the estrus cycle in small ruminants, such as light manipulation, the male effect, hormone treatments with progesterone, prostaglandin ($PGF_{2\alpha}$), follicle stimulating hormone (FSH), pregnancy mare serum gonadotropin (PMSG), equine chorionic gonadotropin (eCG)and gonadotropin-releasing hormone (GnRH) (Boland et al., 1990, Keisler and Buckrell, 1997; Wildeus, 2000; Iida et al., 2004; Santos et al., 201; Sen and Onder, 2016).

Synchronization of estrus is a useful tool for improving andmaintaining improve the reproductive efficiency and the production of milk and meat, as well as reducingthe labour force or cost, shortening the breeding season, throughout the year in herds and flocks (Ozyurtlu et al., 2008; Andrabiet al. 2015; Sen and Onder, 2016).

In the ewes a number of estrus synchronization methods are applied, but the success rate in these applications may vary. The main cause of these variations in estrus synchronization applications is the different physiological and endocrinal (hormonal) responses that animals exhibit against these applications.

Generally, synthetic pre-material hormones as progesterone such as medroxyprogesteron acetat, chlormadinon acetat, flugeston acetate are used in ewe for estrus synchronization, and the effects of these hormones may vary. Therefore, determining the hormonal response of animals against natural progesterone hormone containing applications is important for determining reproductive performance.

For all these reasons, the aim of this study was to compare the effect of two progesterone sources as natural and synthetic on reproductive performance, lamb birth weight and lamb survival rate in Akkaraman ewes.

MATERIALS AND METHODS

Estrus of Akkaraman ewes, which had similar age (ranging from 3 to 4 years of age), body weight (51.3 ± 1.5 kg) and body condition score (2.95 ± 0.15), were synchronized at the breeding season (September, n = 40) of sheep in Turkey. Ninety-six hours prior to of estrus synchronization in both seasons, intramuscular injection of 1 cc $PGF_{2\alpha}$ was performed to lutalyse the corpus luteum (CL) on the ovary in all ewes.

The ewes were allocated randomly into two groups according to body weight. Estrus of ewes in the first group (n=15) were synchronized with intra-vaginal CIDR device containing 0.30 g natural progesterone. Estrus of ewes in the second group (n=25) were synchronized with intra-vaginal sponges containing 30 mg flugestone acetate.

CIDR and sponges were withdrawn following 12 days and immediately 600 IU PMSG were injected intramuscularly.After 24 hours from PMSG injection, all ewes were introduced to Akkaraman rams and ewes in estrus were recorded in both groups.

Birth types (twins and single), body weight and the sex of lambs were recorded within 12 hafter parturition in both groups. Estrus rate; (estric ewes / all ewes) × 100, length of pregnancy, pregnancy rate;(ewes lambing / ewes mated) × 100, lambing rate and lambing period were calculated for ewes in both groups. Additionally, the survive rate of lambs until the weaning age was determined in both groups.

To analyse the data, Mann-Whitney U-test and one-way ANOVA were performed according to the structure of the data by use of the SPSS 17.0 package program (SPSS, Chicago, IL, USA).

RESULTS AND DISCUSSION

Some reproduction characteristics of estrussynchronized Akkaraman ewes with natural and synthetic progesterone applications are presented in Table 1.

In the present study, sponge drop was observed in 12% ($P < 0.05$), while CIDR drop was not observed during the application of estrus synchronization (12 days).

There was no differences between the experimental groups in terms of the estrus and pregnancy rate, but it was found that the total (106.7% and 81.8%) and twin lambing (45.5% and 20.0%) rates were higher in ewes treated with natural progesterone than those of ewes treated synthetic progesterone ($P < 0.05$).

In addition, the rate of sinle lambing (54.6% and 80.0%) was found to be lower in sheep treated with natural progesterone than in sheep treated with synthetic progesterone ($P < 0.05$). There was no significant difference between the experimental groups in terms of the survive rate of lambs until the weaning age. The results of the present study are consistent with the studies of Başaran and Dellal (1996), Fukui et al. (1999), Kutluca (2009).

Table 1. Some reproduction characteristics of estrussynchronized Akkaraman ewes with natural and synthetic progesterone applications

Traits (%)	NP (n=15)	SP (n=25)
CIDR or Sponge drop	0/15 (0.0)[b]	3/25 (12.0)[a]
Estrus rate	12/15 (80.0)	17/22 (77.3)
Pregnancy rate	11/12 (91.6)	15/17 (88.2)
Lambing	16/15 (106.7)[a]	18/22 (81.8)[b]
Twin lambing	5/11 (45.5)[a]	3/15 (20.0)[b]
Single lambing rate	6/11 (54.6)[b]	12/15 (80.0)[a]
Survive rate of lambs	2/16 (12.5)	2/18 (11.1)

[a,b] The differences indicated by different letters on the same line are significant
NP= natural progesterone, SP = syntheticprogesterone

Lamb birth weight of estrussynchronized Akkaraman ewes with natural and synthetic progesterone applications are presented in Figure 1. There was no significant differencesbetween the experimental groups in terms of lamb birth weights in the present study.
Mean lamb birth weights of ewes in the natural progesterone group were 4.8 ± 0.14 kg and mean lamb birthweights of ewes in the synthetic progesterone group were 4.6 ± 0.13 kg. The results of the present study are consistent with the studies of Ülker ve ark. (2004), Kutluca (2005) and Kutluca (2009).

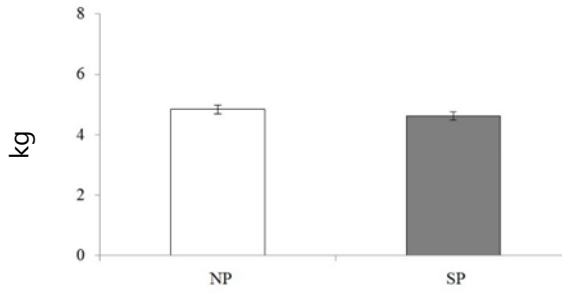


Figure 1. Lamb birth weight of estrussynchronized Akkaraman ewes with natural and synthetic progesterone applications.
NP= natural progesterone, SP = synthetic progesterone

Pregnancy length of estrussynchronized Akkaraman ewes with natural and synthetic progesterone applicationsare presented in Figure 2. Godfrey et al. (1997) reported that CIDR application for estrus synchronization resulted in shorter pregnancy length. However, there was no significant differencesbetween the experimental groups in terms ofpregnancy lengthin the present study. In the group treated with natural progesterone, the pregnancy lengthwas 146 days and the pregnancy lengthwas 149 days in the group treated with synthetic progesterone treatment. The results of the present study are consistent with the studies of Zarkawi (2001), Ülker et al., (2004) and Timurkan (2005).

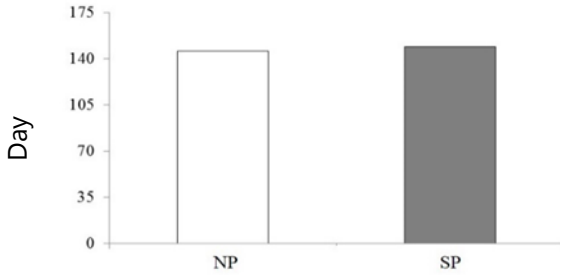


Figure 2. Length of pregnancy of estrussynchronized Akkaraman ewes with natural and synthetic progesterone applications.
NP= natural progesterone, SP = synthetic progesterone

Lambing period of estrussynchronized Akkaraman ewes with natural and synthetic progesterone applicationsare presented in Figure 3. There was no significant differencesbetween the experimental groups in terms of Lambing period in the present study. In natural progesterone treatment group lambing period was 18 days and synthetic progesterone treatment group lambing period was 20 days. The results of the current study were found to be higher than the studies of Aşkın (1982), Başaran (1995) and Başaran and Dellal (1996). These differences may be due to the different sheep breed used in the present study or different breeding season.

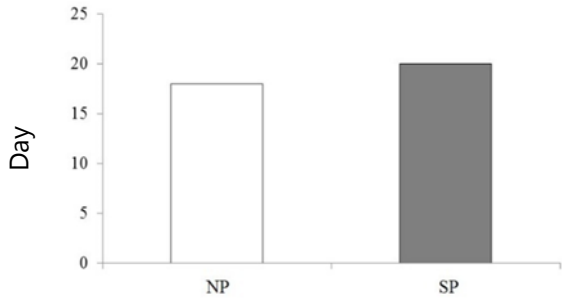


Figure 3. Lambing period of estrussynchronized Akkaraman ewes with natural and synthetic progesterone applications.
NP= natural progesterone, SP = synthetic progesterone

The results of present study determined that natural and synthetic progesterone sources could be used for estrus synchronization combined with PMSGin Akkaraman sheep breed. However, the application of CIDR containing natural progesterone with PMSG increases the success rate of lambing and twinningin Akkaraman sheep breed. Additionally, CIDR device is preferred to the Akkaraman sheep due to it did not drop during the application. Moreover, the results of present study maymade main data and reference to future studies on natural progesterone applications in sheep.

REFERENCES

Andrabi SMH, Anwar M, Mehmood A. 2015. Efficacy of short-term estrus synchronizationprotocols and timed artificial insemination in subtropicalgoats. J Anim Plant Sci, 25(1):298–300.

Aşkın Y. 1982. Synchronization of estrus by utilizing exogen hormone in Akkaraman and Anatolian Merino sheep and possibility of control of progeny yield. Ankara University, PhD thesis.

Başaran D. 1995. Synchronization of estrus by utilizing exogen hormone in Awassisheep and possibility of control of progeny yield. Ankara University, PhD thesis.

Başaran, D, Dellal, G. 1996. Possibility of increasing the fertility and control of estrus by using Progestagen and PMSG in Akkaraman sheep. Turkish JVetAnimSci, 21: 3.

Boland MP, Crosby F, O'Callaghan D. 1990. Artificial control of the breeding season in ewes. Irish Vet J, 43:2-6.

Dogan I, Nur Z. 2006. Different estrous induction methods during the non-breeding season in Kivircik ewes. Vet Med, 51: 133-138.

Fukui Y, Ishikawa D, Ishida N, Okada M, ItagakiR, Ogso T. 1999. Comparison of fertility of estrous synchronized ewes with four different intravaginal devices during the breeding season. J Reprod Dev, 45: 337–343.

Godfrey RW, Gray ML, Collins JR. 1997. A comparison of two methods of oestrous synchronization of hair sheep in the tropics. Anim Reprod Sci, 47 (1-2): 99-106.

Iida K, Kobayashi N, Kohno H, Miyamoto A, Fukui Y. 2004. A comparative study of induction of estrus and ovulation by tree different intravaginal devices in ewes during the nonbreeding season. J Reprod Dev, 50: 63-69.

Keisler DH, Buckrell BC. 1997. Breeding strategies. In: Youngquist RS (Ed.). Current Therapy in Large Animal Theriogenology. Philadelphia, PA: WB Saunders. pp. 603-611.

Kutluca M, 2005. The effects of different estrus synchronization regimes on fertility of Awassi and Morkaraman ewes and groving performance and survivability of their lambs. Atatürk University, MSc thesis.

Kutluca, M., 2009. Effect of different estrus synchronization methods on reproductive performance of Morkaraman sheep in laparoscopic artificial insemination program. Atatürk University, PhD thesis.

Ozyurtlu N, Kucukaslan I, Cetin Y. 2008. Characterization of oestrous induction response, oestrus duration, fecundity and fertility in awassi ewes during the non-breeding season utilizing both CIDR and intravaginal sponge treatments. Reprod Domest Anim, 45: 464-467.

Santos GMG, Silva-Santos KC, Melo-Sterza FA, Mizubuti IY, Moreira FB, Seneda MM.2011. Reproductive performance of ewes treated with an estrus induction/synchronization protocol during the spring season. Anim Reprod, 8 (1/2): 3-8.

Sen U, Onder H. 2016. The effect of estrus synchronization programs on parturitiontime and some reproductive characteristics of Saanen goats. JAppl Anim Res, 44:376-379.

Timurkan H, Yildiz H. 2005. Synchronization of oestrus in Hamedani ewes: the use of different PMSG dose. Bull Vet Pulawy, 49: 311-314.

Ülker H, Gökdal Ö, Aygün T, Karakuş F. 2004. Comparison of Some Reproductive Traits of Karakaş and Norduz Sheep. J Agric Sci, 14 (1): 59-63.

Wildeus S. 2000. Current concepts in synchronization of estrus: sheep and goats. J Anim Sci, 77: 1-14.

Zarazaga LA, Malpaux B, Chemineau P. 2003. Amplitude of the plasma melatonin nycthemeral rhythms is not associated with the dates of onset and offset of the seasonal ovulatory activity in the Ile-de-France ewe. Reprod Nutr Dev, 43: 167-177.

Zarkawi M, Al- Merestani, MR, Wardeh MF. 1999. Induction of synchronizedoestrus and early pregnancy diagnosis in Syrian Awassi ewes, outside the breeding season. Small Rumin Res, 33: 99–102.

EVALUATION OF SOME FEED STUFFS USED IN RUMINANT ANIMALS IN TERMS OF CHEMICAL COMPOSITION, GAS AND METHANE PRODUCTION

Adem KAMALAK[1], Cagrı Ozgur OZKAN[2]

[1]KahramanmarasSutcu Imam University, Faculty of Agriculture. Department of Animal Science, Kahramanmaras, TURKEY
[2]KahramanmarasSutcu Imam University, Goksun Vocational School, Organic Farming Department, Kahramanmaras, TURKEY

Correspondingauthore-mail: akamalak@ksu.edu.tr

Abstract

The aim of the current experiment was to evaluate some feedstuffs used in ruminant animals in terms of chemical composition, gas and methane production. Source had a significant effect on the chemical composition of feedstuffs. Dry matter content of feedstuffs ranged from %88.86 to 92.96. Crude ash content of feedstuffs ranged from %1.10 to 9.53. Crude protein contents of feedstuffs ranged from %4.10 to 16.63. Crude protein content of AH was significantly lower than the others. NDF and ADF contents of feedstuffs ranged from %11.76 to 74.36 and 3.2 to 49.23 respectively. NDF and ADF contents of WS and AH significantly higher than the others. Ether extract of feedstuffs ranged from %1.20 to 2.86. Gas and methane production (ml) ranged from 64.80 to 142.00 and 10.34 to 19.14 ml respectively. The gas and methane production from grains were significantly higher than those for WS and AH. On the other hand, the percentage of methane for WS and AH was significantly higher than those for grains. There is significant variation among feedstuffs used in ruminant animals in terms of the chemical composition, gas and methane production. There is significant negative correlation between cell wall contents and gas or methane production of feedstuffs.

Key words: *feedstuffs, ruminant, chemical composition, methane production*

INTRODUCTION

The methane production from ruminant animal has a considerable contribution to the global worming during the fermentation. It was also reported that during the ruminal fermentation 2- 12 % of dietary energy intake is lost as methane (Jonhson and Johnson 1995). Fermentation of feedstuffs containing low amount of cell walls results in lower methane production (Jonhson and Jonhson 1995). Enteric methane production could be influenced by the nature of carbohydrate fermented (Takahaski 2001, Santosa et al. 2003). There is considerable variation among feedstuffs used in ruminant ration in terms of chemical composition especially cell wall contents. Forages are rich in cell wall content when compared with grain. There is limited information about methane production of carbohydrate sources used in ruminant diets. Recently *in vitro* gas production technique has been used to determine the gas and methane production of feedstuffs (Ulger et al. 2017, Uslu et al. 2018. The aim of the current experiment was to evaluate some feedstuffs used in ruminant animals in terms of chemical composition, gas and methane production using *in vitro* gas production technique.

MATERIALS AND METHODS

Commercially available feedstuffs used in ruminant animal were chosen as substrate. These feedstuffs are wheat straw (WS), alfalfa hay (AH), wheat grain (WG), maize grain (MG) and barley grain (BG). Dry matter (DM), crude ash (CA), crude protein (CP) and ether extract (EE) contents of sainfoin hays were analyzed according to AOAC (2005). Neutral detergent fiber (NDF) and ADF contents of sainfoin hays using the method described by Van Soest and Wine (1967) and Van Soest (1963) respectively. All

chemical analyses were carried out in triplicate.

Feed samples milled through a 1 mm sieve were incubated *in vitro* rumen fluid in calibrated glass syringes following the procedures of Menke and Steingass (1988). Rumen fluid was obtained from three fistulated sheep fed twice daily with a diet containing alfalfa hay (60%) and concentrate (40%). 0.500 gram dry weight of samples was weighed in quadruplicate into calibrated glass syringes of 100 mL containing of 30 mL rumen fluid-buffer mixture into each syringe followed by incubation in a water bath at 39 ^{o}C for 24 h. The gas and methane production were detected from the syringes containing feed samples to determine the net gas production at 24 h incubation. Net gas productions of feed samples were obtained after correction for blank and hay standard (University of Hohenheim, Germany). The methane contents of gas produced after 24 h incubation of feed samples were determined using an infrared methane analyzer (Sensor Europe GmbH, Erkrath, Germany) (Goel et al., 2008).

Methane production (ml) = Total gas production (ml) X Percentage of Methane (%)

The effect of source on chemical composition, gas and methane production was determined using the one-way analysis of variance (ANOVA). Tukey's multiple range tests was employed to identify the significance between means. Mean differences were considered significant at $P<0.05$.

RESULTS AND DISCUSSION

The chemical composition of feedstuffs is given in Table 1. Source had a significant effect on the chemical composition of feedstuffs.

Table 1. The chemical composition of feedstuffs used in ruminant animals

	Source						
	WS	AH	WG	MG	BG	SEM	p
DM	92.96^{a}	92.73^{a}	90.06^{c}	88.86^{d}	90.93^{b}	0.101	0.000
CA	4.43^{b}	9.53^{a}	1.36^{d}	1.10^{e}	2.26^{c}	0.042	0.000
CP	4.10^{e}	16.63^{a}	7.83^{c}	6.53^{d}	8.73^{b}	0.066	0.000
NDF	74.36^{a}	59.53^{b}	11.76^{d}	8.73^{e}	27.56^{c}	0.893	0.000
ADF	49.23^{a}	30.70^{b}	3.36^{d}	3.20^{d}	7.10^{c}	0.262	0.000
EE	1.33^{c}	1.20^{c}	1.26^{c}	2.86^{a}	1.76^{b}	0.042	0.000

^{a,b,c,d}Row means with common superscripts do not differ ($P<0.05$); S.E.M. – standard error mean., CA: Crude ash(%), CP: Crude protein (%), NDF: Neutral detergent fiber (%), ADF: acid detergent fiber (%), EE: Ether extract (%)

Dry matter content of feedstuffs ranged from %88.86 to 92.96. Crude ash content of feedstuffs ranged from %1.10 to 9.53. Crude protein contents of feedstuffs ranged from %4.10 to 16.63. Crude protein content of AHwas significantly lower than the others.

Crude protein content of WS and AH are consisted with findings of Abas et al. (2005) who showed that crude protein content of WS and AH ranged from %3.23 to 5.64 and 13.84 to 20.89 respectively. Crude protein contents of grains also consistent with findings of Abas et al. (2005).

NDF and ADF contents of feedstuffs ranged from %11.76 to 74.36 and 3.2 to 49.23 respectively. NDF and ADF contents of WS and AH significantly higher than the others. Ether extract of feedstuffs ranged from %1.20 to 2.86. NDF contents of WS and AH are comparable with findings of Bhatta et al. (2017) who showed that NDF contents of WS and AH were %71.1 and 61.6 respectively.

Gas and methane production of some feedstuffs used in ruminant animals were given in Table 2. Gas and methane production (ml) ranged from 64.80 to 142.00 and 10.34 to 19.14 ml respectively. The gas and methane production from grains were significantly higher than those for WS and AH. The high gas and methane production for grain are associated with higher fermentable substrate in grain than forages. It is well known that the gas and methane production are positively correlated with the amount of fermentable substrate. The more fermentable substrate the more gas production occurs during fermentation.

Gas production is associated with VFA production following fermentation of substrate so the more fermentable the substrate the greater the gas production,

although the fermentation end products do influence the value of gas produced. Therefore total VFA production should correlate more closely with gas production than dry matter loss (Blümmel and Orskov, 1993).

Table 2. Gas and methane production of some feedstuffs used in ruminant animals

	Source						
	WS	AH	WG	MG	BG	SEM	p
Gas (ml)	64.80^{c}	97.60^{b}	142.00^{a}	130.40^{a}	137.20^{a}	4.543	0.000
Methane (ml)	10.34^{c}	17.24^{ab}	18.80^{a}	16.42^{b}	19.14^{a}	0.695	0.000
Methane (%)	15.98^{b}	17.66^{a}	13.20^{d}	12.60^{e}	13.92^{c}	0.134	0.000

^{a,b,c,d}*Row means with common superscripts do not differ (P<0.05); S.E.M. – standard error mean.*

On the other hand, the percentage of methane for WS and AH was significantly higher than those for grains. The higher percentage of methane for WS and AH is positively associated with high acetic acid production compared with grain. However VFA production should be analyzed to be more conclusive.

Correlation between cell wall contents and gas and methane production is given in Figure 1 and 2. There is significant negative correlation between cell wall contents and gas or methane production.

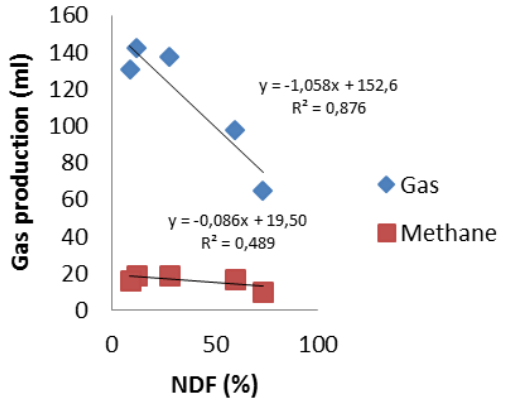


Figure 1. Correlation between NDF and gas and methane production

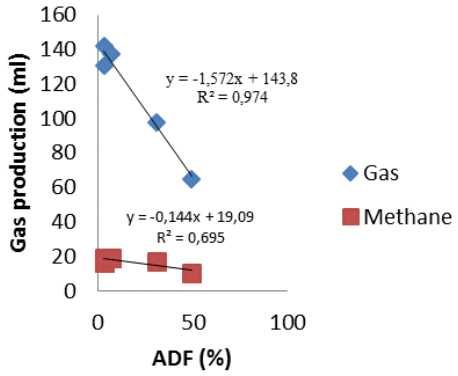


Figure 2. Correlation between ADF and gas and methane production

CONCLUSIONS

There is significant variation among feedstuffs used in ruminant animals in terms of the chemical composition, gas and methane production. There is significant negative correlation between cell wall contents and gas or methane production of feedstuffs.

REFERENCES

AOAC. 2005. Official Methods of Analysis. 18th edn. Association of Official Analytical Chemists; Arlington, VA, USA.

Bhatta R, Saravanan M, Baruah L, Malik PK, Sampath KT. 2017. Nutrient composition, rate of fermentation and in vitro rumen methane output from tropical feedstuffs. Journal of Agricultural Science, 155:171-183.

Blummel M, Orskov E R. 1993. Comparison of an in vitro gas production and nylon bag degradability of roughages in predicting feed intake in cattle. Animal Feed Science and Technology, . 40: 109-119

Goel G., Makkar HPS, Becker K. 2008. Effect of *Sesbaniasesban* and *Carduuspycnocephalus* leaves and Fenugreek (*Trigonellafoenum-graecum* L) seeds and their extract on partitioning of nutrients from roughage and concentrate-based feeds to methane. Animal Feed Science and Technology 147 (1-3): 72-89.

Menke KH, Steingass H. 1988. Estimation of the energetic feed value obtained from chemical analysis and *in vitro* gas production using rumen fluid. Animal Research Development 28:7-55.

Santoso B, Kume S, Nonaka K, Kimura K, Mızukoshi H, Gamo Y, Takahashi J. 2003. Methane emission, nutrient digestibility, energy metabolism and blood metabolites in dairy cows fed silages with and without galactooligosaccharides supplementation. Asian-Australasian Journal of Animal Science, 16:534-540.

Takahaski J. 2001. Nutritional manipulation of methanogenesis in ruminants. Asian-Australasian Journal of Animal Science, 14:131-135.

Ulger I, Kamalak A, Kaya E, Kurt O. 2017. Comparison of chemical composition and anti-methanogenic potential of *Liquidanberorientalis* leaves with *Laurus nobilis* and *Eucalyptus globulus* leaves using in vitro gas production technique. CienciaInvestigacionAgraria. 44(1):75-82.

Uslu S, Kurt O, Kaya E, Kamalak A. 2018. Effect of species on chemical composition, metabolisable energy, organic matter digestibility and methane production of some legume plants grown in Turkey. Journal of Applied Animal Research, 45(1):1158-1161.

Van Soest, P.J., Robertson, J.B. Lewis, B.A., 1991. Methods for dietary fiber, neutral detergent fiber, and nonstarch polysaccharides in relation to animal nutrition. Journal of Dairy Science, 74(10), 3583-3597

THE EFFECTS OF DAM ON THE ECOSYSTEM AND LANDSCAPE DESIGN PROPOSAL: THE CASE OF AKKAYA DAM

Gulden SANDAL[1], Mustafa BOGA[2]

[1]Nigde University, Faculty of Architecture, Niğde, TURKEY
[2]Nigde University, Bor Vocational School, 51700, Niğde, TURKEY

Corresponding author e-mail: gpeyzaj@gmail.com

Abstract

The coastal areas offer natural, cultural, economic and aesthetic facilities and they are distinguished by their significant functions such as creating habitat for urban flora-fauna at the city center and the environment close to it, giving people the recreation opportunity, regulating the urban ecology. The Akkaya dam in the Niğde region is an example. The presence of Akkaya dam birds on the migration route and the reed areas around the dam are places frequented by migratory birds. Not only bird species but also different species of fish are hosted. The dam is used for irrigation of agricultural lands used for human beings, in order to meet the water needs of wild animals, grazing in the region. However, increasing pollution of dam water creates adverse effects particularly on the animals. The aim of the study is to determine the potential effects of Akkaya Dam on the living creatures and offer suggestions about it. Sampling will be made by using geographic information systems (GIS).
In the light of these information, landscape development areas will be created for natural conservation, landscape restoration, visual landscape improvements and planning of recreational potential of dam lake, datas will be evaluated and alternative solutions options for the area will be proposed.

Key words: *Akkaya Dam, Animal Feeding, Landscape Design, Landscape Restoration, Nigde*

INTRODUCTION

Increasing needs of the population in Niğde City cause decrease of agricultural land and increase of concrete structures on fertile soils. While this is an important phenomenon in terms of providing accommodation for the people, it causes a number of problems arising from the reduction of arable land. These problems may lead to inadequate provision of food for humans and a further decline in numbers of animals in natural habitats. For this reason, it is inevitable to obtain yield at the maximum level from the unit area using the available agricultural areas. The physical structure of Niğde province is a steppe. 29% of the provincial territory consists of mountains, 41% of the areas are plateau and %30 of the areas are the plains. (Anonim1, 2016). The Akkaya dam located in the center of Niğde province is a dam constructed between 1962 and 1967 as a means of irrigation of the Tabakhane River. The body volume of the dam is 426,000 m3, the height of the waterfall is 18,00 m, the volume of the lake at normal water level is 5,80 hm3 and the area of the lake at normal water level is 1,38 km2. It provides irrigation services to an area of 2,277 hectares (Anonim2, 2016).

In addition to the many benefits of dams for the development of water resources in the world and our country, the impact on the environment is also known. The way people use habitat and nature has changed as hunting and gathering have led to settled living and agriculture (Sarıyıldız ve ark., 2008). The desire and necessity to provide the desired amount of water, which is one of the biggest necessities of mankind, has served the purpose of preventing floods as well as accumulation of water in agricultural production and use, by making the dam / pond on the rivers with irregular precipitation and flow regime. The creation of water areas has led to the creation of different living environments between water and land.

The water borders that make up the transitional areas between waterborne ecosystems and land-based ecosystems are important habitats for different plant and wildlife species at the same time. Water shores offer many natural, cultural, economic and aesthetic possibilities and they stand out as areas with important functions such as urban living flora and fauna, urban recreation possibility and regulation of urban ecology (Tülek ve Barış, 2011).

The areas with water shores that affect the natural and cultural environment in the positive direction in the cities are areas that create invaluable opportunities with all artificial and natural formations in regions with arid climes such as Niğde city. For this reason, turning the Akkaya dam into a recreation area with appropriate landscaping activities can create pleasant spaces for urban people and students. Within the scope of this study, Akkaya dam, which is one of the important water surfaces and recreation areas within the campus area of Niğde University, was evaluated according to ecological criteria and suggestions were made in terms of landscape planning and design. Appropriate landscape planning studies will contribute to improving the habitat of bovine and ovine creatures.

The Akkaya dam environment of Niğde province is used as an important area especially for wildlife and small family businesses. It is home to wild animals during certain seasons of the year.

Total meat production in our country, While poultry meat, cattle meat production and small ruminants meat production was expressed respectively 1.4 million tons, 622 thousand tons, 159 thousand tons in 2010, poultry meat, cattle meat production and small ruminants meat production was had been 2.2 million tons, 989 thousand tons, 138 thousand tons in 2017 (TÜİK, 2017).

MATERIALS AND METHODS

Located in Niğde Central District, Akkaya Dam is located roughly between Niğde-Bor highway and Kayseri-Adana highway. In other words, Niğde-Bor highway passes from the north of the dam, and Adana-Kayseri railway and road pass from the south. The distance between Niğde city and Bor city is approximately 17 km and Akkaya Dam is located between this short distance (Bulut ve Ceylan, 2011). (Figure 1).

The Akkaya Dam was constructed in 1974 for irrigation purposes and has a depth of 18 m from the thalweg. The lake area is about 1 km^2 (1.38 km^2) and the lake extends in northeast-southwest direction. The irrigation area of Akkaya Dam is 2000 ha. The body volume of the dam which is constructed in the soil body fill type is 426.000 m^3. Since Akkaya Dam facility operation and maintenance activities are transferred to Bor Municipality, the operation is carried out by this municipality (DSİ 4. Bölge Müdürlüğü).

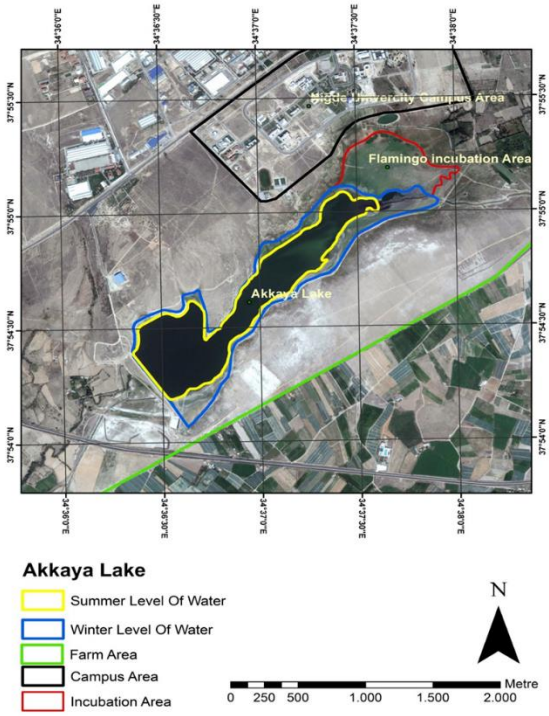


Figure 1. Study Area

The study area is limited to the campus area of Niğde University. There are agricultural areas, cattle and sheep farming around the area.

Method

3-step method was followed in the research. (Figure 2).

Stage I:
Collection and evaluation of data

- The literature review

- Investigation of water coast's contribution to urban ecology and landscape
- Collection of data related to the research field

Stage II:
Suggestions for making appropriate planting studies in order to reduce the spread of the odor in the dam, which is polluted by the wastewater coming from the research area and wastes coming from the organize industry, into the city.

Stage III:
Formation of opinions and suggestions related to research field

Figure 2. Research Flowchart

RESULTS AND DISCUSSION

Water borders are a source of important functions both recreationally and functionally in the landscape. The design and planning studies about water should be able to reconcile the different needs of the community such as industrial waste disposal, transportation, fisheries, agricultural use, clean water, energy acquisition and recreational activities as well as environmental principles.

One of the main objectives of the landscape architecture professional discipline is to keep the continuity and productivity of the natural resources by preventing them from being used over the capacities and the ecological balances, and to place the human activities in an ecological framework. The basic principle of this, is to make ecological planning (landscape planning) to assess the suitability of the available resources against the proposed socio-economic plans. Designing recreation areas in urban and rural areas, restoring damaged areas for various reasons, and making them suitable for any activity by improving ecological conditions so that people can live physically and mentally in a healthy way are among the landscape architecture studies (Güney ve Hepcan, 1994).

People have chosen the edges of the water to meet their needs, since the settled life. There should be no pollutants in this area which is very important to humans. Arrangements to be made in such areas may make it possible to create a relaxing environment by replicating the wooded areas.

Examination of Urban Areas and Waterside in the Surrounding Area in Terms of Ecological Criteria

According to Dugan (1990) and Generation (2006); ecological importance of water areas in urban areas and their immediate surroundings has been explained with criteria such as, fragmentation that forms a living environment and achieving biodiversity, providing coastal strip and erosion control, flood control, microclimate formation and preventing water and environmental pollution.

Watersides make it possible for many species of life to live, breed and feed and have ecological importance in terms of creating a habitat and biodiversity. Appropriate landscape designs are needed to contribute to the protection of ecological balance. The planting work prevents the occurrence of the flood, especially after heavy rainfall. This is due to both the soil structure and the plants they contain. At the time of precipitation, the water absorbed by the soil and plants is stored as groundwater. In arid seasons plants use water stored in this underground. In this context, in addition to the aesthetic effect of the selected plants, the functionality and suitability of the plant is also important in the design studies to be carried out in the vicinity of the lake shores and wetlands (Tülek ve Barış, 2014).

Pollutants that are in the environment with plant growing around are used during photosynthesis to prevent water pollution. The refreshing effect that the water gives has a positive effect on the living things. In order to make the use of the area without deteriorating the ecological balance, the recommended section is given in Figure 3. The plant types foreseen to be preferred to the area are given in Table 1.

Table 1. Plant species that can be used in the study field

Latince Adı	Familya	Türkçe Adı
Alnus glutinosa	Betulaceae	Kızılağaç
*Amorpha fruticosa**	Fabaceae	Yalancı civit
Aralia sieboldi	Araliaceae	Aralia
Arundo donax	Poaceae	Kamış
Arundo donax variegata	Poaceae	Alacalı Kamış
Aponogeton distachyos	Aponogetonaceae	Su Alıcı
Bambusa aurea	Poaceae	Bambu
Bambusa metake	Poaceae	Bambu
Calocedrus sp.	Cupressaceae	Su sediri
Canna pretoria	Cannaceae	Alacalı Yapraklı Kanna
Cortaderia selloana	Gramineae, Poaceae	Pamba otu
Gliricidia sepium *	Fabaceae	Bekçi kakao
Iris laevigata	Iridaceae	Mor ve Beyaz süsen
Iris laevigata rosa queen	Iridaceae	Alacalı Yapraklı Pembe Süsen
*Leucaena leucocephala**	Fabaceae	-
Populus alba	Salicaceae	Ak kavak
Populus nigra	Salicaceae	Kara kavak
*Robinia pseudoacacia**	Fabaceae	Yalancı akasya
Salix babylonica	Salicaceae	Salkım söğüt
Salix caprea L.	Salicaceae	Keçi söğüdü
*Tamarindus indica**	Fabaceae	Demirhindi
Typha minima	Typhaceae	Hasır otu

Plant species foreseen as suitable for use in the field of research do not contain any harmful substances for animals as well as for landscape evaluation.

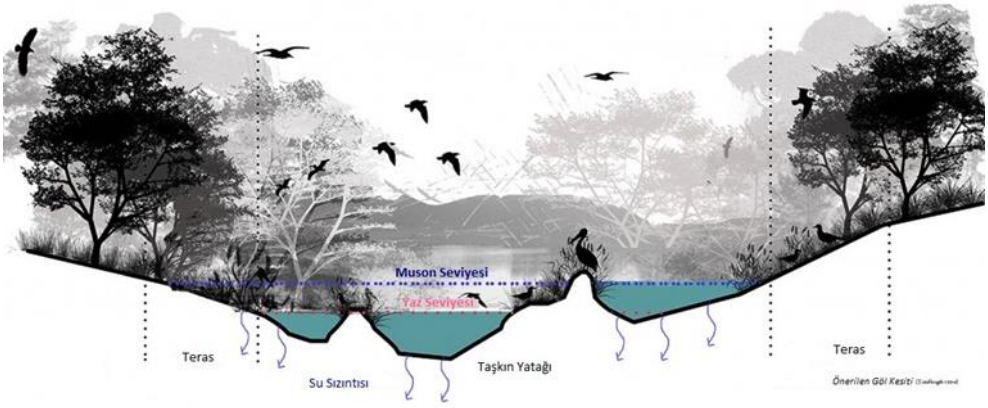


Figure 3. Recommended Area Usage

It is also possible to grow different kinds of animals around the dam. We could contribute to of animal husbandry in the study area and in the region by the encouragement of breeding buffalo which love wetlands. This situation may be an alternative form of production for our country's livestock production and meeting the demand from the increasing need for red meat. At the same time, the production of buffalo in our country is decreasing day by day. In 2017, the number of bovine animals increased by 13.2% compared to the previous year and total number is 16 million 105 thousand head. The number of cattle in bovine animals increased by 13,2% to 15,144,000, while the number of buffalo increased by 13,6% to 161,439 (TUİK, 2018). For this reason, it is also possible to increase the production of buffaloes with different project-based supports.

In addition to improving the ecological aspect of the dam edge of field landscaping studies, providing feed plants suitable for

the animals cultivated in the region will indirectly contribute to animal husbandry.by providing different feed plants to grow. This situation will be encouraged by the provision of a more economical breeding.

CONCLUSIONS

With the improvement of the study area, clean and more suitable habitats for animals could be created. In the studies of Seçer and Boga (2015) on the Niğde region; Although the presence of ovine livestock rangelands is the best utilised production line, they stated that the area in Niğde is sufficient in terms of size but insufficient in terms of quality. They indicated that the improvement of the ranges would increase the productivity and quality, which would affect the producers' income in a positive way. They have indicated in their work that it is very important to improve the quality of the ranges rapidly with inter-institutional studies. As the researchers indicate, opening up rangelands will be important in terms of animal husbandry. The preparation of the Akkaya Dam and its surroundings as common pasture areas of the region will also be an important place in terms of animal husbandry in the region. Different studies that were carried out on Niğde province pointed out that pasture areas were insufficient in the province. Ceyhan et al., (2015) sad that the landownership of Niğde province was 779,522 hectares and 46,0% of the land was meadow and pasture land, 35,4% agricultural land and 18,6% forest and other fields. In their studies, about 25% of the grassland and pasture land are poor, 50% are medium and 25% are of good quality. They stated that such areas are seen as an important opening husbandry practices in terms of meeting the nutrient requirements of an important livestock arm for Niğde Province. Especially it may also be important in terms of animal breeding in the region and in meeting the increasing animal protein needs. At the same time, preservation of natural life and living in wild animals living in these areas may be even more important with the project work to be prepared.

Suggestions for the protection of the Akkaya dam and the improvement of its environment can be listed as follows

1. The Akkaya dam is a open green space where the nature permeates the city and the ecological processes continue in this context. Due to the microclimatic property of the area, it has a rich herbaceous area characteristic of natural vegetation cover. Considering that biodiversity in Niğde is rapidly declining and many tropics are missing, the area is also important and rare in this context. The habitat values of natural plant communities should also not be lowered in landscape planning studies. In this context, all of the plants used in arrangement of the Akkaya dam were selected from natural species. In order to ensure water and plant integrity, the water impact on the project has been emphasized.
2. Large water surfaces in landscaping planning and design are the assets that make a relaxing effect on people. For this reason, the influence of the water should be taken into consideration in the landscape planning studies to be carried out in this area.
3. Informative studies should be carried out on the active flora and fauna groups in the area and the periods during which they are effective. At that time, it is important to discuss with the authorized people and especially to protect the area during spawning period. The necessary information can be made on the area with signs.
4. Necessary precautions should be taken to minimize the effect of pollutants damaging the Akkaya Dam.

These suggestions can contribute to the discovery of the natural beauties of the area, the creation of recreational areas for people, and the creation of living environments for animals.

REFERENCES

Anonim1, 2016. http://www.turkcebilgi.com/ni%C4%9Fde_co%C4%9Frafi_bilgiler

Anonim2, 2016. http://www.turkcebilgi.com/akkaya_baraj%C4%B1

TÜİK, 2016. www.tuik.gov.tr

Seçer, A., Boğa, M., 2016. Niğde İlinin Çamardı İlçesinde Küçükbaş Hayvan Yetiştiriciliğinde Pazarlama Yapısı, Yaşanan Sorunlar ve Çözüm Önerileri Türk Tarım – Gıda Bilim ve Teknoloji Dergisi, 4(2): 79-83, 2016.

Bulut, İ., Ceylan, S., 2011. Ekolojik Sorunları ve Fonksiyonlarıyla Niğde Yöresi Yapay Gölleri. Atatürk Üniversitesi Sosyal Bilimler 270 / Enstitüsü Dergisi 2011 15 (2): 263-288

Ceyhan A., Ünalan A., Çınar M., Serbester U., Şekeroğlu A., Akyol E., Yılmaz E., Demirkoparan A., 2015. Niğde İli Keçi Yetiştiriciliğinin Yapısal Özellikleri ve Sorunları Üzerine Bir Araştırma. Türk Tarım – Gıda Bilim ve Teknoloji Dergisi, 3(2): 74-79.

Dugan, P. J., 1990. Sulak Alanların Korunması, DHKD, İstanbul.

Kuşak, B., 2006. Su Kıyılarının Ekolojik Açıdan Değerlendirilmesi ve Restorasyonu. Yüksek Lisans Tezi, Yıldız Teknik Üniversitesi, Şehir ve Bölge Planlama Anabilim Dalı Peyzaj Planlama Programı, İstanbul.

Sarıyıldız, A., Tahmiscioğlu, S., Silay, A., Tomar, A., 2008. Su Kaynaklarının Geliştirilmesinde Kültür Varlıklarının Korunması Yaklaşımlarının Yortanlı Barajı Örneğinde İrdelenmesi. TMMOB 2. Su Politikaları Kongresi. 541-554 s. 20-22 Mart 2008. Erişim tarihi:24.07.2018 (http://www.imo.org.tr/resimler/ekutuphane/pdf/10960.pdf)

TÜİK (Türkiye İstatistik Kurumu), 2017. https://biruni.tuik.gov.tr/medas/?kn=92 &locale=tr. Erişim Tarihi: 12.05.2018

TÜİK (Türkiye İstatistik Kurumu), file:///C:/Users/MBOGA/Downloads/Hayvansal_%C3%9Cretim_%C4%B0statistikler_07.0

Tülek, B., Barış, M.E., 2014. Kent içi ve Yakın Çevresindeki Su Kıyısı Rekreasyon Alanlarının Ekolojik Kriterler Açısından Değerlendirilmesi: Mavi Göl Örneği. U. Ü. Ziraat Fakültesi Dergisi, 2014, Cilt 28, Sayı 2, 13-26 (Journal of Agricultural Faculty of Uludag University)

Güney, A., Hepcan, Ş., 1994.Akarsu-Göl Kıyılarında Erozyon ve Peyzaj Onarımı. Çevre Dergisi, Sayı 12, İstanbul.

EVALUATION OF SHEEP BREEDS AND SHEEP FARMING

Muge ERKAN CAN[1], Mustafa BOGA[2]

[1]Cukurova University, Faculty of Agriculture, Department of Agricultural Structures and Irrigation, 01330 Sarıcam, Adana, TURKEY
[2]Nigde Omer Halisdemir University, Bor Vocational School, 51700 Bor, Nigde, TURKEY

Corresponding author e-mail: mboga@ohu.edu.tr

Abstract

Sheeps are a characteristic part of the Turkeys the science of breeding and caring for farm animals. They have played an important role such as over centuries, ecology, industry and economy in shaping the Turkeys rural communities. Extensive breeding has become increasingly popular in some areas since it reduces labour and food costs compared to housed sheep facilities.Sheepsmay tend to group naturally and stay together. But they should be kept on spread out in hot weatherbecause excessive crowding can cause too much heat.Sheep farmstructures may be used to store feed, bedding and some equipments. Sheep farm structureshave also function for a sheep producer both during cold weather and during hot weather.If it can been uniform for producer, it is easier to care for sheep that are housed.Having a sheep shelter ready before winter arrives is part of good herd management. Sheep shelter also should provide to protection for livestock from excessive heat, wind, cold weather conditions. Well-designed sheep shelter also protects the environment and natural resources besides protecting animals. It is very important to increase animal health and efficiencyanimal welfare.One of the most important environment factors is water. Uncontrolled wastewater of animal breeding carry potential pollutants with leak into the soil.This situation may be the cause pollution mixed into clean water resources unwanted substances such as includes sediment, organic matter, faecal organisms, wastes. the aim of this study is to emphasize the importance of shelter in sheep breeding and to evaluate shelter form alternatives.

Key words: *sheep, farm, shelter, sheep breeding, farm structures.*

INTRODUCTION

Sheep producing milk for people start with the beginnings of domestication. Sheep are important sources of meat, milk, one of the major sources of protein for human consumption and they readily adapt to a wide range of climates and available feed supplies.

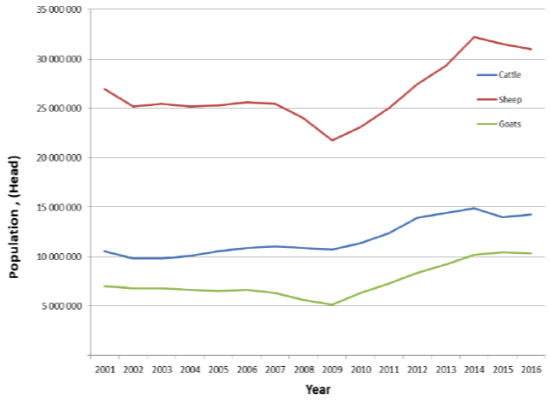
Economic and social contributions of agricultural and animal productions change based on countries' developmental levels. Agriculture and livestock production always takes an important role in socioeconomic development.

Sheep production constitutes a major agricultural activity in the many of Turkey's basins and plays an important role from an cultural, economic, ecological and environmental point of view. Livestock has around a 26% portion of all agriculture production in Turkey. This rate is nearly 42% in developed countries. Sheep and goat number decreased by 1.4% in 2016 when compared to the previous year, and became 41 million 329 thousand heads. In the group of sheep, sheep number decreased by 1.7%, and became 30 million 983 thousand heads. Total milk

production decreased by 0.9% in 2016 when compared to the previous year, and became 18 million 489 thousand heads. 90.8% of this amount was cow milk, 6.3% was sheep milk, 2.6% was goat milk and 0.3% was buffalo milk (Anonymous, 2017b) Number of sheep became 33 million 562 thousandheads. Total number of goat became 11 million 11 thousand heads in 2017 (Anonymous, 2017). Our country' according to the, number of sheep are given in Figure 1 (Anonymous, 2017a).

Figure 1. Distribution of number of sheep (head) according to the provinces

The number of farm animals in our country, during 2001-2016 is shown in Figure 2. It is observed that sheep production is the lowest in 2009 and the highest in 2014 in Figure 2 (Anonymous, 2017 a).



.

Figure 2. Livestock population of Turkey

Sheep Breeding and Production

During the last years genetic selection and especially better feeding conditions and well planned farms structures and environment led to several superior sheep breeds in some countries in terms of milk and solids productivity, proving a great potential for evolution species.

Besides to breeding sheep and goats for milk, the interest in meat, wool and mohair and resistance to mosquito-born tropical diseases developed a great multitude of local breeds with single or dual and triple purpose production orientation for fiber: Angora and Cashmere goats, Merino sheep; for meat: mutton sheep, Boer goats, hair sheep; for brush control: Spanish goats, natives; for disease resistance: West African goat and sheep breeds (Gall, 2001; Haenlein, 2006).

A few wild sheep and goat ancestor breeds in the region of today's Eastern Turkey, Iran, Iraq and Syria sheep and goats were developed around the world into hundreds of different breeds totaling presently more than 750 million goats and 1 billion sheep (Zeuner, 1963; Schaller, 1977; Zeder and Hesse, 2000; Hatziminaoglou and Boyazoglu, 2004, Park and Haenlein, 2006; Haenlein, 2006).

Originating in several countries, performance of dairy sheep breeds by yields of milk, lactation length and 4 % fat-corrected milk after suckling lambs are given in Table1 (Coop, 1982; Park and Haenlein, 2006; Haenlein, 2006).

Table 1. Average performance of dairy sheep breeds from different countries

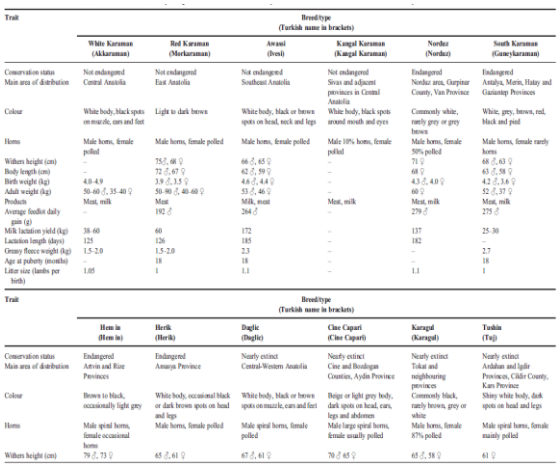
	Lactation length (days)	Yield (kg)		
		Milk	Fat	4% FCM[a]
Czechoslovakia				
Pramenka	162	162	12	245
France				
Lacaune	165	270	20	408
Corsica	170	108	9	178
Germany				
East Friesian	300	632	41	868
Greece				
Chios	210	218	17	342
Karagouniki	168	142	12	237
Kymi	192	135	11	219
Sfakia	195	132	12	233
Skopelos	170	158	14	273
Israel				
Israeli Awassi	270	495	33	693
Assaf	180	180	13	267
Italy				
Comisana	150	132	11	218
Langhe	150	115	10	196
Massese	150	125	10	200
Sarda	200	158	11	228
Spain				
Canaria	200	180	14	282
Churra	150	150	11	225
Lacha	180	210	16	324
Manchega	210	300	28	540
Turkey				
Awassi	120	168	11	232

[a] 4% FCM = (0.4 kg milk yield) + (15 kg fat yield).

There are various differences between sheep breeds and yield as seen in the Figure 3. These differences, which vary according to the sheep breeds, are also seen in the adaptation process of the animals to the environment. Breeding and environmental conditions are interrelated. Breed and environment are there were breed differences in many adaptations that promote lamb survival. Some breeds of sheep could better adapted to cope with in an extensive environment and lambing conditions, with minimal supervision than others. These examples demonstrate that, variation in adaptation to environment exists in sheep breeds and that the extent of mismatch between the animal's

adaptations and the environment can effect potential welfare status (Dwyer, 2009). Differences between breeds also change the rates of hygiene conditions and the impact of diseases on breeding periods. it is known that some sheep breeds may be more resistant to diseases, but especially lambs are not very resistant to diseases without regard to race. The high economic effect of the disease is even more important in those countries where sheep farming and breeding are among the most important productive resources.

In Turkey nearly 90% of sheep are fat-tailed. Akkaraman and Morkaraman sheep are the most numerous and make up nearly 65% of the total sheep population. Yilmaz et al. (2013) pointed out that, pointed out that Turkey's sheep comprise a rich array of fat-tailed and thin-tailed native breeds and crosses of these with animals of exotic origin. These researchers gave detailed tables about this subject in their study (Table 2 and Table 3).

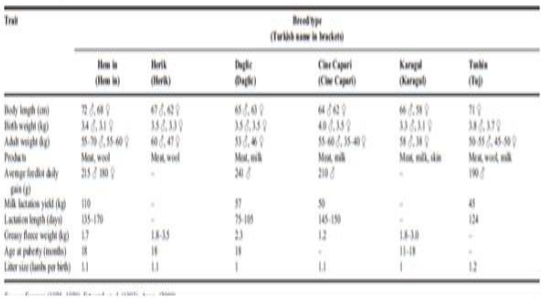


Trait	Breed/type (Turkish name in brackets)					
	White Karaman (Akkaraman)	Red Karaman (Morkaraman)	Awassi (Ivesi)	Kangal Karaman (Kangal Karaman)	Norduz (Norduz)	South Karaman (Guneykaraman)
Conservation status	Not endangered	Not endangered	Not endangered	Not endangered	Endangered	Endangered
Main area of distribution	Central Anatolia	East Anatolia	Southeast Anatolia	Sivas and adjacent provinces in Central Anatolia	Nordüz area, Gurpinar County, Van Province	Antalya, Marin, Hatay and Gaziantep Provinces
Colour	White body, black spots on muzzle, ears and feet	Light to dark brown	White body, black or brown spots on head, neck and legs	White body, black spots around mouth and eyes	Commonly white, rarely grey or grey brown	White, grey, brown, red, black and pied
Horns	Male horns, female polled	Male horns, female polled	Male horns, female polled	Male 10% horns, female polled	Male horns, female 50% polled	Male horns, female rarely horns
Withers height (cm)	–	75♂, 68 ♀	66 ♂, 65 ♀	–	71 ♀	68 ♂, 63 ♀
Body length (cm)	–	72 ♂, 67 ♀	62 ♂, 59 ♀	–	68 ♀	63 ♂, 58 ♀
Birth weight (kg)	4.0–4.9	3.9 ♂, 3.5 ♀	4.6 ♂, 4.4 ♀	–	4.3 ♂, 4.0 ♀	4.2 ♂, 3.6 ♀
Adult weight (kg)	50–60 ♂, 35–40 ♀	50–90 ♂, 40–60 ♀	53 ♂, 46 ♀	–	60 ♀	52 ♂, 37 ♀
Products	Meat, milk	Meat	Milk, meat	Meat, milk	Meat, milk	Meat, milk
Average feedlot daily gain (g)	–	192 ♂	264 ♂	–	279 ♂	275 ♂
Milk lactation yield (kg)	38–60	60	172	–	137	25–30
Lactation length (days)	125	126	185	–	182	–
Greasy fleece weight (kg)	1.5–2.0	1.5–2.0	2.3	–	–	2.7
Age at puberty (months)	–	18	18	–	–	18
Litter size (lambs per birth)	1.05	1	1.1	–	1.1	1

Trait	Breed/type (Turkish name in brackets)					
	Hem in (Hem in)	Herik (Herik)	Daglic (Daglic)	Cine Caputi (Cine Caputi)	Karagul (Karagul)	Tushin (Tuji)
Conservation status	Endangered	Endangered	Nearly extinct	Nearly extinct	Nearly extinct	Nearly extinct
Main area of distribution	Artvin and Rize Provinces	Amasya Province	Central-Western Anatolia	Cine and Beydagan Counties, Aydin Province	Tokat and neighbouring provinces	Ardahan and Igdir Provinces, Cildir County, Kars Province
Colour	Brown to black, occasionally light grey	White body, occasional black or dark brown spots on head and legs	White body, black or brown spots on muzzle, ears and feet	Beige or light grey body, dark spots on head, ears, legs and abdomen	Commonly black, rarely brown, grey or white	Shiny white body, dark spots on head and legs
Horns	Male spiral horns, female occasional horns	Male horns, female polled	Male spiral horns, female polled	Male large spiral horns, female usually polled	Male horns, female 67% polled	Male spiral horns, female mainly polled
Withers height (cm)	79 ♂, 73 ♀	65 ♂, 61 ♀	67 ♂, 61 ♀	70 ♂ 65 ♀	65 ♂, 58 ♀	61 ♀

Figure 3. Various differences between sheep breeds and yield

Table 2. Conservation status, areas of distribution, morphological characteristics and some production traits of Turkish fat-tailed native sheep (Sonmez, 1975; Sönmez, 1978; Ertugrul et al., 1993; Anon, 2009; Yılmaz et al, 2013).



Trait	Breed/type (Turkish name in brackets)					
	Hem in (Hem in)	Herik (Herik)	Daglic (Daglic)	Cine Caputi (Cine Caputi)	Karagul (Karagul)	Tushin (Tuji)
Body length (cm)	72 ♂, 68 ♀	67 ♂, 62 ♀	65 ♂, 63 ♀	64 ♂ 62 ♀	66 ♂, 58 ♀	71 ♀
Birth weight (kg)	3.4 ♂, 3.1 ♀	3.5 ♂, 3.3 ♀	3.5 ♂, 3.5 ♀	4.0 ♂, 3.5 ♀	3.3 ♂, 3.1 ♀	3.8 ♂, 3.7 ♀
Adult weight (kg)	55–70 ♂, 55–60 ♀	60 ♂, 47 ♀	53 ♂, 46 ♀	55–60 ♂, 35–40 ♀	58 ♂, 38 ♀	50–55 ♂, 45–50 ♀
Products	Meat, wool	Meat, wool	Meat, milk	Meat, milk	Meat, milk, skin	Meat, wool, milk
Average feedlot daily gain (g)	215 ♂ 180 ♀	-	241 ♂	210 ♂	-	190 ♂
Milk lactation yield (kg)	110	-	57	50	-	45
Lactation length (days)	135–170	-	75–105	145–150	-	124
Greasy fleece weight (kg)	1.7	1.8–3.5	2.3	1.2	1.8–3.0	-
Age at puberty (months)	18	18	18	-	11–18	-
Litter size (lambs per birth)	1.1	1.1	1	1.1	1	1.2

Table 3. Conservation status, areas of distribution, morphological characteristics and some production traits of Turkish thin-tailed native sheep (Sonmez, 1975; Sönmez, 1978; Ertugrul et al., 1993; Anon, 2009; Yılmaz et al, 2013).

Trait	Breed/type (Turkish name in brackets)					
	Kivirtik (Kivirtik)	Karayuka (Karayuka)	Imroz (Gokceada)	Pirlak (Pirlak)	Karya (Karya)	Sakiz (Sakiz)
Conservation status	Not endangered	Not endangered	Not endangered	Endangered	Endangered	Nearly extinct
Main area of distribution	Thrace, Marmara and North Aegean	Sinop, Samsi, Ordu, Giresun and Trabzon Provinces	Gokceada Island, Canakkale Province	Kutahya, Afyon, Usak, Manisa, Isparta and Burdur Provinces	Aydin, Izmir, Manisa, Usak and Denizli Provinces	Cesme, Urla and Seferihisar in Izmir Province
Colour	White body, occasionally black or pied	White body, black spots on head and neck	White body, black spots around mouth, eyes, ears and legs	White body, black spots around mouth, eyes and ears	White body, black spots around mouth, eyes and ears	White body, black spots around mouth, eyes, ears and legs
Horns	Male spiral horns, female polled	Male horns, female polled	Male spiral horns, female polled	Male spiral horns, female polled	Male spiral horns, female polled	Male horns, female polled
Withers height (cm)	69 ♂, 64 ♀	66 ♂, 62 ♀	61 ♀	63 ♀	67 ♀	75 ♂, 73 ♀
Body length (cm)	80 ♂, 66 ♀	71 ♂, 63 ♀	63 ♀	60 ♀	64 ♀	75 ♂, 72 ♀
Birth weight (kg)	4.0 ♂, 3.7 ♀	3.5 ♂, 3.2 ♀	3.8 ♂, 3.7 ♀	4.0 ♂, 3.5 ♀	4.5 ♂, 3.5 ♀	3.2 ♂, 3.0 ♀
Adult weight (kg)	60–70 ♂, 45–55 ♀	55 ♂, 40 ♀	55 ♂, 48 ♀	45–50 ♀	55 ♂, 45 ♀	70 ♂, 50 ♀
Products	Meat	Meat, wool, milk	Milk, meat	Meat, milk	Milk, lamb	Milk, lamb
Average feedlot daily gain (g)	263 ♂	220 ♂	191 ♂	150 ♂	182 ♂	242 ♂
Milk lactation yield (kg)	83	40–50	121	75–80	100	180–200
Lactation length (days)	180	100–160	204	120	170	190
Greasy fleece weight (kg)	1.5	2.0–3.5	2.2	2.0–2.5	1	2
Age at puberty (months)	16–18	18	16	18	10–14	8–9
Litter size (lambs per birth)	1.2	1.1	1.2	1.2–1.5	1.6	2

Sheep Farming

One of the main factors in animal production is the presence of animals structures. Main tasks of animal structures are to provide a suitable resting, feeding and watering needs for animals, as well as protecting them from adverse climatic conditions and responding to the behavioral desires of animals. Animal shelters are the areas where both created living zone for animals and different animal products are produced. The level of planning and design must be sufficient for these two main elements.

In the current years, the major risk factors that play a role in sheep farming development have been studied, with many of these studies being carried out in order to help understand the breeding, nutrition. Although these studies have focused on breeding and nutrition, little attention has been given to the analysis of the

characteristics of farms, environmental factors and territory features at a micro-level.

Although the effect of well-known farm characteristics and environmental risk factors (such as breeding, number of sheep, nutrition, wind, temperature) have been investigated in many studies, little attention has been given to the effect of overall farm management, farm structures and hygienic conditions of the farms.

Poor management techniques and projectless farms are damaging to the environment in many different ways. These animals which live in poor condition farms, gain the majority of their nutritional resources from the pastures under difficult environmental and climatic conditions. In recent years, a gradual degradation of the mountainous and hilly grazelands of the our country, has taken place as a result of overgrazing of some areas. This phenomenon is due not only to the application of bad management techniques but also to the depopulation of the rural regions associated with industrial development and a growing tendency towards uncontrolled urbanisation of farmland.

Sheep's wool is a good insulator so they adaptable different climate conditions, adult sheep do not always need shelter. When barns or shelters are provided, clean, dry environment and adequate ventilation are important for reduce bacterial and viral accumulation and increase animal comfort. There are mainly three management systems which depending on the climate factors and availability and use of land (Hirning, 2009). These systems are;

Pasture system; The oldest and most widely used system in the world. This might include full time pasture systems in moderate climates and partial pasture systems where supplemental feed is used during seasons when pasture is unavailable because of climatic conditions

Combination of pasture and confined feeding areas; Sheeps, lambs and rams are raised in a pasture system then when lambs reach weaning age, they are removed from the pasture and placed in a confined feeding area until they are ready for market

Total confinement system; Sheeps are raised in a shelter or building. All breeding, lambing and other processes is done in the confined area. Density is such that little or no vegetation grows in the production area. All feedstuffs are grown on close fields and fed to the sheep with specialized feeding equipment (Hirning, 2009).

RESULT AND DISCUSSION

This study paper has summarized based on detailed reviews of the literature and on the authors' own experiences. This paper and other similar studies provides information on sheep breeds, sheep conservation status and sheep farms recognized populations of Turkey's sheep. The researches and problems mentioned in this issue should be examined carefully and the periodic checks should be continued and the controls and studies should be supported with the necessary laws.

REFERENCES

Anonim 2009. Catalogue of Turkish Farm Animal GeneticResources. General Directorate of Agricultural Research, Ministry ofAgriculture and Rural Affairs: Ankara.

Anonymous, 2017. Turkish Statistical Institute Data, Number: 24656.

Anonymous, 2017, a. TurkStat, Animal Production Statistics, June,2017.

Anonymous, 2017b. Turkish Statistical Institute Data, Number: 24655

Coop, I.E., 1982. Sheep and Goat Production. Elsevier ScientificPublishing Co., World AnimalScience C1, 492 pp. Amsterdam, The Netherlands,

Dwyer, C.M., 2009. Welfare of sheep: Providing for welfare in an extensive environment. Small Ruminant Research 86 (2009) 14–21.

Ertugrul, M., Akman, N., Askin, Y., Cengiz, F., Firatli, C., Turkoglu, M., Yener, S.M. 1993. Hayvan Yetiştirme (Yetiştiricilik). Baran Offset: Ankara (Animal Husbandry (Breeding). Baran Offset: Ankara).

Gall, C.F., 2001. Ziegenzucht (Goat Breeding). Verlag Eugen Ulmer, Stuttgart, Hohenheim, 501 pp.

Haenlein, G.F.W., 2006. About the evolution of goat and sheep milk production. Small Ruminant Research 68 (2007) 3–6

Hatziminaoglou, Y., Boyazoglu, J., 2004. The goat in ancient civilisations: from the Fertile Crescent to the Aegean Sea. Small Rumin.Res. 51, 123–129.

Hirning, 2009. Equıpment For Sheep Productıon. Agrıcultural Mechanızatıon and Automatıon – Vol. II Encyclopedia of Life Support Systems (EOLSS) Edited by Paul McNulty, Patrick Grace, United Nations Educational, Scientific and Cultural Organization, Oxford United Kingdom.

Park, Y.W., Haenlein, G.F.W. (Eds.), 2006. Handbook of Milkof Non-bovine Mammals. Blackwell Publishing, Ames, Iowa, USA/Oxford, UK, 449 pp.

Schaller, G.B., 1977. Mountain Monarchs. Wild Sheep and Goats of the Himalaya. University Chicago Press, 425 pp.

Sönmez, R. 1975. Hayvan Yetistirme. Ege Universitesi AgriculturalFaculty Publication: 141. Izmir. (Animal

Husbandry. Faculty ofAgriculture Publication No 141: Ege University.)
Sönmez, R. 1978. Sheep Husbandry and Wool. Faculty of AgriculturePublication No. 108: Ege University.
Yılmaz, O., Cengiz F., Ertugrul, M., Wilson, R.T., 2013. The domestic livestock resources of Turkey: sheepbreeds and cross-breeds and theirconservation status. Animal Genetic Resources, 2013, 52, 147–163. Food and Agriculture Organization of the United Nations.
Zeder, M.A., Hesse, B., 2000. The initial domestication of goats (Capra hircus) in the Zagros mountains 10000 years ago. Science 287, 2254–2257.
Zeuner, F.E., 1963. A History of Domesticated Animals. Harper &Row Publishers, New York, 560 pp.

ESTIMATION OF BEHAVIOR IN POULTRY USING IMAGE PROCESSING METHOD

Mustafa BOGA[1], Aykut BURGUT[2]

[1]NiğdeÖmerHalisdemirÜniversity, Bor Vocational School, 51700, Niğde, TURKEY
[2]Çukurova University, Faculty of Agricultural, Department of Animal Science 01230 Adana, TURKEY

Corresponding author e-mail: mboga@ohu.edu.tr

Abstract

In poultry, determining a short time diagnosis of animal-related problems or hencoop is extremely important. Otherwise, increasing productivity losses in animals and animal deaths are caused by diseases in a short time. For the reduction or absence of animal death is increasing with each passing day use of image processing methods in livestock-related activities. Especially, for detection in the monitoring of animals, in the analysis of their behavior, determining animal behavior and the states of the existing activities in the hencoop has emerged as a topic that has recently been discussed. Studies, with the use of image processing method reported bad management conditions could be eliminated diseases in the poultry, technical failures in feeding and drinking water. Studies, firstly imaged differences in the positions of the animals in the poultry house and problem has been identified with image processing method. This situation is said to be very beneficial for animal welfare. This review, determining of animal behavior in the poultry will focus on the use of image processing techniques.

Key words: *poultry, poultry conditions, feeding, image processing methods*

THE EFFECTS OF ENVIRONMENT THE WASTES AND SUGGESTED SOLUTIONS IN DAIRY CATTLE BREEDING

Mustafa BOGA[1], Aykut BURGUT[2]

[1]NiğdeÖmerHalisdemirÜniversity, Bor Vocational School, 51700, Niğde, Turkey
[2]Çukurova University, Faculty of Agricultural, Department of Animal Science 01230 Adana, TURKEY

Corresponding author e-mail: mboga@ohu.edu.tr

Abstract

The family businesses of small animal production are being converted to modern intensive farming in order to meet increased animal protein the needs in recent times. The aim in this production model can be obtain more yield and more efficient use of animals per unit area. care and feeding should be more intensive and careful to ensure increased productivity. In these systems. special and seasonal feeding systems are applied to keep the yield level high in intensive farming system. The wrong place or non-diet program on these farms is also induced the formation of environmentally harmful substances and more defecation depending on the effective use of feed. It can also have negative effects on greenhouse gases. At the same time, drinking water quality is another parameter that needs to be considered. Waterph, temperature, number of microorganisms, nitrate and phosphorus levels are some of these quality criteria. Liquid waste released in animal breeding mixed primarily surface waters and then into the underground waters. This situation increases the number of microorganisms, nitrate and phosphorus concentrations in drinking water. Liquid wastes are primarily released in surface waters and the underground waters mingling with livestock enterprises, here the increases in the number of microorganism, nitrate and phosphorus concentrations.
In review, the importance of waste management, the environmental impacts and the measures to be taken are summarized.

Key words: *waste management, phosphorus, nitrate, sustainability, dairy cattle*

MODELING OF INDIVIDUAL GROWTH CURVES IN JAPANESE QUAILS

Esra YAVUZ[1], Ayse Betul ONEM[1], Fahrettin KAYA[2], Demet CANGA[3], Mustafa SAHİN[1]

[1]Kahramanmaraş Sütçü Imam University, Faculty of Agricultural, Department of Animal Science, TR46040, Onikişubat, Kahramanmaraş, TURKEY
[2]Kahramanmaraş Sütçü Imam University, Andırın Vocational School, Computer Technology Department, TR46410, Andırın, Kahramanmaras, TURKEY
[3]Osmaniye Korkut Ata University, Department of Food Processing, TR80050, Bahçe, Osmaniye, TURKEY

Corresponding author e-mail: yavuz7346@gmail.com

Abstract

This study was conducted to determine the adaptation of the individual growth curves of Japanese quails to both female and male quail data modeled by using Richard, Logistic, Gompertz, Von Bertalanffy, Cubic Spline and Quardic Spline models. In the study, 810 quail data were used as material, 298 female and 512 male. For six different models of Japanese quails, Mean Square Error (MSE), Durbin-Watson autocorrelation test (DW), Akaike Information Criteria (AIC), Coefficient of determination (R^2) *values were compared for both female and male quails. In addition, are shown model predictions of growth curve parameters. As a result of this study for individual growth curve models in Japanese quails, in female quails MSE: 92,50± 17,69, adj* R^2*:0.986± 0.001, AIC: -19.21± 0,15 and DW: 2.21± 0,01 in male quail MSE: 35,391± 9,07, adj* R^2*:0,997± 0,033, AIC: -35.04± 0,29 and DW: 2.09± 0,91 was found as the cubic spline model, which is the best model for both female and male quails.*

Key words: *japanese quail, growth curve, models.*

INTRODUCTION

Mathematical models that demonstrate age-growth relationships are used to determine feeding programs in farm animals, to determine the optimum cutting age and to estimate the effects of applied selection methods.

With the asymptotic and monomolecular functions developed, we try to predict the age-growth associations of the features that are discussed in quail. Furthermore, it is tried to determine the parameter values that can be the selection criterion of these models (Hyankova et al. 2001).

Growth period analysis is needed in economic growth and optimum cutting time by using growth curves in animal husbandry. This study was conducted to in order to determine compliance with individual growth curves to both female and male quail data modeled by Richard, Logistic, Gompertz, Von Bertalanffy, Cubic Spline and Quardic Spline in Japanese quail. For six different models in Japanese quails MSE , adj. R^2 , AIC and DW values were compared in both female and male quails. In addition, parameter estimates of individual growth curves for 6 different models are given.

It has been shown that the longest selection programs in Japanese quails show that the growth curve characteristics may variability and that for the individual growth curve models, the cubic Spline model is the best model for both female quail and male quail. It has been shown that the parameters of high and low live weight ratios can be estimated according to live weight at 4th week (Anthony et al, 1986; Bilgin and Esenboğa, 2003).

MATERIALS AND METHODS

Materials

For the animal material of the study, a total of 810 breeding quail data, 298 female and 512 male, were obtained from the Japanese

quail (Coturnix japonica) grown in Kahramanmaraş Sütçü İmam University, Faculty of Agriculture, Zootechnics Department Animal Husbandry Facilities. During the trial, quails were free of 24% HP, 1.30% lysine, 0.5% methionine, 0.75% methionine + cystine, 0.8% Ca, 0.45% P and 2900 Kcal / Kg ME until 0-6 weeks of age; in the later period, it was fed with 20% HP, 1.15% lisin, 0.5% methionine, 0.76% methionine + cystine, 2.5% Ca, 0.55% P and 2900 Kcal / Kg ME. Records of quail animals that died during the period of the study trial were not evaluated.

Methods

Six different functions were used in the modeling of the individual growth curves of Japanese quail, Richard, Logistic, Gompertz, Von Bertalanffy, Cubic Spline and Quardic Spline. Mathematical models of these functions used in the study are given in Table 1 (Akbaş and Yaylak, 2000).

Table 1. Model expressions and parameters of studied growth functions

Model	Expression
Richard	$W_t = \beta_0/(1+\beta_1\exp(-\beta_2 t))^{1/\beta_3}$
Logistic	$W_t = \beta_0/(1+\beta_1\exp(-\beta_2 t))$
Gompertz	$W_t = \beta_0\exp(-\beta_1\exp(-\beta_2 t))$
Von Bertalanffy	$W_t = {\beta_0}^{1-\beta_3} - \beta_1\exp((-\beta_2 t)^{1/1-\beta_3})$
Cubic Spline	$W_t = \beta_0 + \beta_1 t + \beta_2 t^2 + \beta_3 t^3 + \beta_4(t-a)^3$
Quadratic Spline	$W_t = \beta_0 + \beta_1 t + \beta_2 t^2$

W_t: t. live weight in the day,
W: Asymptotic weight,
β_0, β_1 and β_2 : Model constants describing the growth curve of Richard, Logistic, Gompertz and Quadratic Spline,
β_0, β_1, β_2 ve β_3 : Model constants defining the Von Bertalanffy growth curve,
β_0, β_1, β_2, β_3 ve β_4 : Model constants defining the cubic spline growth curve,
t : Age (in days),
e : Logarithmic base.

The growth curve parameters (W and β) were calculated using the SAS System for Windows 9.0 computer package program.

Goodness-of-fit criteria

Goodness of the fit of models was evaluated according to criteria Mean Square Error (MSE), Durbin-Watson autocorrelation test (DW), Akaike Information Criteria (AIC), Coefficient of determination (R^2).

The goodness-of-fit criteria to compare the studied functions that explain the growth of Japanese quail are as follows:

•Determination Coefficient, $R^2 = 1-(SSE/SST)$, where SSE is the sum of square errors and SST the total sum of squares.

•Adjusted Determination Coefficient, adj. $R^2 = R^2-((k-1/n-k)(1-R^2))$, where n is the number of observations and k the number of parameters.

•Mean Square Error, MSE = SSE/(n−k), where n is the number of observations, SSE sum square of errors and k the number of parameters.

•Akaike's Information Criteria, AIC = n.ln(SSE/n) + 2k, where n is the number of observations, SSE sum square of errors and k the number of parameters (Soysal et al. 1999; Narinç et al. 2010; Üçkardeş et al. 2013; Talpaz et al. 1986).

RESULTS

In the study, the values calculated by using live weight and weekly live weight gain values of both female and male quails for the Japanese quail used and using the individual growth curves by using Richard, Logistic, Gompertz, Von Bertalanffy, Cubic Spline and Quardic Spline models are given in Table 2. It belongs to these models MSE, adj. R^2, AIC and DW values were given for both female and male quails. The model with the lowest MSE value according to Table 2 was found to be a Cubic Spline model for both female and male quails. It was also found that the model with the highest MSE value was Von Bertlanffy for the female quail and the Gompertz model for the male quail.

As seen in Table 2, adj. R^2 values of all models were found to be between 0.945-0.986 respectively. Table 2 also shows AIC and DW values for both female and male quails of 6 different models.

Table 2. Models of MSE, adj. R^2, AIC and DW values

Model	Female			
	MSE	Adj. R^2	*AIC*	DW
Richard	104,22±15,10	0.975±0.001	-0.019±0,11	2,45±0,01
Logistic	128,51±17,93	0.976±0.004	34.12±0,03	2.96±0,03
Gompertz	94,18±15,99	0.985±0.145	-3.11±0,89	1.96±0,11
Von Bertalanffy	555,78±186,6	0.945±0.025	95.98±0,01	3.75±0,23
Cubic Spline	92,50±17,69	0.986±0.001	-19.21±0,15	2.21±0,01
Quadratic Spline	104,48±17,27	0.975±0.002	0,97±0,05	1.86±0,12
	Male			
Richard	42,603±20,162	0,996±0,025	-6.27±0,42	2,21±0,05
Logistic	79,110±15,716	0,985±0,091	45.22±0,19	2.84±0,33
Gompertz	85,118±14,922	0,989±0,001	-5.32±0,02	1.91±0,05
Von Bertalanffy	84,800±15,517	0,990±0,001	67.49±0,26	2.88±0,03
Cubic Spline	35,391±9,07	0,997±0,033	-35.04±0,29	2.09±0,91
Quadratic Spline	51,541±17,482	0,993±0,103	0,67±0,19	1.75±0,45

X ±S_x, MSE: Mean Square Error, adj. R^2: Adjusted Determination Coefficient, *AIC*: Akaike Information Criteria, DW: Durbin-Watson Statistic

Table 3. Estimates of parameters for the studied growth functions

In study Growth parameters of female and male quail estimated by Richard, Logistic, Gompertz, Von Bertalanffy, Cubic Spline and Quardic Spline models are given in Table 3. With the highest values of the mean β_0 parameter, female quail 228.5 and male quail 227.9 values were estimated in the Richard model. The β_0 parameter calculated from the Richard model was found to be higher than the other models.

In the study, weight at the point of inflection of the Richard, Logistic, Gompertz, Von Bertalanffy, Cubic Spline and Quardic Spline Gompertz models were demonstrated for male quail (Figure 1) and for female quail (Figure 2).

As a result, it has been determined that the Cubic Spline regression, which has a flexible structure in terms of inflection point, is the most appropriate growth function for both female and male Japon quails.

Table 3. Estimates of parameters for the studied growth functions

Model	β_0	B_1	B_2	B_3	B_4	Plateau
Richard	228.5 ± 0.75	0.423 ± 0.08	3.764 ± 1.12	-	-	-
Logistic	209.7 ± 1.12	3.336 ± 0.95	0.81 ± 0.03	-	-	-
Gompertz	222.7 ± 5.89	1.706 ± 0.45	0.497 ± 0.02	-	-	-
Von Bertalanffy	0.651 ± 0.02	-0.488 ± 0.03	4.132 ± 0.95	170.4 ± 2.3	-	-
Cubic Spline	-10.98 ± 0.44	13.58 ± 1.11	5.08 ± 0.95	-0.38 ± 0.3	-0.71 ± 0.5	-
Quadratic Spline	-50.04 ± 1.09	48.28 ± 2.78	-2.12 ± 0.07	-	-	223.63 ± 4.78
			Male			
Richard	227.9 ± 0.95	0.623 ± 0.08	3.531 ± 1.08	-	-	-
Logistic	207.5 ± 1.65	5.421 ± 0.76	0.61 ± 0.01	-	-	-
Gompertz	220.3 ± 5.31	1.902 ± 0.03	0.441 ± 0.01	-	-	-
Von Bertalanffy	0.632 ± 0.01	-0.681 ± 0.01	4.522 ± 0.03	175.8 ± 2.9	-	-
Cubic Spline	-9.63 ± 0.05	11.61 ± 0.19	5.14 ± 1.25	-0.45 ± 0.9	-0.82 ± 0.3	-
Quadratic Spline	-48.07 ± 2.19	44.33 ± 2.21	-2.59 ± 0.05	-	-	226.44 ± 3.79

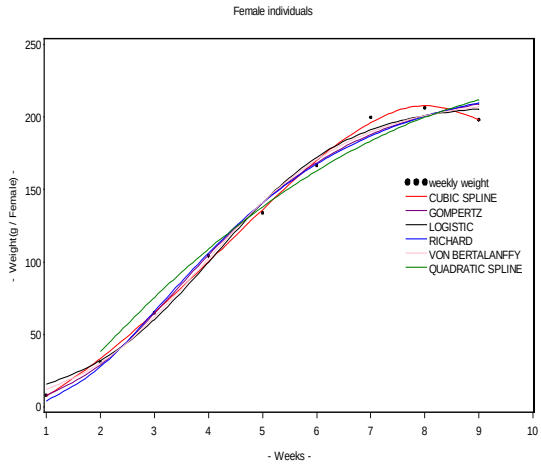


Figure 1. Growth curves of female quail by different growth functions.

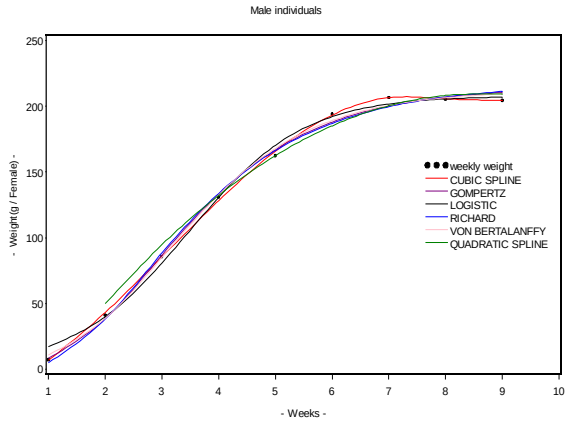


Figure 2. Growth curves of male quail by different growth functions.

DISCUSSION AND CONCLUSIONS

For six different models of Japanese quails, Mean Square Error (MSE), Durbin-Watson autocorrelation test (DW), Akaike Information Criteria (AIC), Coefficient of determination (R^2) values were compared for both female and male quails. In addition, model predictions of growth curve parameters are shown.

As seen in Table 2, adj. R^2 values of all models were found to be between 0.945-0.986 respectively. Many researchers (Alkan et al. 2009 and Balcıoğlu et al. 2005) have displayed quite high values of the adj. R^2 values for growth models such as Logistic, Richards and Von Bertalanffy. In research, the best growth model for female quail was determined to be the Cubic Spline growth function according to the lowest values of MSE and AIC (92.50 and -19.21). Also, the best growth model for male quail was determined to be the Cubic Spline growth function according to the lowest values of MSE and AIC (35.391 and -35.04). The Cubic Spline model, which assesses the shape of a growth curve, has had limited use in quail (Aggrey et al. 2002). Beiki et al. (2013) in study, investigated the growth patterns of quail using seven nonlinear regression models. They reported that the Richards growth curve was the best fitting model for quail growth data, which is in disagreement with the results of the current study. Our results are in disagreement with the previous reports that Gompertz model was the best fitting model for galliforms (Narinç et al. 2010). Growth is a phenomenon depends on genetic and enviromental conditions but it does not depend on species, line or family (Üçkardeş and Narinç 2014). Therefore, it is necessary to determine the best-fitting model for every studied flock. Moreover, the Gompertz model was defined for female the second best fitting function in the current study. But also, the Richard model was defined for male the second best fitting function in the current study. The models showed good fit to the quail growth data as indicated by adj. R^2 values.

Asymptotic weight parameter values of the Richards model for female and male quail (228.5 and 227.9) are in agreement with the value reported by Beiki et al. (2013) for their control group involving both sexes. In another study (Akbaş and Oğuz 1998), the estimated mature weight parameter (β_0) of the Gompertz model for the selection line (239.5 g) was higher than that of the control line (208.3 g), and that of female quail (244.4 g) were higher than male ones (203.5 g). Many studies in which the growth of Japanese quail was showed by the Gompertz model, the mature weight parameter was found to be from 204 to 281 (Narinç et al. 2009, Alkan et al. 2009 and Narinç et al. 2010). Alkan et al. (2009) showed selection to increase the live weight in Japanese quail. In study performed β_0 parameter values to be 295–306 and 151–164 g for a selected and a nonselected line, in order of. It is expected that quail growth and growth curve parameters can be changed via breeding studies or environmental practices (Narinç

et al 2010).

As a result of study for individual growth curve models in Japanese quails, in female quails MSE: 92,50 ± 17,69, adj R^2:0.986 ± 0.001, AIC: -19.21 ± 0,15 and DW: 2.21 ± 0,01 in male quail MSE: 35,391 ± 9,07, adj R^2:0,997 ± 0,033, AIC: -35.04 ± 0,29 and DW: 2.09 ± 0,91 the cubic spline model, which is the best model for both female and male quails was found.

REFERENCES

Aggrey SE, 2002. Comparison of Three Nonlinear and Spline Regression Models for Describing Chicken Growth Curves. Poultry Science, 81, 1782-1788.

Akbaş Y, Oğuz İ, 1998. Growth Curve Parameters of Lines of Japanese Quail (Coturnix coturnix japonica), Unselected and Selected For Four-Week Body Weight. Arch. Geflügelk. 1998, 62 (3), 104-109.

Alkan S, Mendeş M, Karabağ K, Balcıoğlu MS. 2009. Effects short term divergent selection of 5-week body weight on growth characteristics in Japanese quail. Arch Geflugelkd. 73:124–131.

Anthony N B, Nestor K E, Bacon W L, 1986. Growth Curves of Japanese Quail as Modified by Divergent Selection for 4-Week Body Weight. Poultry Science, 65:1825-1833.

Balcıoğlu MS, Kızılkaya K, Yolcu HI, Karabağ K. 2005. Analysis of growth characteristics in short-term divergently selected Japanese quail. S Afr J Anim Sci. 35:83–89.

Beiki H, Pakdel A, Moradi-shahrbabak M, Mehrban H. 2013. Evaluation of growth functions on Japanese quail lines. J Poult Sci. 50:20–27.

Bilgin Ö C, Esenbuğa N, 2003. Parameter Estimation in Nonlinear Growth Models. Animal Production, 44 (2): 81-90.

Hyankova L, Knizetova H, Dedkova L, Hort J, 2001. Divergent Selection Shape of Growth Curve in Japanese Quail 1. Responses in Growth Parameters and Food Conversion. Br. Poultry Sci. 42: 583-589.

Narinç D, Aksoy T, Karaman E. 2010. Genetic parameters of growth curve parameters and weekly body weights in Japanese quails (Coturnix coturnix japonica). J Anim Vet Adv. 9:501–507.

Narinç D, Aksoy T, Karaman E, Karabağ K. 2009. Effect of selection applied in the direction of high live weight on growth parameters in Japanese quail. Akdeniz Univ Zir Fak Derg. 22:149–156.

Soysal M İ, Tuna Y T, Gürcan E K, Özkan E, 1999. A Study on the Comparison of Various Linear and Nonlinear Growth Curves in Japanese Quails (Coturnix coturnix japonica). Livestock Research Journal. 9, 1-2:40-44.

Talpaz H, De La Torre J R, Sharpe P J H, Hurwitz S, 1986. Dynamic Optimization Model for Feeding of Broilers. Agricultural Systems, 20 (1986) 121-132.

Üçkardeş F, Korkmaz M, Ocal P. 2013. Comparison of models and estimation of missing parameters of some mathematical models related to in situ dry matter degradation. J Anim Plant Sci. 23:999–1007.

Üçkardeş F, Narinç D. 2014. An application of modified Logistic and Gompertz growth models in Japanese quail. Indian J Anim Sci. 84:903–907.

UNCHECKED ANIMAL SHELTERS AND THEIR DAMAGES IN FARM

Muge ERKAN CAN[1], Mustafa BOGA[2]

[1]Çukurova University, Faculty of Agriculture, Department of Agricultural Structures and Irrigation 01330 Sarıçam, Adana, TURKEY
[2]Nigde Ömer Halisdemir University, Bor Vocational School, 51700 Bor, Niğde, TURKEY

Corresponding author e-mail: mboga@ohu.edu.tr

Abstract

Turkey is predominantly an agrarian society whose populace mainly subsists on agriculture. In spite of the fact that Turkey is endowed with many human and natural resources per capita agricultural productivity seems to be degenerating in the area of livestock production. Among the main reasons for this degeneration are uncontrolled and unsuitable animal husbandry operations. In our study, we aimed at taking into account the inadequate circumstances of the animal shelters we encountered during our land visits and the conditions under which these shelters harbor unusual livestock.

Key words: *Animal Shelters, waste, unusual livestock, unusual livestock*

INTRODUCTION

The main goal of livestock production is to convert the energy in feed into products that can be utilized by human beings, such as meat, milk, eggs, wool, hair etc.
Livestock play multiple roles in the livelihoods of people in developing communities, especially the in our country' rural area. Systematic and efficient livestock breeding and its by-products, provide food and nutrition, work, economic and social status and maintain environmental sustainability. Besides them, livestock sector plays a basic role in socio-economic development of rural households as in the raising income and improving human nutrition and also have an important function in farming systems. Livestock has considerable positive impact on the rural population where livestock is predominant in terms of employment and manure for crops and as fuel for cooking, power for farming then poverty reduction (Walli, et al., 2012). Unfortunately the our country' livestock sector in general is poorly organised and specifically small family enterprises. On average, 70% of farm buildings have not been built for their current purpose and are usually, therefore, not fit for purpose and if it is possible the scope for change is quite substantial.

Traditional livestock production involving local breeds and low-cost feeding will usually have low performance and can therefore only reduce minimal, if any, expenses for shelters. However, where improved breeds, proper

management and feeding are available it will usually be economic to increment the production intensity. In both cases, however, proper project planning, supervision and various measures must be taken in order to ensure the availability of animal shelters and prevent to damage to the environment. Although this situation can be eased by, besides other farm applications, the construction of buildings and other livestock structures to provide for some environmental control, reduced wastes and better control of diseases and parasites (Mrema et al., 2011). Countrywide measures and agriculture and animal husbandry policies of the country will be very effective in this matter.
Williams and Williams (1984) reported that if the any country wants to increase essantially the protein level in its peoples diet, then a more dynamic and aggressive livestock policy, specially in the area of livestock extension would need to be vigorously pursued.
The purpose of this study is to investigate implementation of livestock husbandry

through farm animal buildings and shelters. The specific objectives of this study are to: To identify major problems with livestock production, determine specific livestock applications and waste management situations and their effects on livestock production and to share the images we obtain about such issues.

MATERIALS AND METHODS

A office study was first done to review literature then a field study was done through the use of questionnaire and interviews. The primary data for this study were garnered using farmers interviews and taken barn photos during our fields visits, which elicited information on the livestock management systems and production problems. All interviews and photographs we took were evaluated in the light of literature information. Images and barn studies belong to the enterprises in Niğde and Adana provinces.

RESULTS AND DISCUSSION

One of the biggest problems in the field of work and in our country and in animal husbandry enterprises is the management of animal wastes. Cleaning and storage applications of wastes are completely inadequate. Fertilizers that can be a very useful and economical source for both plant and other use alternatives are wasted on these conditions. Besides, the uncontrolled accumulation of animal wastes to natural resources such as soil and water is a very dangerous threat to the environment. Animal wastes are a major threat to health both for animals and for working people. If animals are contaminated with fertilizer, this will leads to infections and serious animal health problems . On non-hygienic conditions very serious health problems can be seen in people especially children. Example photographs of the mentioned conditions are given in Picture 1.

Picture 1. Accumulated waste in shelter

There are very different livestock building designs but in all cases the shelter must control three basics which are airspeed, moisture and fresh air environmental parameters. Moisture is produced by all livestock and poultry with breath, urine, faeces and sweat. In order to reduce the risk of infection and to prevent the transport of possible diseases, the floors, walls, bedding and feeding troughs of the shelters must be dry, free of moisture and clean. This clean and dry conditions has not been seen in small family enterprises but large and dense enterprises provide a clean and dry shelter environment (Picture 2.).

Picture 2. Small enterprise (wet-left) and extensive enterprise is (dry-right)

Floors must be well drained to keep bedding and animal housing areas dry. Good drainage both inside and around the outside of the barn is needed to keep the floor dry. A proper drainage system and planned installation are required for clean and dry enterprises. The purpose of succesful livestock building design is to prevent any build-up of moisture by ensuring competent drainage and manure management, and effective ventilation that works in all weather conditions. Feeding storages and animal feed should keep dry and they protected from the elements so as not to develop moulds. Animal feeds should protected from rain and from contamination by rodents, cats and birds.

Hay and whole grains, should protected from moisture and sunlight to help maintain nutrient quality and reduce waste and should not store hazardous materials in or near feed or bedding storage areas (Picture 3.).

Picture 3. Animal feed storage next to animals and modern feed storage

According to researches, clean air must be able to flow in and out of a livestock buildings at all times. Also the clean air should take with it bacteria and viruses that are inevitably present in the environment. Air ventilation should be balanced to maximise growth with providing a livable temperature within the building. New builds should be designed accordingly. While doors and windows are designed, care must be taken to ensure that the barn does get enough light and that fresh air intake does not hit the animals directly. In most of the enterprises visited in our work, especially in natural ventilation cattle shelters, the doors and windows are inadequate and the incoming air directly affects the animals. In mechanically ventilated poultry and closed livestock shelters the standard values required when the system is being projected should be applied with caution (Picture 4.).

Picture 4. Different windows and ventilation equipments

Farm animals are born with certain fixed behaviour patterns, such as nursing in mammals and pecking in chickens but most behaviour patterns develop through. Social contact with other animals of their species and under the influence of environmental impulse and genetic factors. Although behaviour variation within a kindes is caused primarily by differences in the environment and between the sexes, breed, strain and individual variance also have an influence (Walli, et al., 2012). The animals must be housed according to the welfare conditions that their species and characteristics require. Restriction of animal movements in the shelter and damage of the animal by the building elements is a result of the faulty project and it is an undesirable situation. Gates, cages, divisions and stops that are unsuitable for animal sizes and animal movements can cause serious damage to animals (Picture 5).

Picture 5. Unsuitable gates

Enlightenment is also an important factor for livestock buildings to prevent animal stress. There was insufficient lighting or even completely dark in visited enterprises. Where natural lighting is not adequate, artificial lighting should be used so there wont be dark corners or excessive shadows. In the photographs there are dark and smoky barns that we can called the cave type (Picture 6.).

Picture 6. Dark and smoky barns

The specific dimensions and design of the feed barriers and water equipments will depend on feeding ration, animal breed and size, group size and labour availability. Water requirements for animals vary with air temperature, moisture content of feed and stage of production. Ideally they should be flexible to accommodate different range of animal types and sizes (Picture 7.).
There are different styles applied across all the livestock buildings and lack of a linkage between the livestock systems and the farms. These differences and problems might be reduced with improved planning and management.

Picture 7. Different types of feeding and watering equipment

Poor housing conditions have a direct effect on animal welfare and farm yield. Future agricultural and livestock husbandry policies aimed at sustaining extensive livestock husbandry maintenance should be developed while taking into account these findings and recommendations.

REFERENCES

Williams, S.K.T., 1984. Identification of Local Leaders. In: A Manual of Agricultural Extension Workers in Nigeria. Les Shyraden, Ibadan Nigeria pp 41-45.

Mrema, G.C., Gumbe, L.O., Chepete, H. J., Agullo, J.O., 2011. Rural Structures in the Tropics, Design and Development. Chapter 10, Livestock Housing. Food and Agrıculture Organızatıon of The Unıted Natıons Rome.

Walli, T. K., Garg, M. & Makkar, H. P., 2012. Crop residue based densified total mixed ration – A user-friendly approach to utilise food crop. 1st ed. Rome: FAO.

HONEY BEE BREEDING FOR VARROA REZISTANCE

Dilsan BOYLU[1], Hasan ONDER[2]

[1]Akdeniz University, Faculty of Agriculture, Department of Plant Protection, Antalya, TURKEY
[2]Ondokuz Mayıs University, Faculty of Agriculture, Department of Animal Science, Samsun, TURKEY

Corresponding author e-mail: honder@gmail.com

Abstract

Honey bees are exposed to many damaging pathogens and parasites. The most devastating is Varroa destructor, which mainly affects the brood. Breeding for Varroa-resistant honey bees became the primary goal for many researchers around the world. In this review we tried to describe breeding for Varroa resistance.

Key words: *honey bee, varroa, breeding*

INTRODUCTION

Selective honey bee breeding is a phenomenon that fascinates beekeepers around the world. They often regard it as one of the most enigmatic and complex aspects of beekeeping. Indeed, according to our experiences participating in many international projects, both beekeepers and bee experts without a background in plant or animal breeding often have trouble correctly interpreting and conceptually visualizing the breeding process.

These difficulties arise partly because of the complex reproductive biology of honey bees, where queens mate with a multitude of drones. Fundamentally the greatest struggle for people to understand is how selection of animals with preferred characteristics in one generation leads to improved progeny in the next (Uzunov et l., 2017).

The first and very important step is to define the breeding objective. Thus, based on the economic importance, scientific evidence and practical experience, breeders must decide which traits they intend to improve, and what is the relative importance of improving the different traits. Generally, the preferred traits in selection for honey bees involve improving honey yield, gentleness, decreasing the swarming tendancy and increasing Varroa resistance (Uzunov et l., 2017).

Varroa jacobsoni is an external parasite of *Apis cerana* F. and the honey bee, *Apis mellifera* L. These mites feed on the hemolymph of immature and adult bees.

Varroa jacobsoni has a reproductive cycle of '19 d. Just before a brood cell is capped and as the bee larva in the cell approaches maturity, a female mite enters the cell to reproduce. This reproductive opportunity lasts for approximately 12 days while the host bee in the cell progresses through its late larval and pupal stages. All male mites and immature female mites die when the host bee removes the cell capping and exits the cell as an adult. Only adult female mites survive outside the cell, and they spend approximately 7 days on adult bees before repeating the reproductive cycle and entering another brood cell (Harbo and Harris, 1999).

Generally, the preferred traits in selection for honey bees involve improving honey yield, gentleness, decreasing the swarming tendancy and increasing Varroa resistance next (Uzunov et l., 2017).

Honey bees are exposed to many damaging pathogens and parasites. The most devastating is Varroa destructor, which mainly affects the brood (Spötter et al., 2016). Breeding for Varroa-resistant honey bees became the primary goal for many researchers around the world. Varroa Sensitive Hygiene is a behavioral trait of honey bees (*Apis mellifera*) conferring

economically useful and heritable resistance to *Varroa destructor*. Colonies with high expression of the trait reduce and therefore tend to maintain mite populations below economic injury levels (Villa et al., 2017).

RESISTANCE MECHANIZM

The Russian (or Korean) haplotype of *V. destructor* is the hypervirulent variant which threatens *Apis mellifera* beekeeping worldwide
(de Guzman et al., 1997; de Guzman et al., 1999; Anderson and Trueman, 2000). Honey bee colonies that survive infestations of this *Varroa* haplotype have one or more behavioral or physiological traits which underlie their resistance to *Varroa* (Rinderer et al., 2010).

Hygienic Behavior

Hygienic bees are able to detect, uncap and remove diseased brood. A general test of hygiene, the removal of freeze-killed brood by colonies, correlates relatively well with removal of *Varroa*-infested brood (Rinderer et al., 2010).

Grooming behavior

Honey bees clean themselves (autogrooming) and nestmates (allogrooming). Grooming may injure or kill Varroa mites, or it may cause mites to either move to other parts of the autogroomer's body, transfer to a new host or be removed from the bee's body without causing visible injury. Grooming is rarely observed directly. However, variation among honey bee stocks in grooming has been inferred from the proportion of mites that drop to hive floors that are damaged, apparently from bees' mandibles (Rinderer et al., 2010).

Removal of mites from the nest

The bees may carry and discard *Varroa* mites outside the nest. Likewise, living Varroa mites can be lost during foraging flights. The higher proportion of the infested RHB did not return to the hive as compared to infested A. m. carnica and interpreted the behavior to be an adaptive contribution to resistance (Rinderer et al., 2010).

BREEDING PROGRAM

A breeding program represents a set of systematically planned and implemented activities aimed at the sustained genetic improvement of a honey bee population (Uzunov et l., 2017). Thus, by continuous implementation of this selection program it is expected that the colonies in the next generation will express improved behavior concerning targeted traits, enhanced production and vitality including resistance to diseases and pests, prolonged life expectancy and so on.
A breeding program should include clear breeding objectives, performance testing to evaluate the interested characteristics, estimation of the breeding values, selection, mating, production of the improved genetic stock, and evaluation.

CALCULATING HERITABILITY

It is important to calculate heritability (h^2) of a desirable characteristic before beginning a program of selective breeding. Heritability (h^2) is the proportion of the observed variance (among a group of bee colonies in this case) for which differences in heredity are responsible. The estimate of h^2 is a pragmatic measurement that predicts breeding success. If a characteristic has an h^2 close to 1, then the characteristic can be rapidly changed with selective breeding. If h^2 approaches 0, selective breeding will probably fail. As a general rule, it is reasonable to attempt selective breeding if $h^2 > 0.25$ (Harbo and Harris, 1999).
Some researchers used sibling analysis to calculate heritability (Harbo and Harris, 1999). Spötter at al. (2016) declared that the heritability of hygienic behavior was estimated as ~0.2 by Boecking et al. (2000) and as ~0.6 by Harbo and Harris (1999) and Lapidge et al. (2002). According to Spötter at al. (2016) 6 SNP markers had highly significant associations with the Varroa-specific defense behavior. Locke (2016) argued that a dominant genetic component to the trait's inheritance, as opposed to maternal effects or epigenetic mechanisms, and that the trait can be easily produced through selective breeding using

the mite-resistant bee stock. Villa et al. (2016) argued that adaptation of mites to host cues, loss of resistance alleles in a small breeding population, or environmental effects present challenges to breeding for this trait.

CONCLUSION

Breeding for Varroa-resistant honey bees is a very important aim to increase honey bee products and vitality of the stock. Heritability value of this trait is about 0.25; in this situation it is possible to improve that character by selection.

REFERENCES

Anderson D.L., Trueman J.W.H. (2000) Varroa jacobsoni (Acari: Varroidae) is more than one species, Exp. Appl. Acarol. 24, 165–189.

Boecking O, Drescher W. 1992. The removal responses of Apis mellifera L. colonies to brood in wax and plastic cells after artificial and natural infestation with Varroa jacobsoni Oud. and to freeze-killed brood. Exp Appl Acarol. 16:321–332.

de Guzman LI, Rinderer TE, Stelzer JA. 1997. DNA evidence of the origin of Varroa jacobsoni Oudemans in the Americas, Biochem. Genet. 35: 327–335.

de Guzman LI, Rinderer TE., Stelzer JA. 1999. Occurrence of two genotypes of Varroa jacobsoni Oud. in North America, Apidologie 30: 31–36.

Harbo JR, Harris JW. 1999. Heritability in Honey Bees (Hymenoptera: Apidae) of Characteristics Associated with Resistance to Varroa jacobsoni (Mesostigmata: Varroidae), Apiculture and social insects, 92(2): 261-265.

Lapidge KL, Oldroyd BP, Spivak M. 2002. Seven suggestive quantitative trait loci influence hygienic behavior of honey bees. Naturwissenschaften. 89:565–568.

Locke B. 2016. Inheritance of reduced Varroa mite reproductive success in reciprocal crosses of mite-resistant and mite-susceptible honey bees (Apis mellifera), Apidologie, 47:583–588.

Rinderer TE, Harris JW, Hunt GJ, de Guzman LI. 2010. Breeding for resistance to Varroa destructor in North America, Apidologie, 41: 409–424.

Spötter A, Gupta P, Mayer M, Reinsch N, Bienefeld K. 2016. Genome-Wide Association Study of a Varroa-Specific Defense Behavior in Honeybees (Apis mellifera), Journal of Heredity, 107(3): 220–227.

Uzunov A, Brascamp EW, Büchler R. 2017. The Basic Concept of Honey Bee Breeding Programs, The Basic Concept of Honey Bee Breeding Programs, Bee World, 94:3, 84-87.

Villa JD, Danka RG, Harris JW. 2017. Repeatability of measurements of removal of mite-infested brood to assess Varroa Sensitive Hygiene, Journal of Apicultural Research, 56(5): 631–634.

Villa JD, Danka RG, Harris JW. 2016. Selecting honeybees for worker brood that reduces the reproduction of Varroa destructor, Apidologie, 47:771–778.

DETERMINATION OF 70 KDA PROTEINS IN CATTLE OOCYTES MATURED DIFFERENT CULTURE TEMPERATURES IN VITRO

Leyla BENER[1], Ugur SEN[1], Mehmet KURAN[1]

[1]Department of Agricultural Biotechnology, Faculty of Agriculture, Ondokuz Mayis University, 55139 Samsun, TURKEY

Corresponding author e-mail: ugur.sen@omu.edu.tr

Abstract

This study was conducted to determine the effect of 36.5 (low) or 38.5 °C (conventional) culture temperatures during in vitro maturation (IVM) on 70 kDa proteins in cattle oocytes. In the study, cattle cumulus oocyte complexes (COC) were subjected to IVM in bicarbonate-buffered TCM–199 supplemented with 10% FCS for 22 hours with a humidified 5% CO2 in air at either 36.5 or 38.5 °C culture temperatures. Maturation of COCs was determined according to fully cumulus expansion at the end of IVM. The cumulus cells of matured COCs were removed by vortexing in TCM-199 with hepes buffered TCM-199 containing 0.1% hyaluronidase enzyme. Following, denuded oocytes were washed in 9.6 % phosphate buffered saline (PBS) solution for protein isolation. Denuded oocytes (n= 100 for both groups) were centrifuged for 5 min at 300 rpm at 4 °C for PBS removed. The lysis buffer (100 µl) was than added and shake 15 min on ice for 30 minutes. For protein isolation, the protein was centrifuged again at 13000 rpm for 5 minutes and the protein samples was stored at -20 ° C. To increase the concentration of isolated protein samples, the samples were frozen at -80 °C for 24 hours and lyophilized at 0.140 hPa in a lyophilizer. Lyophilized protein samples were stored at -20 °C until SDS-PAGE analysis. The level of 70 kDa proteins in oocytes was determined by SDS-PAGE method. There were no significant differences between low (81.11%) or conventional (84.41%) incubation temperatures in IVM in terms of full cumulus expansion. The 70 kDa proteins band size in SDS-PAGE polyacrylamide gel image of cattle oocytes maturated at low culture temperature was weak compared to cattle oocytes maturated at conventional culture temperature. The results of this study may show that low incubation temperature during IVM decrease the amount of 70 kDa proteins in cattle oocytes.

Key words: *oocyte, maturation, culture temperature, 70 kDa proteins, cattle*

INTRODUCTION

For a long time, in vitro embryo production experiments have been carried out in bovine, but this reproductive biotechnology technique is not yet satisfactory to obtain sufficient quantity of good quality transferable embryos (Pfeifer et al., 2008). In vitro production of bovine embryo is affected by many factors (Camargo et al., 2006). One of the basic factors is essential culture conditions of the oocyte during in vitro maturation (IVM) for normal maturation (Cetica et al., 2001). Various approaches have been employed to improve maturation and developmental competence of bovine oocytes following in vitro fertilization (Katska-Ksiazkiewicz and Alm, 2005; Cevik et al., 2011). Improve in vitro maturation (IVM) competence in bovine oocytes has been subjected in many investigations by supplementation such as follicular fluid, co-culture (Moulavi et al., 2006), growth factors or gonadotropic hormones into IVM media (Cevik et al., 2011). However, developmental competence of bovine oocytes not only depends on the composition of the culture medium but also incubation conditions such as gases tension, humidity and temperature (Leese et al., 2008). IVM of bovine oocytes are performed at 38°C to 39°C, as this temperature is close to the rectal temperature in cattle (Shi et al., 1998). However previous studies demonstrated that the temperature in preovulatory follicles is 1.5 to 2°C cooler than their adjacent stroma in cattle (Hunter, 2005). The existence of follicular cooling raises the question of whether oocytes develop advantageously at lower temperatures. Reduced temperature may be required for

successful oogenesis or oocyte maturation, or for subsequent embryonic or fetal development (Hunter et al. 2006).

Heat shock proteins, first described in 1962, are an increased protein group that is produced when cells are exposed to high temperatures (Aufricht, 2005). The phenomenon that leads to a dramatic increase in heat shock proteins is often regulated by the heat shock factor and is called heat shock response (Morimoto and Santoro, 1998, Sarge et al., 2009). Heat shock proteins can cause many stress factors such as infections other than heat, dehydration, treatment with toxic agents, and ultraviolet light (Morimoto and Santoro, 1998, Aufricht, 2005, Petrof et al., 2005). For this reason, heat shock proteins are also called stress proteins and they are also seen as a sign of stress response.

The best protected and most studied group in organisms is the 70 kDa heat shock protein family (Morimoto et al., 1986; Feige et al., 1996). The 70-kD heat shock proteins have been studied in different animal models, including embryos (Bernardini et al., 2003), bovine oocytes (Camargo et al., 2006) and embryos (Tavares et al., 2005).

The aim of the present study was, therefore, to determine the effect of 36.5 (low) or 38.5 °C (conventional) culture temperatures during in vitro maturation (IVM) on 70 kDa proteins in cattle oocytes.

MATERIALS AND METHODS

All chemicals and media used in this study were purchased from Sigma-Aldrich, Turkey. In the present study, cattle ovaries were collected from a local slaughterhouse. Cumulus-oocyte complexes were recovered from follicles 2–8 mm in diameter by aspiration, using an eighteen-gauge needle fixed to ten ml syringe. After than cumulus-oocyte complexes were washed two times with Hepes-buffered medium-199. Cumulus-oocyte complex were assessed morphologically and only oocytes with compact, intact cumulus cells around and homogeneous cytoplasm were selected for maturation.

A total of 400 cumulus-oocyte complex were subjected to in vitro maturation. Cumulus-oocyte complexes were separately placed in 500 µl of maturation medium covered with 300-µl mineral oil in four-well dishes approximately thirty cumulus-oocyte complexes per well. Maturation medium was sodium bicarbonate-buffered Medium 199 supplemented with ten percentage (10%) heat-inactivated fetal bovine serum.

Cumulus-oocyte complexes were matured for 22 hours filled with humidified 5% CO_2 in air at 36.5 °C (low) or 38.5 °C (conventional) culture temperatures.

In the present study, Cumulus cell expansion of cumulus-oocyte complexes were evaluated at the end of maturation period under a stereomicroscope. Cumulus-oocyte complexes with fully expanded cumulus cell layer considered as maturated oocytes.

The cumulus cells of matured COCs were removed by vortexing in TCM-199 with hepes buffered TCM-199 containing 0.1% hyaluronidase enzyme. Following, denuded oocytes were washed in 9.6 % phosphate buffered saline (PBS) solution for protein isolation. Denuded oocytes (n= 100 for both groups) were centrifuged for 5 min at 300 rpm at 4 °C for PBS removed. The lysis buffer (100 µl) was than added and shake 15 min on ice for 30 minutes.

For protein isolation, the protein was centrifuged again at 13000 rpm for 5 minutes and the protein samples was stored at -20 ° C. To increase the concentration of isolated protein samples, firstly the samples were frozen at -80 °C for 24 hours and secondly lyophilized at 0.140 hPa in a lyophilizer. Lyophilized protein samples were stored at -20 °C until SDS-PAGE analysis. The level of 70 kDa proteins in oocytes was determined by SDS-PAGE method.

Treatment effects (temperature) on cumulus cell expansion of cattle oocytes were analyzed by chi-square (χ^2) test. Statistical analyzes were done by the SPSS 17.0 package program (SPSS, Chicago, IL, USA).

RESULTS AND DISCUSSION

Maturation ratio according to cumulus expansion of bovine oocytes matured in

vitro either at 36.5°C or 38.5°C maturation temperatures is present Table 1. There were no significant differences between low (81.11%) or conventional (84.41%) incubation temperatures in IVM in terms of full cumulus expansion. The results of present study show that culture temperature during in vitro maturation had no effect on cumulus cell expansions of bovine oocytes.

Ye et al. (2007) suggested that lower follicular ambient temperature is advantageous to complete oocyte maturation or development, within the follicular microenvironment. The results of present study show that culture temperature during in vitro maturation had no effect on cumulus cell expansions of bovine oocytes. Similar to the results of our study, previous studies have shown that low incubation temperature during IVM did not affect the rate of cumulus expansion (Shi et al., 1998; Lenz et al., 1983; Ravindranatha et al., 2003; Sen and Kuran, 2018).

Table 1. Maturation ratio according to cumulus expansion of bovine oocytes matured in vitro either at 36.5°C or 38.5°C maturation temperatures

Culture temperatures (°C)	Total oocyte number	Matured oocytes number	Matured oocytes ratio (%)	Std Error	P
36.5 C°	1393	1121	81.11	3.41	0.554
38.5 C°	1501	1325	84.41	2.26	

SDS-PAGE polyacrylamide gel image of cattle oocytes maturated at 36.5 °C (low) or 38.5 °C (conventional) culture temperatures is present Figure 1.

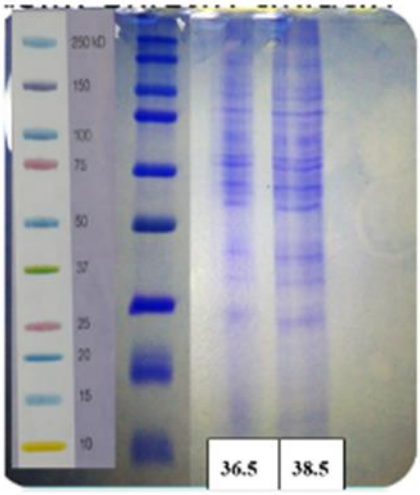


Figure 1. SDS-PAGE polyacrylamide gel image of cattle oocytes maturated at low or conventional culture temperatures.

Among the major heat shock proteins produced by most cells are those that belong to 70 kDa heat shock proteins family (Parsell and Lindquist, 1993). 70 kDa heat shock proteins protect cells against adverse effects of stress (Hendry and Kola, 1991), and function in the absence of stress as a molecular chaperone (Becker and Craig, 1994). In mammals, cytosolic members of the 70 kDa heat shock proteins family appear in two isoforms: a constitutively synthesised variant and a highly heat-inducible form. These two proteins exhibit a high degree of relatedness, although encoded by distinct genes (Welch and Feramisco, 1982). Experiments utilising metabolic labelling with 35S-amino acids and two-dimensional gel electrophoresis have indicated that maturing bovine oocytes synthesise 70 kDa heat shock proteins but the magnitude of synthesis is not increased upon heat shock (Edwards and Hansen,1997). By the 2-cell stage, however, heat shock increases synthesis of 70 kDa heat shock proteins. The heat-inducibility of 70 kDa heat shock proteins genes at the 2-cell stage occurs even in the presence of α-amanitin (Edwards et al., 1997), suggesting either that the increase in 70 kDa heat shock proteins synthesis is regulated post-transcriptionally or, as with Drosophila (Gilmour and Lis, 1986), that RNA polymerase II is bound to the promoter before heat shock and thereby prevents the inhibitory effect of α-amanitin on transcription. In the present study, the 70 kDa proteins band size in SDS-PAGE polyacrylamide gel image of cattle oocytes maturated at low culture temperature was

weak compared to cattle oocytes maturated at conventional culture temperature.

The results of this study may show that low incubation temperature (36.5 °C) during IVM did not have any effects on cumulus expansion and low incubation temperature during IVM decrease the amount of 70 kDa proteins in cattle oocytes.

REFERENCES

Aufricht, C. 2005. Heat–shock protein 70: molecular supertool? Pediatr Nephrol, 20: 707-713.

Becker J, Craig, EA. 1994. Heat-shock proteins as molecular chaperones. Eur J Biochem, 219: 11-23.

Bernardini C, Fantinati P, Castellani G, Forni M, Zannoni A, Seren E, Bacci ML. 2003. Alteration of constitutive heat sok protein 70 (HSC70) production by in vitro culture of porcine preimplanted embryos. Vet Res Commun, 27(Suppl. 1): 575-578.

Camargo LSA, Viana JHM, Sa WF, Ferreira AM, Ramos AA, Vale Filho VR. 2006. Factors influencing in vitro embryo production. Anim. Reprod, 3 (1): 19-28.

Cetica PD, Pintos LN, Dalvit GC, Beconi MT. 2001. Antioxidant enzyme activity and oxidative stress in bovine oocyte in vitro maturation. IUBMB Life, 51(1): 57-64.

Cevik M, Sen U, Kocyigit A, Soydan E, Kuran M. 2011. Effects of serum, gonadotropins, epidermal growth factor and estradiol 17-beta on cumulus expansion and nuclear maturation of bovine oocytes. Kafkas Univ Vet Fak Derg, 17: 1009-1014.

Edwards JL, Hansen, PJ. 1997). Differential responses of bovine oocytes and preimplantation embryos to heat shock. Mol Reprod Dev, 46: 138-45.

Edwards JL, Ealy AD, Monterroso VH, Hansen PJ. 1997. Ontogeny of temperature-regulated heat shock protein 70 synthesis in preimplantation bovine embryos. Mol Reprod Dev, 48: 25-33.

Feige U, Morimoto R I, Yahara I, Polla B. 1996. Stress Inducible Cellular Responses, Birkhauser Verlag, 77.

Gilmour DS, Lis JT. 1986. RNA polymerase II interacts with the promoter region of the noninduced hsp70 gene in Drosophila melanogaster cells. Mol Cell Biol, 6: 3984-3989.

Hendry J, Kola I. 1991. Thermolability of mouse oocytes is due to the lack of expression and/or inducibility of hsp70. Mol Reprod Dev, 28: 1-8.

Hunter RHF, Einer-Jensen N, Greve T. 2006 Presence and significance of temperature gradients among different ovarian tissues. Microsc Res Tech, 69: 501-507.

Hunter RHF. 2005. The Fallopian tubes in domestic mammals: how vital is their physiological activity? Reprod Nutr Dev, 45: 281-290.

Katska-Ksiazkiewicz L, Alm H. 2005. Effect of culture methods on cumulus and oocyte morphology and meiotic competence of bovine oocytes from early antral follicles. Arch Tierz Dummerstorf, 48: 562-571.

Leese HJ, Baumann CG, Brison DR, McEvoy TG, Sturmey R.G. 2008. Metabolism of the viable mammalian embryo: quietness revisited. Molec Human Reprod, 14: 667-672.

Lenz RW, Ball GD, Leibfried ML, Ax RL, First NL. 1983. In vitro maturation and fertilization of bovine oocytes are temperature dependent processes. Biol Reprod, 29: 173-179.

Morimoto RI, Hunt C, Huang S Y, Berg L, Banerji S. 1986. Organization, nucleotide sequence, and transcription of the chicken HSP70 gene. J Biol Chem, 261: 12692-12699.

Morimoto RI, Santoro MG. 1998. Stress–inducible responses and heat shock proteins: new pharmacologic targets for cytoprotection. Nat Biotechnol, 16: 833-838.

Moulavi F, Hosseini SM, Ashtiani SK, Shahverdi A, Nasr-Esfahani MH. 2006. Can Vero cell co-culture improve in-vitro maturation of bovine oocytes? Reprod Biomed Online, 13: 404-411.

Parsell DA, Lindquist S. 1993. The function of heatshock proteins in stress tolerance: degradation and reactivation of damaged proteins. Annu Rev Genet, 27: 437-96.

Petrof EO, Ciancio M, Chang EB. 2004. Role and regulation of intestinal epithelial heat shock proteins in health and disease. Chin J Dig Dis, 5: 45-50.

Pfeifer LFM, Schneider A, Correa MN. 2008. Factors that affect the in vitro production of bovine embryos: A review Rev Colomb Cienc Pecu, 21: 109-120.

Ravindranatha BM, Nandi S, Raghu HM, Reddy SM. 2003. In vitro maturation and fertilization of buffalo oocytes: effects of storage of ovaries, IVM temperatures, storage of processed sperm and fertilization media. Reprod Domest Anim, 38: 21-26.

Sarge KD, Murphy SP, Morimoto RI. 2009. Activation of heat shock gene transcription by Heat Shock Factor 1 involves oligomerization, acquisition of DNA–binding activity, and nuclear localization and can occur in the absence of stress. Mol Cell Biol, 13: 1392-1407.

Şen U, Kuran M. 2018. Low incubation temperature successfully supports the in vitro bovine oocyte maturation and subsequent development of embryos. Asian-Australas J Anim Sci, 31(6): 827-834.

Shi DS, Avery B, Greve T. 1998. Effects of temperature gradients on in vitro maturation of bovine oocytes. Theriogenology, 50: 667-674.

Tavares A, Oliveira de D, Felix Lopes RF, Rodrigues LJ. 2005. Gene expression and developmental competence of bovine embryos produced in vitro under varying embryo density conditions. Theriogenology, 64: 1559-1572.

Welch RJ, Feramisco, JR. 1984. Nuclear and nucleolar localization of the 72 000-dalton heat shock protein in heatshocked mammalian cells. J Biol Chem, 259: 4501-4513.

Ye J, Coleman J, Hunter MG, Craigon J, Campbell KH, Luck MR. 2007. Physiological temperature variants and culture media modify meiotic progression and developmental potential of pig oocytes in vitro. Reprod, 133: 877-886.

IMPLEMENTATION OF GROWTH CURVES AND INTERPOLATION METHODS FOR FATTENING CONTINUATION DECISION

Ebru ERGUNES BERKIN[1], Hasan ONDER[2], Ozgur Hakan AYDOGMUS[3]

[1] Bandirma Sheep Breeding Research Institute, Bandirma, Balikesir, TURKEY
[2] Department of Animal Science, Ondokuz Mayis University, Samsun, 55139, TURKEY
[3] Social Science University of Ankara, Faculty of Political Science, 06050, Altindag, Ankara, TURKEY

Correspondingauthore-mail: ebru_berkin01@hotmail.com

Abstract

In classical breeding, animals of fattening material are picked up on the basis of a fixed fattening period or fattening weight. In this case, it can come out with unforeseen individual differences in the growth and fattening performances of the animals. If the animals which growth and fattening performance is not sufficient, continuation of the feed may lead to economic loss or while it is possible to produce higher meat, there may be a possible deprivation of utility with the early sale of these animals. In this study, it was aimed to develop a decision mechanism for continuing the feeding, if the expected live weight gain for the lambs is economical, otherwise the slaughtering should be referred. For this purpose, live weight of the lambs was taken from birth until the sixth month and then the first 4 months of live weights were extrapolated to the expected weights of the animals in the fifth month by using parameter estimation of the Gompertz growth curve and Shape-Preserving piecewise cubic interpolation (SPPCI) methods. With this method, it is aimed to establish a decision support system about whether fattening will be cut or not in the fourth. Profitability in this direction was determined by taking the difference between the estimated product price at the end of one month fattening and the fattening cost calculated over 3% dry matter consumption. According to the research findings, it is determined that the mean of the deviations of the estimations made by the Gompertz growth curve method is higher than the SPPCI method but the standard deviation is lower. Taking into consideration the evaluations made using birth weight and the first 3 months of live weight, it is considered that the SPPCI method can be used to estimate the next measurement point and the Gompertz growth curve method can provide more reliable estimates for the estimation of more distant measurement points.

Key words: *Gompertz growth curve, Shape-Preserving piecewise cubic interpolation, Fattening, Economy*

INTRODUCTION

The world's Sheep farming meets the needs of people for meat and milk, as the other branch of sheep production that benefits from other products such as wool and skin. Sheep constitutes 76% of the 44.312 million heads of small ruminants In Turkey In sheep breeding, lamb meat production has a great importance. In total red meat production, the share of sheep meat is 20.8%, of which 6.1% is lamb meat (TUİK,2017).

In classical breeding, the animals of fattening material have got usually a fixed fattening period or the ending weight of fattening, unpredicted individual differences in these animals may have an impact on growth and fattening performances. Fattening performance is affected by internal and external factors in relation to the animal to be fed. These internal factors may be race, gender, age, type of birth etc., as well as external factors such as feed, climate, water, and care etc. (Sahin and Akmaz, 2002). Continuing feed in animals with insufficient fattening performance can lead to economic losses. In addition, while it is possible to achieve higher meat production, there may be possible deprivation of utility by sending these animals at early ages. There are some studies on this issue;

In a study conducted by Aksoy (1995), It was the result that would be appropriate for slaughter when it becomes 40 kg. live weight starting from two or three months of age after weaning for Morkaraman and Tuj male lambs taking into account daily live weight gain, tail fat and feed conversion rate. Altın et al., (2005), maintained the feeding until 10 weeks of age of Kıvırcık and Karya lambs weaned at approximately 77 days and determined feed consumption with weekly live weight during fattening.As a result, authors made a simple economic analysis of the feeding and reported that these two breeds gave similar results in terms of post-slaughter fattening performance.Tekel et al., (2007), examined the effects of fattening performance and carcass characteristics of Ivesi male lambs on 60, 75, and 91 days of intensive fattening. As a result, it has been revealed that the prolongation of the fattening period can negatively affect the economy of fattening and mentioned that producing of fatty carcasses may reduce market demands. Demir et al., (2001), separated 3 groups, one of which was the control group, and applied the bovino somatotropin hormone at different doses. At the end of the 56-day fattening period, they made comparisons for the cost of fattening, and they came to the conclusion that these hormones were not economically viable for breeding. Çelikeloğlu and Tekerli (2004), applied four different mathematical models in order to study the environmental factors affecting the growth curves of the live weight of the 328 head of Pırlak lambs. It is reported that the best model is Brody, Bertalanffy, Gompertz and Logistic model respectively in terms of the determination coefficient. As a result; that female lambs had reached early adult live weight earlier than male lambs, therefore they reported that females can be dispatched to slaughtering earlier than males. Bytqi et al. (2015), reviewed economic values for a combination of milk and meat production characteristics in four different sheep breeds in Kosovo.For this purpose daily income and costs are calculated. The Wood function for the average daily milk yield and the Gombertz function for the live mass calculations of the lambs were used. In conclusion, this study showed that milk production for all sheep breeds raised in Kosovo has much more economic importance than meat production.

Sieklicki et al. (2016), used Brody, Gompertz, Von Bertalanffy and Logistic model to describe the relationship between weight and age in their study with 42 heads of Texel male lambs. It has been reported that the high negative correlation between A and k parameters was found for all models examined for optimum nutritional management and slaughter weight. In this case, animals with high growth rates tend to have lower asymptotic weights than animals with low growth rates. However, it is stated that animals growing earlier can be slaughtered without anticipation of reaching a slightly higher slaughter weight. As a result, authors reported that the Body model gives the best result in terms of growth curve with high determination coefficient and low mean squares error. Lupi et al., (2015), applied the Brody, Verhulst, Gompertz, Von Bertalanffy and Logistic model to 129.610 individual live weight data during the period from birth to adulthood on Segureña sheep breeds. With the use of curve parameters as a selection criterion, the aim was to mathematically express the best cut-off time, information on the feeds that animals need and production forecasting. For rapidly growth animals, it has been reported that the curve can be deduced from the slope of the curve, which corresponds to the inflection point of the best cut time. They noted that this information could also allow marketing and commercial forecasting, as well as being able to plan feeds at the same time. The possibility that non-linear models can be used as early selection criterion for decision making in slaughtering, some curve parameters in breeding programs may be presented as a selection criterion in the development of important commercial features such as early development.

In this study, it was aimed to develop a decision mechanism for the continuation of feeding according to economy of expected live weight gain for the lambs, not based on the fattening time and aimed slaughtering weight.

MATERIALS AND METHODS

Material

The data used in this study belongs to 38 Karayaka male lambs, taken from a commercial farm located in Bafra province of Samsun. In the realization of the analysis, MATLAB V.7.12.0.635 software was used with license number of 161052 (Dhar et al., 2017).

Methods

Generally, a fixed fattening period or the end of fattening live weight is based for fattening studies. In this study, the weight of lambs that live weights were recorded monthly from birth to the sixth month were extrapolated with using first 4 month live weights and birth weight in order to estimate their expected weights in the fifth month. For this aim Gompertz growth curve (GGC) and Shape-Preserving piecewise cubic interpolation (SPPCI) methods were used. With these methods, it is aimed to establish a decision support system for the termination or continuation to feeding at the fourth month. Profitability in this direction was determined by taking the difference between the estimated product price at the end of one month's fattening and the fattening cost calculated over 3% dry matter consumption. Considering that an animal's live weight (LW) consumes forage (1.1% of LW) and concentrated feed (2.2% of LW), profitability can be calculated as shown in equation (1).
In this equation, the 5th month LW data was calculated over the expected values for both methods and the same procedures were applied on the original data set taken on the 5th month and compared. For the calculation of operating costs, only feed costs are taken into consideration and other costs are assumed to be fixed.

The expected values for the 5th month were calculated using the Gompertz growth curve and the Shape-Preserving piecewise cubic interpolation (SPPCI) method.

Gompertz Growth Curve (GGC) Method

One of the methods used in predicting growth curves is the Gompertz growth curve. The function of the Gompertz growth curve can be defined as in equation (2) (Onder et al., 2017).

$$a*\exp(-b*\exp(-k*t)) \quad (2)$$

a: Asymptotic or predicted final mature weight
b: Scaling parameter (constant of integration)
k: Instantaneous growth rate (per time unit) parameter
t: Age at the inflection point

Shape Preserving piecewise cubic interpolation (SPPCI) Method

Data points x_k, k=0,...,n are interpolated using a piecewise cubic polynomial $P(x)$ with the following properties :
1-On each subinterval $x_k \le x \le x_k+1$, $P(x)$ is a cubic Hermite interpolating polynomial for the data points with specified slopes at the interpolation points.
2- $P(x)$ interpolates y, that is, $P(x_j)=y_j$, and the first derivative dP/dx is continuous. The second derivative d^2P/dx^2 is probably not continuous so jumps at the x_j are possible.
3- The cubic interpolant $P(x)$ is shape preserving i.e. the slopes at the x_j are chosen in such a way that $P(x)$ preserves the shape of the data and respects monotonicity (Luo, and Huiyan, 1996).

$$A = 5.month\ LW - 4.month\ real\ LW$$
$$Sale\ price(SP) = A\,x\,Carcass\ yield(\%45)\,x\,Carcass\ purchase\ price(43TL/kg)$$
$$Meadow\ Grass\ Costs(MGC) = 4.month\ real\ LW x 1.1\,x\,meadow\ grass\ unit\ price\ (0.55TL/kg) \quad (1)$$
$$Concentrate\ Feed\ Costs(KYC) = 4.month\ real\ LW\ x\ 2.2\ x\ concentrate\ feed\ costs\ unit\ price\ (1.3TL/kg)$$
$$Total\ Costs(TC) = MGC + KYC$$
$$Profit = SP - TC$$

Table 1: Profitability values used at the end of the fourth month for fattening termination decision

Lamb no	MP	SPPCP	GGCP	MP-SPPCP	MP-GGCP
1	-10,57	1,26	-52,08	-11,83	41,51
2	4,57	-35,74	-37,01	40,32	41,58
3	0,67	-42,77	-35,68	43,44	36,35
4	-5,22	-3,84	-33,90	-1,38	28,68
5	14,09	26,36	-31,77	-12,26	45,87
6	5,60	31,19	-21,01	-25,59	26,61
7	-6,13	-53,37	-44,60	47,24	38,47
8	-3,97	2,16	-49,99	-6,13	46,02
9	7,34	-50,46	-41,87	57,80	49,21
10	-9,20	-59,20	-51,00	50,00	41,80
11	-4,61	-69,41	-48,12	64,80	43,51
12	2,52	21,29	-40,04	-18,77	42,56
13	1,31	6,83	-25,85	-5,52	27,16
14	-1,27	17,82	-41,11	-19,10	39,84
15	-8,98	2,87	-51,62	-11,85	42,65
16	1,80	27,72	-21,52	-25,92	23,32
17	-17,48	13,95	-56,86	-31,42	39,38
18	-7,76	-1,30	-51,40	-6,46	43,64
19	-8,86	-22,02	-53,07	13,16	44,21
20	-1,23	-44,50	-35,96	43,27	34,73
21	0,78	-39,21	-37,53	39,99	38,30
22	3,55	-53,92	-42,79	57,47	46,34
23	-9,01	-7,31	-34,48	-1,71	25,46
24	-13,68	17,41	-55,71	-31,09	42,03
25	5,67	0,02	-41,61	5,65	47,28
26	-7,08	4,60	-51,06	-11,68	43,98
27	-12,47	-0,47	-52,68	-12,00	40,21
28	1,87	-3,44	-42,80	5,32	44,68
29	-10,84	12,37	-49,57	-23,20	38,74
30	5,10	10,30	-26,14	-5,19	31,24
31	-2,33	-49,91	-43,32	47,57	40,99
32	-6,51	-71,14	-48,60	64,63	42,09
33	10,30	22,89	-32,26	-12,59	42,56
34	-13,00	-62,66	-52,19	49,67	39,19
35	-8,14	-12,01	-33,71	3,87	25,57
36	-5,07	-18,56	-51,68	13,49	46,61
37	-11,94	-15,48	-34,75	3,54	22,81
38	-7,04	15,83	-48,38	-22,87	41,33
			Total	354,66	1.476,51
			Average	9,33	38,86
			Standard deviation	4,97	1,18

MP= Profit calculated from measured live weight data
SPPCIP= Profit calculated for expected live weight using the SPPCI method
GGCP= Profit calculated for expected live weight using the Gombertz growth curve method

RESULTS AND DISCUSSION

Along with many factors affecting fattening performance, feed is the biggest expense in animal husbandry. The longevity of the fattening period can cause declines in feed consumption and also adversely affect the economy of feeding. It is clear that the most important factor is the relationship between cost and profitability over meat and feed prices. Profitability values used at the end of the fourth month for fattening termination decision was given in Table 1. In Table 1, the profitability values used in the decision to terminate the feeding were compared at the end of the fourth month.According to the results, 24 lambs for MP and 21 lambs for SPPCIP were found not to be economical to continue the fattening.Hence, when the MP and SPPCIP are compared, it can be seen that the amount of economic losses to each animal changes, but the feed should be terminated at 16 of the same lambs. On the other hand, when GGCP was examined, it was seen that all lambs should be sent for slaughtering at the 4th month. In addition, when the mean and standard error of the difference between MP-SPPCIP and MP-GGCP were examined, it was determined that the mean of the deviations of the estimations made by the GGCP was higher than the SPPCI method, but the standard deviation was lower.

Taking into consideration the evaluations made using birth weight and the first 4 months of live weight, it is considered that the SPPCI method can be used to estimate the next measurement point and the Gompertz growth curve method can provide more reliable estimates for the estimation of more distant measurement points.

REFERENCES

Cakmak H, Dudu H, Saracoglu S. 2009. Climate change and agriculture in Turkey: A Cge Modeling Approach. EconAnadolu 2009: Anadolu International Conference in Economics. June 17-19, Eskişehir, Turkey.

Aksoy AR. 1995. Farklı kesim ağırlıklarında Morkaraman ve Tuj erkek kuzularının besi performansı kesim ve karkas özellikleri, Ankara Ünv. Veteriner Fak.Dergisi, 42:15-23.

Altın T, Karaca O, Cemal İ, Yılmaz M, Yılmaz O. 2005. Kıvırcık ve Karya kuzularda besi ve karkas özellikleri. Hayvansal Üretim, 46(1): 19-29.

Bytyqi H, Fuerst-Waltl B, Mehmeti H, Baumung R. 2015. Economic values for production traits for different sheep breeds in Kosovo. Italian Journal of Animal Science, 14(4): 3808.

Çelikeloğlu K, Tekerli M. 2014. Pırlak kuzularında büyüme eğrilerini etkileyen genetik ve çevresel faktörlerin belirlenmesi ve eğri parametreleri yönünden baba koçların değerlendirilmesi: I. Bazı çevresel faktörlerin canlı ağırlığa ilişkin büyüme eğrilerine etkileri, Lalahan Hay. Araşt. Enst. Derg., 54(1): 8-14.

De Fatima Sieklicki M, Pedrosa VB, Rocha CG, Moreira RP, Falcão PR, dos Santos IC, de Souza Martins A. 2016. Growth curves of Texel male lambs. Acta Scientiae Veterinariae, 44: 1-6.

Demir H, Özcan M, Kaygısız F, Abaş İ, Ekiz B. 2001. Erken dönemde besiye alınan Kıvırcık Irkı kuzularda farklı dozlarda somatotropin hormonu (Rbst) uygulamasının besi performansı, bazı karkas özellikleri ve kuzu maliyetine etkisi. J Fac Vet Med, 20: 41-47.

Dhar S, Mukhopadhyay SK, Pal S, Mitra M. 2017. An efficient data compression and encryption technique for PPG signal, Measurement, 116: 533-542.

Lupi TM, Nogales S, León JM, Barba C, Delgado JV. 2015. Characterization of commercial and biological growth curves in the Segureña sheep breed. Animal, 9(8): 1341-1348.

Onder H, Boz MA, Sarıca M, Abacı SH, Yamak US. 2017. Comparison of growth curve models in Turkish native geese. European Poultry Science, 81: 1-8.

Sahin E, Akmaz A. 2002. Farklı kesim ağırlıklarında Akkaraman kuzuların besi performansı, kesim ve karkas özellikleri. Vet. Bil. Der, 18(3): 29-36.

Tekel N, Şireli HD, Vural ME. 2007. Besi süresinin ivesi erkek kuzuların besi performansı ve karkas özelliklerine etkisi. Tarım Bilimleri Dergisi, 13(4): 372-378.

TUİK. (2017). http://www.tuik.gov.tr (Access date: 09.08.2018).

Yang L, Huiyan Z. 1996. Shape preserving piecewise cubic interpolation. Applied Mathematics, 11(4): 419-424.

THE EFFECTIVENESS OF *YUCCA SCHIDIGERA* FOR REDUCING METHANE EMISSION IN STRAW BASED RATIOS

Sabri YURTSEVEN[1], Sultan AL[1]

[1]Harran University, Faculty of Agricultural, Department of Animal Science, TR63300, Osmanbey, Şanlıurfa, TURKEY

Corresponding author e-mail: syurtseven@harran.edu.tr

Abstract

The effect of feeding diets with dietary Yucca schidigera extract (YE) on some greenhouse gases (CH_4, CO_2 N_2O) of Awassi sheep fed on wheat straw diets was studied. Total eight sheep (average live weight: 42.87±3.75) were assigned randomly two diets with iso caloric (ME: 2.5 Mcal/kg), iso nitrogenous (15 % CP) groups differing in their YE content. The ratios were mixed with rough and concentrated feed and sheep were housed in individual pens and fed ad libitum as total mixed diets. No significant difference was observed in feed intake, live weight change for sheep fed the experimental diets. However, sheep fed the YE diet emitted lower ($P < 0.05$) N_2O (g/kg and g/kg LW) as compared to sheep fed the Control diet. No significant ($P > 0.05$) difference was observed in emitted CH_4, CO_2. As results of this experiment, it was observed that 0.1 % YE were a potent for decreasing nitrogen based gas (N_2O) of Awassi sheep.

Key words: *awassi, straw, yucca schidigera extract, N_2O, CH_4*

INTRODUCTION

Şanlıurfa province is a region where the problem of roughage is constant due to the hot and arid climate. In recent years the need for roughage in the region has been met with alfalfa and silage maize. The region has potential for wheat straw (WS) production, and large animal farming now treat straw as major forage feed source. According to the figures for 2013, about 22 million tons of wheat were produced (TUIK, 2017). Assuming that hay is produced by the amount of grain produced, straw production is close to 25 million tons. Today, a total ruminant feed can contain up to 20% and sometimes completely straw and it is an inevitable source for economic livestock. However, the use of nitrogen decreases and the formation of methane gas increases in straw-based feeds (Blummel et al., 2005). Methane emissions have increased by 149% over the last 250 years and it has 23 times more global warming potential than carbon dioxide. (Thorpe, 2009).

Sheep produce 8 m^3 (about 8 kg) of enteric methane gas per animal per year (Vermorel, 1997). In addition to its environmental effect, enteric methane corresponds to a gross energy loss of 2% and 12% (Johnson and Johnson, 1995). Cattle produce 7-8 times more methane than sheep (Broucek, 2014).

N_2O is 298 times more potent than global warming potential of carbon dioxide and is a greenhouse gas that occurs in animal activities. In general, N_2O is emitted as gas to the environment from animal feces. It is estimated that 25% of the greenhouse gases of animal origin are derived from fecal-emitting gases. The most important resource is cattle. Approximately, 10% of fecal-source gases are formed and spread in storage conditions. Among these gases, nitrogen-based gases are emitted in significant quantities atmospheres as nitrous oxide and ammonia. N_2O is more effective in the global warming than the methane and damages the ozone layer.

Among all animal species, the most CH_4 and N_2O producers are ruminants. Decreasing effects of saponin and similar substances *in vitro* studies have been demonstrated in decreasing the release of enteric methane as well as fecal-derived nitrous oxide release (Patra et al., 2006; Pen et al., 2006; Goel et al., 2008).

It is suggested that gas formation can be reduced by some contributions that can be made in straw-based rations (Yurtseven et al., 2009). Some saponin sources have proved to have anti methanogenic anti-protozoal effects in small ruminants (Hu et al., 2005). *Yucca schidigera* is a plant that grows in South America and has the highest saponin level in the desert climate. The rumen effect of the *Yucca schidigera* saponins may be reflected in the feces and thus it may have a reducing effect on the nitrous oxide emitted from the feces. *In vivo* studies on the effects of saponins on methane, carbon dioxide and nitric oxide gas emissions are also limited. Investigation of the effect of *Yucca schidigera* additives on methane and nitrous oxide in straw-based feeding regimens is an important aspect of this research.

MATERIALS AND METHODS

In this study, the effects of *Yucca schidigera* extract on methane, carbon dioxide and Nitrous oxide gases were investigated in sheep. The current study lasted 21 days, with 15 days of adaptation followed by gas measurements on 6 days during November-December 2015.

The animal material used in the study was *Awassi* female sheep in Harran University Agricultural Faculty Research Application Farm. The live weights of the sheep were 42.87 ± 3.75 kg and their ages were 2-3 years old. In the study, 8 sheep were divided into two groups with similar weight and age in each group (Table 1).

Table 1. Experimental groups (WS: wheat straw)

Groups	Concentrate	Forages
1.Control	70%	30% WS
2.Yucca ekstract	70 %	30% WS + 0.1% of the concentrate feed mixture.

Table 2. Concentrate feed content

Feed material	%
Barley	38.9641
Cotton seed meal -28	10.6463
Corn bran	10.5
Wheat bran	7.5572
Lime stone	1.7724
Salt	0.49
Vit + min.premix*	0.07
Wheat straw	30
	100.00
Dry matter, %	88.52
Me, kcal /kg	2.360
Crude protein,%	11.0
Ether extract, %	1.87
Crude fiber, %	19.72
ADF, %	20.6
NDF, %	41.6
Crude ash, %	8.34
Calcium, %	1.00
Total phoshorus, %	0.60
Sodium, %	0.31

*: 1 kg vitamin mineral mixture: 5000 IU vitamin A, 30 mg Vit E, 1000 IU Vit D3, trace minerals: Mn (Mn oxide): 50mg; Zn (Zn Oxide) 50mg; Cu (Cu sulfate pent hiydrate) 10 mg; I (Calcium iodide): 0.8 mg; Se (Sodium selenite) 0,1 mg; Co (cobalt carbonate monohydrate) 0,1 mg.

Both groups were contained similar energy and protein. The contents of the concentrate used are given in the table 2.

The WS used in the ratios was milled to 3-5 cm in size. Eight sheep were distributed to 2 treatment groups with similar live weight and age. The groups were distributed in each trial group consisting of four replications with one animal. The individual paddocks were constructed as 1.5×1.5×1.5 m in size. The experiment was carried out on the soil and *ad libitum* (free) feeding was applied.

Sheep were taken to the room for enteric methane measurement after 15 days adaptation feeding. After the adaptation period, one animal from each group was placed in a container with two different rooms. The methane measurement was based on the principle of finding a concentration difference in the air stream entering and leaving a closed room. For this purpose, a container consisting of two rooms (with 2m width - 2 m height - 2 m height) was turned into a respiration chamber. Fresh air entering and leaving the room was provided with inlet and outlet fans with the same ventilation capacity (90 m3 / h = 0.25 m3 / s). Each fan was placed in a cylindrical tube with a diameter of 10 cm and a length of 30 cm. Air samples were taken five times per day from the cylinders. The sheep were taken to the gas room at

08.30 in the morning and two air samples were taken at 10.30, 12.30, 14.30, 16.30, 18.30, 20.30, 22.30, 00.30, 02.30, 04.30, and 06.30. During the data collection period, sheep were kept in the respiratory chamber as a single sheep every day. The next day, after the sheep were removed, doors and windows were opened for about 1 hour and the room was ventilated. In addition, the stool and urine of the previous animal were cleared because they could spread methane. After the sheep were taken into the room, the fans were continuously operated and the air inside the room was changed. In this way, an attempt was made to find the flow of air flowing through a certain section of the cylinder tube.

The detection of gases was measured as ppm in air entering and leaving by gas chromatograph and the differences are found. Methane and carbon dioxide emissions were calculated with the help of the air flow formula below (McGinn et al., 2004).

$$CH_4 = \left\lfloor Ce.Ma\frac{P}{RT}Ve.A \right\rfloor - \left\lfloor Ci.Ma\frac{P}{RT}Vi.A \right\rfloor$$

In this formula; fCH4: Amount of methane (g/sec), Ce: the concentration of methane in the fresh air enter in and leaving the room (ppm), Ma: molecular weight of Methane (16 g/mol) or carbon dioxide (44 g/mol), P: Barometric air pressure (Pa), Ve: The wind speed (m/sec) of the air entering and leaving the room, R: International gas constant value (8.31 $Jmol^{1}.degree.K^{-1}$), T: Ambient temperature Kelvin (then turned to °C), A: Cross section of cylinder with gas flow (0.0250 m^2). Feed consumption was determined weekly and live weights were determined at the beginning and end of the experiment.

The daily feces accumulation was calculated by weighing. The results of the experiment were analyzed according to the t test and to the experimental design with two groups' randomized design. The obtained data were analyzed according to Independent Sample t test in SPSS (2003).

RESULTS AND DISCUSSION

The performance values obtained at the trial were given in Table 3. There was no significant difference between the control and *Yucca schidigera* groups in terms of feed consumption, daily weight gain and feed conversion ratio (P>= 0.05).

Table 3. Some performance values during the adaptation period and data collection period in the experimental groups

	Control	*Yucca*	SEM**	P=
Feed consumption, g/day (0-13 days)	1832.07	1893.94	95.3	0.69
Feed consumption, g/day (13-18 days)	1702.3	1766.2	210.6	0.84
Feed consumption, g/day (0-18 days)	1769.7	1830.0	150.4	0.79
DWG*, g/day (0-18 days)	125.0	111.1	32.6	0.78
FCR (0-18 days)	1.06	1.04	0.04	0.75

*DWG: daily weight gain, FCR: feed convertion ratio, **SEM: Standart error mean.

Likewise, Eryavuz et al (2015) reached similar conclusions when they studied the effect of *Yucca* powder on lamb rations. Gorgulu et al. (2002) reported that some performance parameters, such as live weight, were not affected during the studies they performed in Awassi lambs. Our study focused on gas measurement and lasted 21 days, one week adaptation and two weeks gas sampling. The study also consisted of sheep from 2 and 3 years of age completed.

Although no significant performance values were observed in our study, but the emission of rumen-derived enteric CH_4 gave significantly positive results when proportioning to live weight. (Table 4).

Pen et al. (2007) were obtained similar results in *in vitro* studies in order to demonstrate the effect of nitrogen in sheep, methane production. They suggested that *Yucca schidigera* extract did not adversely affect cellulose digestion. Our study was done in order to effect *in vivo* and straw factor was especially important factor. Significant differences in carbon dioxide (CO_2) production did not arise in

our study. Since the CO_2 emissions in our study were obtained by sampling the air in the room, this gas can be enteric, as well as respiratory and fecal. However, it was not possible to separate these three sources in the respiratory chamber. On the other hand, the situation became more promising in terms of nitrogen-based gases. When table 4 was examined, the production of methane showed a significant decrease in the *Yucca schidigera* groups for kg body weight. N_2O production showed a significant decrease according to animal, daily dry matter consumption and kg live weight.

Table 4. The values of enteric methane (CH_4), carbon dioxide (CO_2) and fecal N_2O release after the adaptation period in the experimental groups.

	Control	*Yucca*	SEM*	P=
CH_4, g/day	11.80	12.43	2.45	0.86
N_2O, g/day	15.31	6.80	3.10	**0.07**
CO_2, g/day	1001.85	1670.19	680.6	0.52
CH_4, g/kg DMI**	6.90	5.68	0.58	0.21
N_2O, g/kg DMI	6.09	2.27	0.42	**0.002**
CO_2, g/kg DMI	292.98	281.11	53.04	0.76
CH_4, g/kg Live weight	0.26	0.23	0.01	**0.06**
N_2O, g/kg Live weight	0.23	0.09	0.0006	**0.001**
CO_2, g/kg Live weight	11.11	11.39	0.45	0.68
Daily feces production, g/day	1799.25	1409.0	437.5	0.55
N_2O, g/kg feces	8.8	5.23	3.4	0.49

*SEM: Standard error mean, **DMI: dry matter intake

N_2O is not a gas emitted from the living organism, but the livestock releases the gas through the feces. During the gas sampling phase of our study, sheep were kept in a closed and isolated chamber. Before putting in the room, the remaining feces from previous animal was cleaned and the animal entering the room left its feces in 23 hours. For this reason, the N_2O values read in the air sample were fecal origin. In this case, the *Yucca schidigera* extract was found to have an effect on the fecal composition. Thus, it also had an important potential to reduce the use of fecal nitrogen for gas formation. This result is significant and N_2O is an important greenhouse gas. It occurs with the nitrification and denitrification of the nitrogen in the feces. On the other hand, lower N throwing was achieved with feces in *Yucca schidigera* groups. Daily methane (CH_4) production in our study was found to be 11.8 g/day in the control group and 12.43 g/day in the *Yucca schidigera* groups per animal. (Table 4). These values refer to 4.5 kg of methane production per animal per year. Broucek (2014) found that milk sheep produce 8.4 kg of methane per animal per year, which was higher than the value we achieved in our study. It was related to saponins in *Yucca schidigera* extract which had the reducing effect on the gas release levels.

The actual role of saponins in the plant is unknown. However, it is a strong detoxifying agent and it is expressed that the plant protects against insects. It is said to be an important monosaccharide source for the plant. (Barr et. Al., 1998). In particular, it was shown that saponins contributed to the digestion of cellulose and protein and reduced the level of rumen NH_3 because of its repressive effect on the protozoa, leading to an increase in the bacterial population (Mcmurphy, 2004). The most important source of N_2O is ammonia. It is known that saponins reduce methanogens (methanogenic microorganisms) as well as increase Nitrogen retention.

CONCLUSIONS

In studies, *Yucca schidigera* extract showed significant effect in reducing N_2O. CH_4 production also showed a tendency to decrease. In our study, the positive effect on the fattening performance was not seen because of the shortness of the study because it was not the main topic of the study.

ACKNOWLEDGEMENT

This work was supported by the Harran University Scientific Research Projects Coordination Unit. Project Number: HUBAK-14186.

REFERENCES

Barr, I. G., Sjolander, A., Cox, J. C., 1998. Iscoms and other saponin based adjuvants. A reviews. Adv. Drug Del., 32:247-271.

Broucek, J. 2014. Production of Methane Emissions from Ruminant Husbandry: A Review. Journal of Environmental Protection, 5, 1482-1493.

Eryavuz, A., Küçükkurt, İ., İnce, S., Fidan, A.F., Avcı, G., Bülbül, T., 2015. Kuzularda Rasyona *Yucca schidigera* Tozu Katılması ve Günlük Dozunun Rumen Fermentasyonu ile

Verime Etkilerinin Araştırılması. Kocatepe Vet., J.8 (2):1 – 10.

Goel, G., Makkar, H.P.S., Becker, K., 2008. Changes in microbial community structure, methanogenesis and rumen fermentation in response to saponin-rich fractions from different plant materials. J. Appl. Microbiol. 105, 770–777.

Görgülü M., Yurtseven S., Unsal I., Kutlu Hr. 2002. Effect of dietary supplemental *Yucca schidigera* powder on fattening performance of male lambs. J. Appl. Anim. Res.. 25: 33-36.

Hu, W.L., Wu, Y.M., Liu, J.X., Guo, Y.Q., Ye, J.A., 2005. Tea saponins affect *in vitro* fermentation and methanogenesis in faunated and defaunated rumen fluid. J. Zhejiang Univ. Sci. 6B, 787–792.

Mcgınn, S.M.,Beauchemin, K.A., Coates, T., And Colombatto, D. 2004. Methane emissions from beef cattle: Effects of monensin, sunflower oil, enzymes, yeast and fumaric acid. J. Anim. Sci., 82:3346–3356.

Mcmurphy, C.P., 2004. Effects of plant saponins on forage digestion and performance of grazing beef cattle. Bachelor Of Science In Agriculture Business. Oklahoma State University Stillwater, Oklahoma.

Patra, A.K., Kamra, D.N., Agarwal, N., 2006. Effect of plant extracts on *in vitro* methanogenesis: enzyme activities and fermentation of feed in rumen liquor of buffalo. Anim. Feed Sci. Technol. 128, 276–291.

Pen, B., Takaura, K., Yamaguchı, S., Asa, R., Takahashı, J., 2007. Effects of *Yucca* schidigera and Quillaja saponaria with or without 1–4 galacto-oligosaccharides on ruminal fermentation: methane production and nitrogen utilization in sheep. Anim. Feed Sci. Technol. 138, 75–88.

Thorpe, A., 2009. Enteric fermentation and ruminant eructation: the role (and control?) of methane in the climate change debate. Clim. Change 93, 407–431.

TUIK, 2017. http://www.investsanliurfa.com/ SayfaDownload/ %C5 % 9Eanl % C4% B1urfa% 20Tar%C4%B1m % 20Bro% C5 % 9F % C3 %BCr%C3%BC.pdf. (erişim tarihi: 18.08.2016)

Vermorel, M. 1997. Yearly methane emissions of digestive origin by sheep, goats and equines in France. Variations with physiological stage and production type. INRA Prod. Anim.10 (2), 153-161.

Yurtseven, S., Öztürk, I., 2009. Influence of two sources of cereals (corn or barley), in free choice feding on diet selection, milk production indices and gaseous production (CH4 CO2) lactating sheep. Asian J. Anim Sci. Vet. Adv., 4(2):76-85.

THE EFFECT OF PARITY ON PLACENTAL CHARACTERISTIC AND LAMB BIRTH WEIGHT IN AWASSI EWES

Ugur SEN[1]

[1]Ondokuz Mayis University, Faculty of Agricultural, Department of Agricultural Biotechnology, TR55139, Atakum, Samsun, TURKEY

Corresponding author e-mail: ugur.sen@omu.edu.tr

Abstract

Maternal factors such as body weight, age and parity may influence placental and fetal development. The aim of this study was, therefore, to examine the effect of maternal parity on placental weight, total cotyledon number, total cotyledon weight and lamb birth weight in Awassi ewes. The experiments were conducted on 35 singleton-bearing Awassi ewes, ranging from 3 to 6 years of age and classified according to second, third, fourth and fifth parities. Birth weight, lamb sex and placental measurements were recorded within 12 h after parturition. There were no significant differences among parities in terms of placental weight, total cotyledon number and lamb birth weight. Similarly, there were no significant correlation between placental weight, total cotyledon number and lamb birth weight. However, there were positive correlations between placental weight and total cotyledon weight (0.482; p<0.01) and total cotyledon number and total cotyledon weight (0.372; p<0.05). The results of present study showed that parity has no effect on placental weight, total cotyledon number, total cotyledon weight and lamb birth weight in Awassi sheep breed.

Key words: *parity, placenta, cotyledon, lamb birth weight, Awassi*

INTRODUCTION

The placenta is defined as a functional organ, which provides nutrients, gases and waste exchange between the maternal and fetal systems (Igwebuike, 2010). Placental characteristics are important indicator of postnatal mortality of offspring in small ruminants (Dwyer et al., 2005). Mellor and Stafford (2004) reported that postnatal viability of newborn is associated with placental growth and development during gestation. The caprine have polycotyledonary placenta and placentomes performs exchange between the maternal and foetal circulatory system (Igwebuike, 2010). Thus, exchange capacity of placental between the maternal and fetal systems in the caprine is depend on placental size and number of the placentomes (Dwyer et al., 2005). Therefore the size, which is relationship with nutrient transfer capacity of the placenta, play a pivotal role in determining the prenatal growth trajectory of the fetus and hence birth weight and postnatal viability (Sen et al., 2013).

Placental growth and development support consequent fetal development during mid- to late gestation (Redmer et al., 2004; Sen et al., 2013). Previous studies indicated that plasental development during gestation is dominantly affected by maternal factors, especially nutrition levels (Owens et al., 1994; Wu et al., 2004; Sen et al., 2013). Also, many studies have demonstrated that there are relationships between weight of the placenta and birth weight of the newborn (Osgerby et al., 2003; Sen et al., 2013). Dwyer et al. (2005) reported that maternal age affected birth weight and placental characteristics.

The aim of this study was, therefore, to examine the effect of maternal parity on placental weight, total cotyledon number, total cotyledon weight and lamb birth weight in Awassi ewes.

MATERIALS AND METHODS

The study was conducted on 35 singleton-bearing Awassi ewes with different ages and parities in a private dairy farm in Kirşehir, Turkey (39°39'36.8"N 34°25'34.1"E and 771 m above sea level) in the normal

breeding season. The distribution of singleton lambs with respect to different parities is presented in Table 1. All ewes were naturally impregnated using mixed multiple sires. Ewes parity was classified as second, third, fourth and fifth. Second-parity ewes were either 2 or 3 years old (n =6), third-parity ewes were either 3 or 4 years old (n= 7), fourth-parity ewes were either 4 or 5 years old (n= 11) and fifth-parity ewes were either 5 or 6 years old (n= 11). All ewes were housed and cared for under the same conditions in the stockyard and were allowed to graze for 5 h daily during gestation. Experimental ewes were fed 200 g/ewe/day of concentrate and 1 kg/ewe/day of alfalfa hay to meet their daily nutritional requirements during gestation.

Birth weight the sex of lamb were recorded within 12 h after parturition. Each ewe was left to deliver the placenta naturally and placentas were collected immediately after delivery; placental weight was measured and recorded after removing placental fluid. The total cotyledon numbers and total cotyledon weights of placental cotyledons dissected from the chorioallantois were also counted and determined.

The effects of ewes parity on placental weight, total cotyledon number, total cotyledon weight and lamb birth weight were analyzed using a completely randomized design by the general linear model procedure of SPSS. The sex of lambs was used as acofactor in the model to adjust the lamb birth weight and the placental characteristics. Significant differences between means were tested using Duncan's test and results were computed as mean ± SEM. Statistical significance was considered at $p<0.05$. Relationships between variable traits for discrete data were determined with Pearson correlation analysis at the 95% confidence interval.

Table 1. The distribution numbers of singleton born lambs from Awassi ewes with different parity

Parity	Male	Female	Total
First	3	3	6
Second	4	3	7
Third	5	6	11
Fifth	6	5	11

RESULTS AND DISCUSSION

Lamb birth weight and some placental characteristics of Awassi ewes with different parity is present Table 2.

Table 2. Lamb birth weight and some placental characteristics of Awassi ewes with different parity

Parity	BW (g)	PW (g)	TCN	TCW (g)
First	4.8±0.4	283.0±38.7	69.0±7.1	94.4±9.9
Second	5.1±0.3	229.3±16.5	65.0±6.5	85.0±9.3
Third	5.6±0.2	277.2±26.0	66.6±5.5	101.2±14.8
Fifth	5.4±0.3	330.5±39.0	64.1±5.2	103.8±9.44

BW = lamb birth weight, PW = placental weight, TCN = total cotyledon number, TCW = total cotyledon weight.

Increasing maternal parity is associated with both absolute and relatively heavier litters and heavier placentas. Dwyer et al. (2005) reported that although placental efficiency also increased with increasing parity, there was no increase in the number of foetal cotyledons. The main reason for the increase in both weight and placental efficiency appeared to be the increase in cotyledon weight with parity. As ewe age was included in the model these effects could not be explained by the age and growth stage of the ewe, which has been shown to have a considerable impact on placentation (Wallace et al., 2001; Wallace, 2000), but were due to the reproductive maturity of the animals. Several studies have shown that primiparous mothers produce smaller offspring than multiparae

(Goldstein, 1981, humans; Dwyer and Lawrence, 2000, sheep; Bellows et al., 1982, cattle), and the placenta data and maternal weight gain in pregnancy seen in this study are consistent with these results. In addition, a similar effect of primiparity on placenta and foetal weight, and on exchange surface area, has been reported in mares (Wilsher and Allen, 2002 and 2003). However, in the present study ewes with different age and parity had similar lamb birth weight, placental weight, total cotyledon number, total cotyledon weight.
Konyali et al. (2007) indicated that the first parity goat had lower placental weight and higher cotyledon density, but total numbers of cotyledon in per placenta were greater than higher parity goat in contrast to our study. Dwyer et al. (2005) also showed that maternal parity influenced placental traits and ewes in the 1-3 parities had lower placental weight, total cotyledon numbers and total cotyledon weights than those of ewes in the <3 parities, without affecting the cotyledon density. Dwyer et al. (2005) also reported that placenta weight and average cotyledon weight were not changed number of cotyledon, increased with ewe age or parity. Contrast to Konyali et al. (2007) reported that placental weight was not influenced by parity, but total cotyledon numbers and total cotyledon weights were affected. Previous studies showed that low weight of placenta and reduced numbers of cotyledons associated with growth deficiency of fetus (Jenkinson et al., 1995; Greenwood et al., 2000; Dwyer et al., 2005).
Pearson correlation coefficients of lamb birth weight and placental characteristics in Awassi ewes with different parity is present Table 3. There were no significant correlation between placental weight, total cotyledon number and lamb birth weight in Awassi ewes with different parity. However, there were positive correlations between placental weight and total cotyledon weight (0.482; $p<0.01$) and total cotyledon number and total cotyledon weight (0.372; $p<0.05$) in Awassi ewes with different parity.

Table 3. Pearson correlation coefficients of lamb birth weight and placental characteristics in Awassi ewes with different parity

Traits	BW	PW	TCN
PW	0.048		
TCN	0.167	0.182	
TCW	0.224	0.482**	0.372*

BW = lamb birth weight, PW = placental weight, TCN = total cotyledon number, TCW = total cotyledon weight.
* P < 0.05, ** P < 0.01.

Previous studies reported that there was no significant correlation between birth weight and placental weight in sheep (Sen et al., 2013) and goats (Konyali et al., 2007). Similarly, in the present study no significant correlation between placental weight and lamb birth weight in Awassi ewes with different parity. Contrast to, Echternkamp (1993), Dwyer et al. (2005) and Konyali et al. (2007) reported that a significant positive correlation between birth weight and placental weight in beef cattle, sheep and goats.
Previous studies reported the positive correlation between offspring birth weight and total cotyledons number in the different farm animal species such as goat, sheep and beef cattle (Echternkamp, 1993; Dwyer et al., 2005; Konyali et al., 2007, Sen and Onder, 2016). However, in the present study no significant correlation between lamb birth weight and total cotyledons number in Awassi ewes with different parity.
Sen and Onder (2016) reported that there was the significant positive correlation between placental weight and total cotyledon weight and total cotyledon number and total cotyledon weight. Similarly, a positive correlation was calculated between placental weight and total cotyledon weight and total cotyledon number and total cotyledon weight in Awassi ewes with different parity in the present study.

CONCLUSIONS

In conclusion, the results of the present study imply that maternal parity has no

effect on placental weight, total cotyledon number, total cotyledon weight and lamb birth weight in Awassi sheep breed.

REFERENCES

Bellows RA, Short RE, Richardson GV. 1982. Effects of sire, age of dam and gestation feed level on dystocia and postpartum reproduction. J Anim Sci, 55: 18–27.

Dwyer CM, Calvert SK, Farish M, Donbavand J, Pickup HE. 2005. Breed, litter and parity effects on placental weight and placentome number, and consequences for the neonatal behavior of the lamb. Theriogenology, 63: 1092–1110.

Dwyer CM, Lawrence AB. 2000. Maternal behaviour in domestic sheep (Ovis aries): constancy and change with maternal experience. Behaviour, 37: 1391–1413.

Echternkamp SE. 1993. Relationship between placental development and calf birth weight in beef cattle. Anim Reprod Sci, 32, 1–13.

Goldstein H. 1981. Factors related to birth weight and perinatal mortality. Br Med Bull, 37: 259–264.

Greenwood P.L., Slepetis R.M., Bell A.W. 2000. Influences on fetal and placental weights during mid to late gestation in prolific ewes well nourished throughout pregnancy. Reprod Fertil Dev, 12: 149–156.

Igwebuike UM. 2010. Impact of maternal nutrition on ovine foetoplacental development: A review of the role of insulin-like growth factors. Anim Reprod Sci, 121: 189–196.

Jenkinson CMC, Peterson SW, Mackenzie DDS, McDonald MF, McCutcheon SN. 1995. Seasonal effects on birth weight in sheep are associated with changes in placental development. New Zeal J Agric Res, 38: 337–345.

Konyali A, Tölü C, Daş G, Savaş T., 2007. Factors affecting placental traits and relationships of placental traits with neonatal behaviour in goat.Anim. Reprod Sci, 97: 394–401.

Mellor DJ, Stafford KJ. 2004. Animal welfare implications of neonatal mortality and morbidity in farm animals. Vet J, 168: 118–133.

Osgerby JC, Gadd TS, Wathes DC. 2003. The effects of maternal nutrition and body condition on placental and foetal growth in the ewe. Placenta, 24: 236–247.

Owens JA, Kind KL, Carbone F, Robinson JC, Owens PC. 1994. Circulating insulin-like growth factor-I and II and substrate in fetal sheep following restriction of placental growth. J Endocrinol, 140: 5–13.

Redmer DA, Wallace D, Reynolds LP. 2004. Effect of nutrient intake during gestation on fetal and placental growth and vascular development. Domest Anim Endocrinol, 27: 199–217.

Sen U, Onder H. 2016. Poor placental traits reduce kid birth weight in young Saanen dams at the first parity. Turkish J Vet Anim Sci, 40: 554-561.

Sen U, Sirin E, Kuran M. 2013. The effect of maternal nutritional status during mid-gestation on placental characteristics in ewes. Anim Reprod Sci, 137: 31–36.

Wallace J, Bourke D, Da Silva P, Aitken R. 2001. Nutrient partitioning during adolescent pregnancy. Reprod, 122: 347–357.

Wallace JM. 2000. Nutrient partitioning during pregnancy: adverse gestational outcome in overnourished adolescent dams. Proc Nutr Soc, 59: 107–117.

Wilsher S, Allen WR. 2002. The influence of maternal size, age and parity on placental and fetal development in the horse. Theriogenology, 58: 833–835.

Wilsher S, Allen WR. 2003. The effects of maternal age and parity on placental and fetal development in the mare. Eq Vet J, 35: 476–483.

Wu G, Bazer FW, Cudd TA, Meininger CJ, Spencer TE. 2004. Maternal nutrition and fetal development. J Nutr, 134: 2169–2172.

DEVELOPMENT OF BETWEEN BIRTH TO 120. DAYS PERIOD OF AKKARAMAN LAMBS REARED IN CANKIRI REGION

Cagri Meliksah SAKAR[1], Abdulkadir ERISEK[1]

[1] International Center For Livestock Research and Training, 06852, Lalahan, Mamak, Ankara, TURKEY

Corresponding author e-mail: melikksahi@gmail.com

Abstract

The aim of this study is to determine the development of the Akkaraman lambs grown in the Cankırı province until the age of four months by weighing them at different periods and prepare the growth curve. The animal material of this study was formed a total of 281 heads of lambs from 7 farms, born in 2018, grown in "Cankırı Province Akkaraman Breed Sub-Project 1" within the scope of "Animal Improvement National Project in Public" conducted by TAGEM. In the study, weights of lambs at birth, 60, 90 and 120. days were determined. In this study, average birth, 60, 90 and 120 days weight average were found 4.264 kg, 22.114 kg, 30.147 kg, and 34.950 kg, respectively. In the study, the gender effect on birth weight was not statistically significant (P>0.05), while the effect of type of birth was found statistically significant (P<0.001). The effect of birth type was significant (P<0.05) on 2., 3. and 4. month weights; the effect of farm conditions on birth weight was statistically significant (P<0.001). The determination coefficient (R^2) in the improvement of the lambs from birth to 4th month age was found 0.918.

Key words: *Akkaraman, lamb weight, growth curve.*

INTRODUCTION

Turkey, is a suitable country for sheep farming with some reason like consumer prefences, besides geographic structure, pasture presence and grasslands that is more suitable for sheep grazing. Turkey has been among the most important countries in terms of sheep presence. Although there has been a decline in the presence of sheep in recent years, because of the incentives of sheep farming for the past few years it has entered recovery process (Boztepe, 2015). According to TUİK data, presence of sheep in Turkey was 33.677.636 heads in 2017 while in the Çankırı province where the research was carried out was 105.847 heads.

The most important criterion determining the profitability in sheep and goat breeding is the weight of lamb or kid produced per maternal when weaned. An important feature of this criterion is that it is the main indicator of fertility. The type of birth, birth weight, sex of the offspring and maternal age effects the weight of the offspring produced per maternal when weaned. Therefore, it is necessary to investigate the effects of the factors mentioned above on live weights of the 30th day or weaned day and on birth weight of the kids or lambs (Duman and Demirören, 2002).

Growth and development occur in two phases as pre-natal and post-natal. Growth curve is defined as the alteration that any feature examined shows in a particular period. This alteration shows differences in species, races, lines and mainly in the feature being examined. (Akbaş et al., 1999). Considering the sheep breeding in Turkey there is a quite wide variation in terms of race and type. The determination of the parameters related to growth at various periods in the mentioned genetic resources will provide benefits for future breeding investigations and for the applications related maintenance and feeding (Aytekin et al., 2009).

Akkaramans that assets approximately 40-45 % of the the presence of sheep Turkey are scattered more in Central Anatolia. It is a durable breed that adapts to the harsh climatic conditions of the region. For feeding, they usually take advantage of

from the pastures in the spring and autumn and from stubbles in the summer (Boztepe, 2015).

In this study, the data obtained from "Cankırı Province Akkaraman Breed Sub-Project 1" within the scope of "The National Project of Animal Breeding in Public" conducted by TAGEM was used. In the mentioned project it is aimed to obtain yield values of sheeps at farmer conditions. In the light of the obtained data a selection program has been implemented in order to make the breed more efficient with a breeding program. It is aimed to increase especially yield and live weight gain of lambs with the selection of studs in the frame of scientific programs.

The aim of this study is prepare the growth curve and determine the development of the Akkaraman lambs grown in the Cankırı province until the age of four months by weighing them at different periods.

MATERIALS AND METHODS

Animal material of this study was formed of Akkaraman breed lambs born in 2018 and grown in "Cankırı Province Akkaraman Breed Sub-Project 1" within the scope of "The National Project of Animal Breeding in Public" conducted by TAGEM. A total of 281 pieces of lambs were received from 7 farms. In the study, weights of lambs at birth, 60, 90 and 120. days were determined. Birth weights were determined with sensitive scales up to 10 gr. Other weights were determined with sensitive scales up to 100 gr. Live weights taken during certain periods (± 15 days) of lambs were loaded on a computer and 60. 90. and 120. day data were determined by interpolation method. In the study gender, type of birth and farm diversity were considered as environmental factors affecting the living weights.

"Minitab 16" package program was used for evaluation of data and statistical analysis. In the differences between the group averages Duncan's multiple comparison test was used to determine the significant in which the difference between two group averages (Düzgüneş et al., 1983).

RESULTS AND DISCUSSION

Mean values and standard error values for birth and other live weights are given in Table 1. The development chart of the lambs from birth to day 120 is shown in Figure 1. The development chart of lambs according to sex and type of birth is also shown in Figure 2 and Figure 3. Findings concerning to daily live weight gain (DLWG) in the lambs are given in Table 2. The DLWG chart of the lambs is also presented in Figure 4.

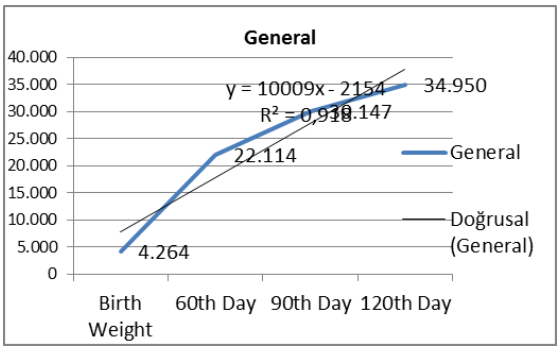


Figure 1. Chart of lambs growth (kg)

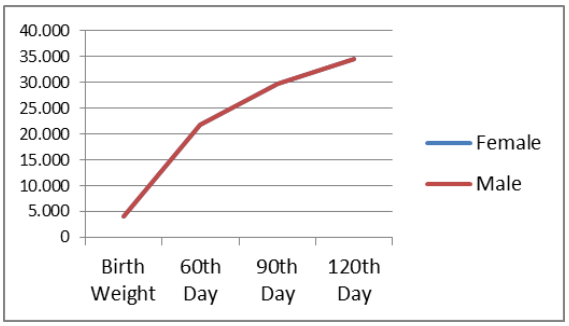


Figure 2. Chart of lambs growth on gender (kg)

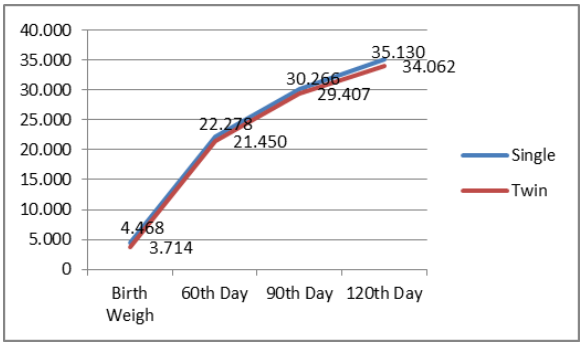


Figure 3. Chart of lambs growth on birth type (kg)

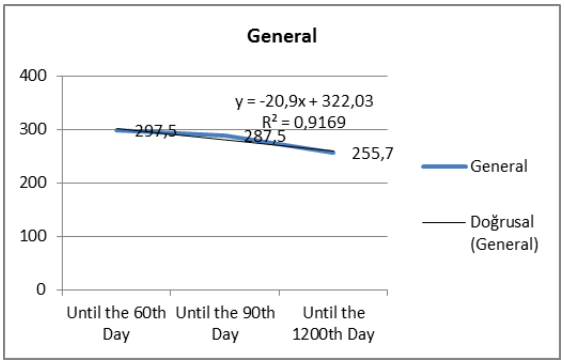


Figure 4. The chart of lambs daily live weight gain (DLWG) (g/day)

In this research carried out with Akkaraman lambs, the birth weight was found as 4.264±0.059 kg. When compared with the results reported in the studies conducted with the same breed, the value found in this study was lower than the values reported by Çolakoğlu and Özbeyaz (1999), Ünal (2000), Şireli and Ertuğrul (2002) and Küçük and Eyduran (2009) while it was found close to the values reported by Ünal et al. (2006).

Table 1. Mean values of birth weight and other live weights

Weights		N	Birth Weight (kg)	60th Day (kg)	90th Day (kg)	120th Day (kg)
Factor			Average±SEM	Average±SEM	Average±SEM	Average±SEM
General		281	4.264±0.059	22.114±0.152	30.147±0.220	34.950±0.256
Gender	Female	163	4.088±0.073	21.894±0.209	29.827±0.250	34.564±0.324
	Male	118	4.093±0.081	21.835±0.230	29.847±0.275	34.627±0.356
	P-Value	-	*0.958*	*0.838*	*0.953*	*0.888*
Birth Type	Single	210	4.468±0.058^{a}	22.278±0.165^{a}	30.266±0.198^{a}	35.130±0.256^{a}
	Twin	71	3.714±0.105^{b}	21.450±0.298^{b}	29.407±0.356^{b}	34.062±0.461^{b}
	P-Value	-	*0.001*	*0.018*	*0.040*	*0.048*
Farm	1	40	3.918±0.134^{b}	20.656±0.379^{b}	27.032±0.454^{d}	31.879±0.588^{de}
	2	40	4.242±0.137^{ab}	21.165±0.388^{b}	26.570±0.465^{d}	31.679±0.602^{e}
	3	35	4.044±0.146^{ab}	20.681±0.414^{b}	28.454±0.496^{cd}	33.354±0.642^{cde}
	4	36	4.155±0.150^{ab}	21.924±0.427^{ab}	29.706±0.510^{bc}	34.013±0.661^{cd}
	5	46	3.270±0.122^{c}	21.753±0.347^{b}	31.049±0.415^{b}	35.568±0.538^{bc}
	6	43	4.377±0.126^{ab}	23.504±0.356^{a}	33.237±0.426^{a}	37.514±0.552^{ab}
	7	41	4.630±0.134^{a}	23.368±0.380^{a}	32.809±0.455^{a}	38.162±0.590^{a}
	P-Value	-	*0.001*	*0.001*	*0.001*	*0.001*

^{a,b} The difference between same colum which has shown with different letters are significant (P<0.05).

Table 2. Mean values of lambs daily live weight gain (DLWG) (g/day)

Ağırlıklar		N	Until the 60th Day	Until the 90th Day	Until the 120th Day
General		281	297.5±2.6	287.5±2.5	255.7±2.1
Gender	Female	163	296.8±3.7	286.0±2.9	254.0±2.8
	Male	118	295.7±4.0	286.1±3.2	254.4±3.0
	P-Value	-	*0.833*	*0.968*	*0.901*
Birth Type	Single	210	296.8±2.9	286.7±2.3	255.5±2.2
	Twin	71	295.6±5.2	285.5±4.2	252.9±3.9
	P-Value	-	*0.841*	*0.813*	*0.574*
Farm	1	40	279.0±6.7^{c}	256.8±5.3^{cd}	233.0±5.0^{c}
	2	40	282.1±6.8^{bc}	248.1±5.5^{d}	228.6±5.2^{c}
	3	35	277.3±7.3^{c}	271.2±5.8^{bc}	244.2±5.5^{c}
	4	36	296.2±7.5^{abc}	283.9±6.0^{b}	248.8±5.7^{bc}
	5	46	308.1±6.1^{ab}	308.7±4.9^{a}	269.2±4.6^{ab}
	6	43	318.8±6.3^{a}	320.7±5.0^{a}	276.1±4.7^{a}
	7	41	312.3±6.7^{a}	313.1±5.4^{a}	279.4±5.1^{a}
	P-Value	-	*0.001*	*0.001*	*0.001*

^{a,b} The difference between same colum which has shown with different letters are significant (P<0.05).

In this study weight averages at 60, 90. and 120. days were found 22.114±0.152 kg, 30.147±0.220 kg and 34.950±0.256 kg respectively. When these values compared with the results reported in the studies conducted with the same breed, the datas belonged to 60th day were found close to the values reported by

Şireli and Ertuğrul (2002) as 21.30 kg while it was found higher than the values reported by Küçük and Eyduran (2009) as 16.79 kg. The 90th day values were found higher than the values reported by Unal (2002) as 26.37 kg, by Şireli and Ertuğrul (2005) as 27.53 kg, by Unal et al. (2006) as 21.10 kg and by Küçük and Eyduran (2009) as 21.66 kg. The 120th day values were found higher than the values reported by Şireli and Ertuğrul (2002) as 31.55 kg and by Küçük and Eyduran (2009) as 25.51 kg.

When the data in Table 1 is examined, there is little difference in favor of male lambs at birth, at 90 and 120 days weights, and at 60 days, in female lambs. As shown in Figure 2, there is no significant difference between male and female lambs in all weights calculated. Therefore, the difference between female and male lambs was found statistically unsignificant ($P>0.05$) at all weight data. When the literature reporting the effect of sex on birth and other weights was examined; it was found statistically significant ($P<0.01$) in birth and 105th day weight by Çolakoğlu and Özbeyaz (1999). It was found by Ünal (2002) statistically significant ($P<0.01$) in birth and 45th day weights and statistically very significant ($P<0.001$) in 120th day weight. İt was found statistically significant ($P<0.05$) in full of birth, 1., 2., 3. and 4th month weights by Şireli and Ertuğrul (2005) and found statistically very significant ($P<0.001$) in birth and 90th day weights by Ünal et al. (2006).

As seen in Figure 3, single lambs were heavier than twin lambs in all weights measured. It was determined that, the difference of this weights was statistically very significant ($P<0.001$) in birth weight and significant ($P<0.05$) in 2, 3 and 4th month weights. These values were found coherent with the values in various periods from birth to 4th month reported by Çolakoğlu and Özbeyaz (1999), Ünal (2002), Şireli and Ertuğrul (2005) and Ünal et al. (2006).

In the study, the highest birth weight, 3th and 4th month weights were determined at 7th sheepfarm. The difference between sheepfarms was found statistically significant ($P<0.001$) in all weights calculated.

In the study, the DLWG from birth to 60th, 90th and 120th day was determined as 297.5 gr, 287.5 gr and 255.7 gr respectively. As shown in Figure 4, there was a tendency to decrease in DLWG with the progress of the months. In this values calculated the gender difference was found statistically nonsignificant ($P>0.05$). Likewise, also the birth type was found statistically nonsignificant ($P>0.05$). However, in DLWG, the difference between sheepfarms was statistically significant ($P<0.001$).

In this study, the determination coefficient (R^2) in the improvement of the lambs from birth to 4th month age was found 0.918. In other words, it can be said that the development of lambs from birth to fourth month is under the influence of gender, type of birth and farm factors by 91.8 %. It can be said that the remaining 8.2 % is determined by other unexamined factors. In the period up to the fourth month of lambs can be achieved improvement by arrangements in environmental factors which is effective on their development. Because of this reason determination of effective environmental factors in lamb development and make selection of breeder after their effects are reduced is important in terms of prevention of wrongs that will happen.

CONCLUSION

The birth weight obtained in this study is close to the literature reports in general. High birth weight is very undesirable to producers due to difficult birth. The fact that the 60, 90 and 120 days weights obtained in the study are higher than the literature reports is an indicator of the well-being of the caring and nutrition in the farms. It is thought that, the reason of differences between farms all calculated weights and DLWG could result from the

condition of caring and feeding lambs before and after the birth. As a result, it can be said that the lamb development is at desired levels in this study, which is made with Akkaraman lambs in Çankırı province.

REFERENCES

Akbaş Y, Taşkın T, Demirören E. 1999. Farklı modellerin kıvırcık ve dağlıç erkek kuzularının büyüme eğrilerine uyumunun karşılaştırılması. Turkish J Vet Anim Sci, 23 (Suppl. 3): 537-544.

Anonymous. 2018. Turkey statistical agency data. [Date of Access: 29.06.2018]. http://www.tuik.gov.tr/UstMenu.do?metod=temelist

Aytekin İ, Karabacak A, Zülkadir U, Keskin İ, Boztepe S. 2009. Açık ve kapalı ağıllarda besiye alınan akkaraman ve anadolu merinosu kuzuların besi periyodu büyüme eğrilerinin tanımlanmasında bazı modellerin kullanımı. Selcuk J Agri and Food Sci, 23:30-35.

Boztepe S. 2015. Koyun yetiştiriciliği. 1th ed. ISBN:978-605-85836-3-4, Selçuk Un Printing House, Konya; p. ٧, 20.

Çolakoğlu N, Özbeyaz B. 1999. Akkaraman ve malya koyunlarının bazı verim özelliklerinin karşılaştırılması. Turkish J Vet Anim Sci, 23: 351-360.

Duman A, Demirören E. 2002. Süt tipi oğlakların doğum, 30. gün ve 60. gün canlı ağırlıkları üzerine sistematik çevre etmenlerinin etkileri. J Agri Fac Ege Un, 39 (2): 73-78.

Düzgüneş O, Kesici T, Gürbüz F. 1983. İstatistik Metodları 1. Ankara Un Fac of Agri Publications (N:861), Ankara.

Küçük M, Eyduran E. 2009. The determination of the best growth model for akkaraman and german blackheaded mutton x akkaraman B1 crosbreed lambs. Bulgarian J Agri Sci, 15 (1): 90-92.

Şireli HD, Ertuğrul M. 2005. Akkaraman, GD_1 x GD_1 (dorset down x akkaraman) ve akkaraman x GD_1 genotipli kuzularda canlı ağırlık ve vücut ölçülerinin tekrarlanma dereceleri. J Agri Sci, 11 (1): 1-6.

Ünal N. 2002. Akkaraman ve sakız x akkaraman F1 kuzularda yaşama gücü, büyüme ve bazı vücut ölçüleri. Turkish J Vet Anim Sci, 25: 109-116.

Ünal N, Akçapınar H, Atasoy F, Aytaç M. 2006. Some reproductive and growth traits of crossbred genotypes produced by crossing local sheep breeds of kıvırcık x white karaman and chios x white karaman in steppe conditions. Arch Tierz, Dummerstorf, 49 (1): 55-63.

BAYESIAN PARTITIONED REGRESSION IN MULTI-TRAIT GENOMIC PREDICTION

Emre KARAMAN[1*], Mogens S. LUND[1], Guosheng SU[1]

[1]Center for Quantitative Genetics and Genomics, Aarhus University, 8830 Tjele, DENMARK

Corresponding author e-mail: emre@mbg.au.dk

Abstract

Bayesian whole genome regression (BWGR) methods have been widely used to estimate breeding value of individuals using single nucleotide polymorphism markers (SNPs) as covariates in a linear regression. The main difference between the BWGR methods is the prior assumed for SNP effects. A region of the genome that comprises a set of SNPs likely inherited together, and also likely to be in linkage disequilibrium with the same quantitative trait loci (QTL). Accounting for such dependence of SNPs in the prior can improve the accuracy of prediction by allowing SNPs clustered around QTL to jointly capture its effect. Some of the existing single-trait BWGR methods have been extended to accommodate more than one trait at a time, however, they are either restricted to special cases which are seldomly true, or lack of the advantage of grouping SNPs for improving prediction accuracy. In this study, we propose a multi-trait Bayesian method for genomic prediction, utilizing the partitioned regression approach. Two correlated traits representing low and high heritability traits were simulated, and the performance of this novel multi-trait genomic prediction method were examined for varying sizes of regions (1 SNP, 100 SNPs, a whole chromosome or whole genome). The accuracies for the region size of 100 SNPs were about 5 and 4 percentage points higher than for the region size of 1 SNP, and 9 and 7 percentage points higher than for the region size of whole genome, for low and high heritable traits, respectively.

Key words: *region size, SNP grouping, whole genome regression*

A STUDY ON DETERMINATION OF OUTLIER OBSERVATIONS BY USING CHI-SQUARE THRESHOLD VALUE

Fahrettin KAYA[1], Esra YAVUZ[2], Seyma KOC[2], Omer Faruk KARAOKUR[2]

[1]Kahramanmaraş Sütçü Imam University, Andırın Vocational School, Computer Technology Department, TR46410, Andırın, Kahramanmaras, TURKEY
[2] Kahramanmaraş Sütçü Imam University, Institute of Science and Technology, Department of Animal Science, TR46040, Onikişubat, Kahramanmaraş, TURKEY

Corresponding author e-mail: fkaya@ksu.edu.tr

Abstract

Outlier observations are observations that are out of the tendency of all observations in a data set. The observations come out in situations such as faulty observation, incorrect data entry, observation of an event that does not always occur. It is important to be able to identify these observations as the results of statistical analyzes, for example such as multiple regression analysis, can be quite sensitive against to these observations. Outlier observations are mostly determined by using distance calculation, statistical test, density based approaches. In this study, the distances of each observation vector to the center were calculated with Mahalanobis distance by using R program. For this purpose, the features such as htc, hgb, mpv, pdw measured in the blood of 315 heart patients were examined as data set. As a result of the research, sixteen observations were found as outlier observation. It is thought that the result of this study will help the researchers trying to find out especially the outlier observations.

Key words: *outlier observation, mahalanobis distance, threshold value*

INTRODUCTION

Researchers generally analyze on multivariate data sets (Hubert et al., 2008). It is likely that there will be outliers observations in these data sets. These observations are called in different areas as error, defect, surprise, noise, exception. Such observations are called outlier observations (data) (Gogoi et al., 2011). Outlier observations can have negative effects on statistical analysis such as regression analysis, clustering analysis, factor analysis. Sometimes, while this data is an observation wanted in security areas, it may also be an observation of a disease in the field of health. Therefore, it is important to identify them. In order to detect outlier observations in multivariate data sets, approaches such as distance calculation, Bayesian, linear regression techniques have been developed (Gupta et al., 2013; Pei et al., 2006; Singh et al., 2012; Ting et al., 2007; Ting et al., 2007). In addition, the filters such as Kalman filter have been used because they deal with huge data that is unknown. (Liu et al., 2004; Rousseeuw et al., 2011). The methods of finding distance are based on the Euclidean distance calculation, which calculates the distance between objects. (De Maesschalck et al., 2000; Hodg et al., 2004).

In case of mean and variance-covariance information of the multivariate data is known, such as the distances of observations to each other and the distance of an observation to the center and the distance between groups in the dataset is calculated with the aid of mahalanobis distance (MD). An observation in a multivariate dataset can be defined as the whole of measured quantities such as height, weight, blood pressure, and level of sugar on blood. In addition, an observation may also contain measurement of a feature (blood sugar) at different times, such as t1, t2, t3. While distance is calculated in such data structures, the distance measure of mahalanobis becomes important when the correlation is considered. However, these traditional methods of detecting outliers' observations are based on the assumption that the data has the same species and normal distribution (Liu et al., 2004).

The fields used for MD are quite extensive. For example, learning machine on

computer field is important(Xiang et al., 2008). The researchers, who investigated environmental, biological and natural phenomena and also produced solutions, have benefited from this distance measure. (Calenge et al., 2008; Maesschalck, 2000). Moreover, this distance measure is used on time-dependent data, on the modeling of bioclimatic changes, on chemical data. (Egan & Morgan, 1998; Farber & Kadmon, 2003; Teng, 2010). In this study, it was aimed to determine the outliers in the multivariate data set and to display them on the Q-Q graph.

MATERIALS AND METHODS

In this study, htc, hgb, mpv, pdw values which are measured in the blood of 315 heart patients and consisting of their NBP and pulse pressure values, data sets with six variables were used as material.

Statistical Usage of MD

MD is modelled by using of multivariate normal distribution and Chi-square distribution. In multivariate data analysis, the dataset matrix which has nxp dimension X (observation) and p column (variable), is shown in Table 1.

Table 1. X data set matrix

	X data set variables			
Observation Number	x_1	x_1	...	x_p
1	x_{11}	x_{12}	...	x_{1p}
2	x_{21}	x_{22}	...	x_{2p}
...	...	...	...	...
n	x_{n1}	x_{n2}	...	x_{np}

The probability density function of such a data set is as in the following;

$$f(x) = \frac{1}{|\sum|^{\frac{1}{2}}(2\pi)^{\frac{p}{2}}} . e^{-\frac{1}{2}}(x-\mu).\sum^{-1}.(x-\mu)^T$$

is expressed so. In this formula, Σ parameter shows the variance-covariance matrix and μ parameter shows the mean vector. However, theoretically, as these parameters of a data set are not known in certain, the mean vector $\bar{X}$ is used instead of the vector μ and the sampling matrix S is used instead of the matrix Σ. The value of mahalanobis distance which has m_j^2 calculated for j[th] observation is given in Equation (1). In this formula, m_j^2 expresses the distance of the j[th] observation vector to the mean vector

$$m_j^2 = (x_{ij} - \bar{x}_\iota)^T S^{-1}(x_{ij} - \bar{x}_\iota) \quad (1)$$

where;

S: Variance-covariance matrix of pxp variables,

$X_{\cdot}$: px1 observation vector

$\bar{X}$: px1 mean vector

In fact, in the closed form of equation (1), the m_j^2 value is summed by standardizing p random variables each X with normal distribution. If an X random variable has Standard Normal Distribution, the Y random variable shown in Equation (2) has Chi-square distribution with p-freedom degree (URL1, 2018)

$$Y = X_1^2 + X_2^2 + \cdots + X_p^2 \quad (2)$$

In this case, m_j^2 values have a distribution of $\chi^2_{(p)}$. The outlier observations in the heart disease dataset that are the subject of this study, is determined using the following R program code. Furthermore, the web application which can run R codes is also designed in order to help the researchers to study easily (URL2, 2018)

```
dfName="http://stat.ksu.edu.tr/data.txt"
dataset =read.table(dfName,header=TRUE)
n <- dim(dataset)[1]
p <- dim(dataset)[2]
data<-dataset
data$mah<-round(mahalanobis(data,
    colMeans(data),cov(data)),2)
data$sign<-round(1-pchisq(data$mah, df=p),
        digits = 4)
data$outcome<-ifelse(0.05>data$sign, 1,0)
sno<-1:n
data<-cbind(sno,data)
outlierList<-data[data$outcome %in% 1,]
outlierList
qqplot(data$mah,qchisq(ppoints(n), df = p),
    main=expression("Q-Q plot" * ~D^2 *
        " vs. quantiles of" * ~ chi[p]^2))
abline(0, 1, col = 'black')
abline(v=qchisq(0.95,p),lwd=1,col="red")
```

RESULT AND DISCUSSION

All m_j^2 distances were calculated and finalized. As a result of this calculation, sixteen outlier observations list is shown together with the observation number in Table 2. The "m2", "sign" and "outcome" calculation list of the observations is shown in Table 3. While this list is being prepared, chi-square 95% confidence limit has been

taken basis. "Outcome" value is marked as "1" in case of m_j^2 > 12.59 and in other cases it is marked as "0".
The value "sign" takes the value α which is "1-P ($\chi^2_{(6)}$ <m_j^2)".

Table 2. Outlier observations list

Object Number	htc	hgb	mpv	pdw	nbp	nabiz
11	51.1	17.4	7.32	18.9	80	50
12	50.1	17.2	7.33	17.8	80	50
96	31.1	9.4	11.90	12.1	100	87
97	31.1	9.4	12.00	12.1	100	87
126	38.0	16.0	11.90	12.2	60	77
127	37.0	16.0	11.10	19.1	60	77
133	31.1	9.4	11.80	12.1	100	87
162	39.0	17.1	11.90	12.5	50	66
171	28.9	8.9	8.12	16.9	30	82
172	38.0	17.9	11.80	13.6	40	66
173	36.0	17.9	13.20	13.6	40	66
174	56.2	17.9	12.80	19.9	40	66
175	37.0	17.9	12.90	17.7	40	66
220	44.4	12.5	15.50	17.0	65	88
263	41.8	13.6	15.50	17.1	71	91
279	43.7	10.4	12.00	17.2	50	78

Mpv: mean platelet size. hgb: hemoglobin. Htc: the number and size of red blood cells. Pdw: Platelet Distribution Width Nbp: pulse pressure, peripheral nabiz: pulse

Table 3. Outlier observation calculation result list

Object Number	m_i^2	sign	outcome
11	15.57	0.0163	1
12	14.74	0.0224	1
96	14.05	0.0291	1
97	14.13	0.0282	1
126	15.78	0.0150	1
127	19.09	0.0040	1
133	13.98	0.0299	1
162	21.32	0.0016	1
171	14.92	0.0209	1
172	32.92	0.0000	1
173	43.26	0.0000	1
174	14.96	0.0206	1
175	39.58	0.0000	1
220	17.23	0.0085	1
263	12.63	0.0493	1
279	23.78	0.0006	1

mi^2:Mahalanobis distance, sign:Chi-square α level of significance, outcome:Outcome of the observation test (0-1)

Some intermediate calculations are given as in the following.

The variance-covariance matrix of the data set (S) is:

	htc	hgb	mpv	pdw	nbp	nabiz
htc	20.87	6.49	1.03	1.60	-5.60	-7.65
hgb	6.49	2.89	0.38	0.60	-4.29	-3.55
mpv	1.03	0.38	4.17	-1.97	4.34	-0.61
pdw	1.60	0.60	-1.97	8.77	-1.70	1.88
nbp	-5.60	-4.29	4.34	-1.70	258.62	20.72
nabiz	-7.65	-3.55	-0.61	1.88	20.72	99.66

The inverse of the variance-covariance mat rix is:

$$S^{-1}= \begin{pmatrix} 0.16 & -0.36 & -0.01 & -0.01 & 0.00 & 0.00 \\ -0.36 & 1.20 & -0.04 & -0.03 & 0.01 & 0.01 \\ -0.01 & -0.04 & 0.28 & 0.07 & -0.01 & 0.00 \\ -0.01 & -0.03 & 0.07 & 0.13 & 0.00 & 0.00 \\ 0.00 & 0.01 & -0.01 & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.01 & 0.00 & 0.00 & 0.00 & 0.01 \end{pmatrix}$$

The mean vector of the data set is:

htc hgb mpv pdw nbp nabiz

$$\bar{X} = \begin{bmatrix} 42.15, & 14.00, & 9.93, & 15.68, & 57.99, & 74.05 \end{bmatrix}$$

Additionally, the Q-Q plot of outlier observations is shown in Figure 1. In this graph, the threshold value has been drawn with a red line. The outlier observations are located to the right of this line.

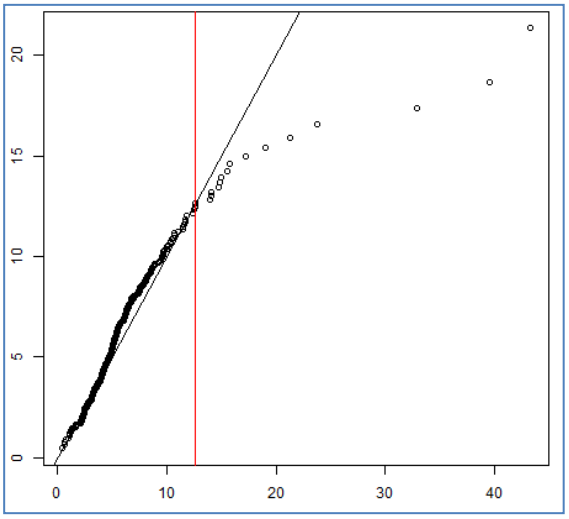


Figure 1.Q-Q plot of mahalanobis

Researchers can identify outlier observations because of mistakes while examining them. In this case, they can analyze these observations by separating from the data set. However, if the outlier observation is the real observation value, it need to be careful to distinguish this observation from the data set. Because, in

this case, information may be lost. Therefore, in both cases, the result of the statistical analysis should be examined and decided.

CONCLUSIONS

In conclusion, it has been shown in the present study whether there is any outlier observations in the multivariate data set beyond the 95% confidence limit.

REFERENCES

Calenge C., Darmon G., Basille M., Loison A., Jullien J. M. 2008. The factorial decomposition of the Mahalanobis distances in habitat selection studies. *Ecology*. https://doi.org/10.1890/06-1750.1

De Maesschalck R., Jouan-Rimbaud D., Massart D. L. L. 2000. The Mahalanobis distance. *Chemometrics and Intelligent Laboratory Systems*. https://doi.org/10.1016/S0169-7439(99)00047-7

Egan W. J.,Morgan S. L. 1998. Outlier Detection in Multivariate Analytical Chemical Data. *Analytical Chemistry*. https://doi.org/10.1021/ac970763d

Farber O., Kadmon R. 2003. Assessment of alternative approaches for bioclimatic modeling with special emphasis on the Mahalanobis distance. *Ecological Modelling*. https://doi.org/10.1016/S0304-3800(02)00327-7

Gogoi P., Bhattacharyya D. K., Borah B., Kalita J. K. 2011. A survey of outlier detection methods in network anomaly identification. *Computer Journal*. https://doi.org/10.1093/comjnl/bxr026

Gupta M., Gao J., Aggarwal C., Han J., 2013. Outlier Detection for Temporal Data : A Survey. *Tkde*. https://doi.org/10.1109/TKDE.2013.184

Hodge V. J.,Austin J. 2004. A survey of outlier detection methodologies. *Artificial Intelligence Review*. https://doi.org/10.1023/B:AIRE.0000045502.10941.a9

Hubert M., Van Der Veeken S. 2008. Outlier detection for skewed data. In *Journal of Chemometrics*. https://doi.org/10.1002/cem.1123

Liu H., Shah S., Jiang W. 2004. On-line outlier detection and data cleaning. *Computers and Chemical Engineering*. https://doi.org/10.1016/j.compchemeng.2004.01.009

Maesschalck R. De. 2000. The mahalanobis distance. *… and Intelligent Laboratory …*. https://doi.org/10.1007/s11120-010-9578-0

Pei Y., Zaïane O. 2006. *A synthetic data generator for clustering and outlier analysis. Department of Computing science, University of Alberta*. https://doi.org/https://doi.org/10.7939/R3B23S

Rousseeuw P. J., Hubert M. 2011. Robust statistics for outlier detection. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*. https://doi.org/10.1002/widm.2

Singh K., Upadhyaya S. 2012. Outlier Detection: Applications And Techniques. *International Journal of Computer …*.

Teng M. 2010. Anomaly detection on time series. *2010 IEEE International Conference on Progress in Informatics and Computing*. https://doi.org/10.1109/PIC.2010.5687485

Ting J. A., D'Souza A., Schaal S. 2007. Automatic outlier detection: A Bayesian approach. In *Proceedings - IEEE International Conference on Robotics and Automation*. https://doi.org/10.1109/ROBOT.2007.363693

Ting J. A., Theodorou E., Schaal S. 2007. A Kalman filter for robust outlier detection. In *IEEE International Conference on Intelligent Robots and Systems*. https://doi.org/10.1109/IROS.2007.4399158 url1(Erişim: 09.10.2018) http://stat.ksu.edu.tr url1(Erişim: 09.10.2018) https://onlinecourses.science.psu.edu/stat414/node/154/

Xiang S., Nie F., Zhang C. 2008. Learning a Mahalanobis distance metric for data clustering and classification. *Pattern Recognition*. https://doi.org/10.1016/j.patcog.2008.05.018

CONTRAST ANALYSIS ON SINGLE FACTORIAL STUDIES AND SOLUTION WITH SPSS

Demet CANGA[1], Aysel YENIPINAR[2], Omer Faruk KARAOKUR[2], Ayse Betul ONEM[2], Ercan EFE[3]

[1]Osmaniye Korkut Ata University, Department of Food Processing, TR80050, Bahçe, Osmaniye, TURKEY
[2]Kahramanmaraş Sütçü Imam University, Institute of Science and Technology, Department of Animal Science, TR46410, Onikişubat, Kahramanmaraş, TURKEY
[3]Kahramanmaraş Sütçü Imam University, Faculty of Agriculture, Department of Animal Science, TR46040, Onikişubat, Kahramanmaraş, TURKEY

Corresponding author e-mail: demetcanga@osmaniye.edu.tr

Abstract

Contrast analysis is a method for comparing sets of means using specific coefficients for weighting the means. In this study, contrast analysis as a planned comparison method and its use in one-factor trial designs are examined. For this purpose, a hypothetical data set is used to analyze the data related to the amount of dry matter determined by three different methods. The steps of the contrast analysis are explained using the SPSS.18 package program. In conclusion, contrast analysis results showed that a great part of the difference between the methods is due to the difference between method 3 and the others ($p < 0.01$) according to F test detailed with 1 degree of freedom.

Key words: *ANOVA, contrast, mean comparison, trial plans, planned comparisons*

INTRODUCTION

The purpose of many research studies is to examine the mean differences between groups. While t test is commonly used to compare two averages, variance analysis (ANOVA) is used to analyze two or more averages (Bek et al., 1988, Shavelson, 2016). A detailed examination of the differences between the averages is done by multiple comparison tests (Özdamar, 1999, Efe et al., 2000, Üçkardeş, 2006, Darlington and Hayes, 2016). In this case, unplanned (post-hoc or posteriori) tests or planned (priori) tests are used.

There are numerous unplanned (post-hoc or posteriori) multiple comparison tests involving Duncan, Scheffe, Tukey LSD tests. Recently, some researchers (Benton, 1989; Durapau, 1988; Keppel, 1982; Kuehne, 1993; Thompson, 1988; Tucker, 1991) recently proposed planned comparisons as an important alternative to unplanned comparisons or post-hoc comparisons following the ANOVA test.

The effect of the independent variable is analyzed in detail by the use of contrast, which is a planned comparison (Kwon, 1996; Abdi, 2010). These comparatively few comparisons are based on personal knowledge and theoretical work in the field of researchers (Zieffler, 2011). Contrast analysis, then, will question the specific hypotheses given for researchers and compare the results with predictions made on the basis of theory, hypothesis or intuition (Rosenthal and Rosnow, 1985, Kwon, 1996, Çanga and Efe, 2017).

The aim of this study is to provide the presentation and use of contrast analysis applications in our country which are mostly found in foreign literature. Contrast estimates based on the research hypothesis have been made with the data set used to accomplish this. The detailed construction of the generated contrast coefficients and contrast analysis was demonstrated using a one-way ANOVA. With the demonstration of the research in the SPSS analysis, it is expected that the use of contrast analysis, which allows the researcher to ask questions of interest related to the researcher, is expected to increase.

MATERIAL VE METHOD

Material

In this study, a data set called Bek and Efe (1988) was used in order to understand the use of contrast analysis in one-way studies. The dry matter quantities determined by three different methods are given in Table 1.

Table 1. Dry matter quantities determined by three different methods (%)

Methods	Method 1	Method 2	Method 3
Replicates	3	4	6
	5	4	7
	2	3	8
	4	8	6
	8	7	7
	4	4	9
	3	2	10
	9	5	9
Means	4.75	4.62	7.75
Standart Deviation	0.87	0.69	0.60
n	8	8	8

Method

For the one-way ANOVA design, the model has only two components;

$$Y_{ij}=\mu+\alpha_j+\varepsilon_{ij} \quad (1)$$

where

μ : General mean

α_j : j-th group effect

ε_{ij} : Random error (Karpinski, 2006).

Estimate value of a contrast:

$$\hat{\psi}=\sum_{a=1}^{A} M_{a.}C_a=\sum_{a=1}^{A} M_{a.}c_{a,i}=M_{1.}c_{1,i}+M_{2.}c_{2,i}+\ldots+M_{k.}c_{k,i} \quad (2)$$

where;

n : number of observations in each group

Ma. : means of conditions (or groups)

$C_a : c_{a,i}$: ith contrast coefficient in a[th] group. Hypothesis-based contrast coefficient (a: group index, i: contrast estimate index)

$\hat{\psi}$: contrasted (weighted) sum of the means (Rosethal and Rosnow, 1985; Rosnow et al., 2000; Abdi ve ark., 2009; Çanga and Efe, 2017)

Standard error of a contrast estimate

If it is recalled that the standard deviation of the standard error is the standard deviation; standard error is calculated for contrast estimation;

where

$$Std\ Error(\hat{\psi})=\sqrt{MSE\sum\frac{c_{a,i}^2}{n_i}} \quad (3)$$

$c_{a,i}^2$: the squared weight for each group

n_i : Sample size of each group

MSE: Mean Squares Error

Significance test for estimating a contrast

For a contrast estimation, the t value is calculated using the following formula:

$$t=\frac{\sum c_{a,i}\bar{X}_{a.}}{\sqrt{MSE\sum\frac{c_{a,i}^2}{n_i}}} \quad (4)$$

where;

α : The significance of the test (Karpinski, 2006).

Determination of research questions:

Since there are 3 groups of research questions, (3-1) hypothesis can be established. In general, if n groups are present, (n-1) contrast estimates (hypothesis) can be generated.

If you want to compare two contrasts firstly; The hypothesis $H_{0,1}$ for hypothesis 1 is constructed as follows:

Hypothesis 1: The null hypothesis "There is no difference between the mean of the first method and the mean of the second method" has been transformed into a symbolic hypothesis in equation 5:

$$H_{0,1}: \mu_{Method1}-\mu_{Method2}=0 \quad (5)$$

For the contrast estimate $(\hat{\psi}_1)$ to be formed by this hypothesis, the contrast coefficient values are determined as $c_{1,1}$ = 1, $c_{2,1}$ = -1, $c_{3,1}$ = 0.

Hypothesis 2: The null hypothesis of "there is no difference between the averages of the third method and the averages of the other two methods" is transformed into a symbolic hypothesis in equation 6.

$$H_{0,2}:\left(\frac{\mu_{Yöntem1}+\mu_{Yöntem2}}{2}\right)-\mu_{Yöntem3}=0 \quad (6)$$

The same hypothesis as another demonstration saved from fractions can

$$H_{0,2}:\psi_2=1\mu_{Method1}+1\mu_{Method2}-2\mu_{Method3} \quad (7)$$

also be written as:

For the contrast estimate $(\hat{\psi}_2)$ to be formed by this hypothesis, the contrast coefficient values are determined as $c_{1,1}$ = 1, $c_{2,1}$ = 1, $c_{3,1}$ = -2 (Abdi, 2009; Çanga, 2018).

Analysis of the data in the study was made using the "Windows SPSS 18.0 software" statistical package program (SPSS Inc., Chicago, IL, USA).

RESULTS AND DISCUSSION

The results of the analysis of classical variance depending on the data in Table 1 are given in Table 2.

Table 2. ANOVA results based on the dry substance used in the three methods specified

SV	DF	SS	MS	F
Between methods	2	50.083	25.041	6.053*
Within methods (Error)	21	86.875	0.065	
Total	23	136.958		

*: p<0.05

Contrast estimation coefficients C_1 = {1, -1, 0},
C_2 = {1, 1, -2}; the standard error due to these values when written in Equation 3; standard error for two predictions made respectively;

$$Std\ Error(\hat{\psi}_1)=\sqrt{4.14*\left(\frac{1}{8}+\frac{1}{8}+\frac{0}{8}\right)}=1.01734$$

$$Std\ Error(\hat{\psi}_2)=\sqrt{4.14*\left(\frac{1}{8}+\frac{1}{8}+\frac{4}{8}\right)}=1.76210$$

The t values for the first contrast estimate and the second contrast estimate, respectively, are written as follows in Equation 4:

$$t(\hat{\psi}_1)=\frac{\hat{\psi}_1}{Std\ Error(\hat{\psi}_1)}=\frac{1*4.75-1*4.62+0*7.75}{1.01734}=\frac{0.13}{1.76210}=0.12$$

$$t(\hat{\psi}_2)=\frac{\hat{\psi}_2}{Std\ Error(\hat{\psi}_1)}=\frac{1*4.75+1*4.62-2*7.75}{1.76210}=\frac{-6.1}{1.76210}=-3.46$$

(Karpinski, 2006; Gonzalez, 2016).
In Figure 1, data entry is given in SPSS (Efe et al., 2000; Field, 2016).

	Yöntem	kuru_madde
1	1	3
2	1	5
3	1	2
4	1	4
5	1	8
6	1	4
7	1	3
8	1	9
9	2	4
10	2	4
11	2	3
12	2	8
13	2	7
14	2	4
15	2	2
16	2	5
17	3	6
18	3	7
19	3	8
20	3	6
21	3	7
22	3	9
23	3	10
24	3	9

Figure 1. Example data set

The window after the ***Analyze/Compare Means/ One Way Anova*** key sequence; dependent variable (dry matter) is transferred to ***Dependent Variable*** and the independent variable (Method) is transferred to **Factor** fields **(Figure 2).**

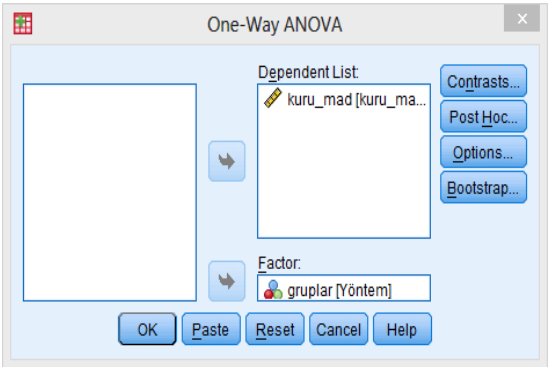


Figure 2. Factor / Variable definitions

In the same window, the window with the C***ontrasts...***button will have the contrast definitions. If the trends in the data are to be tested, ***Polinomial*** option is marked. In this study, trends will not be examined. The ***Cofficients*** option is for specifying planned comparisons. In order to make planned comparisons, firstly, in SPSS, it is determined which contrast estimation coefficients are assigned to each group. First, coefficients related to the first contrast estimate are entered as {1, -1, 0}, respectively. After each coefficient of the first estimate is entered; To generate another contrast estimate, the ***Next*** box on the left side is highlighted and the other contrast estimate is passed. Another important point here is that the sum of the coefficients entered must be equal to zero. For this reason, under the contrast coefficients entered, totals are immediately reported by the software. Then, coefficients related to the second contrast estimate are entered {1, 1, -2}, respectively, and ***Continue*** button on the lower left corner is pressed to return to the ***One-Way Anova*** window **(Figure 3a, Figure 3b).**

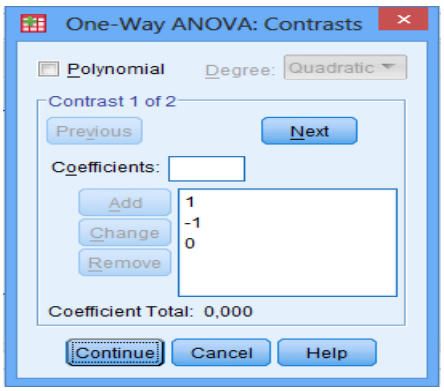


Figure 3a. First contrast estimation coefficients

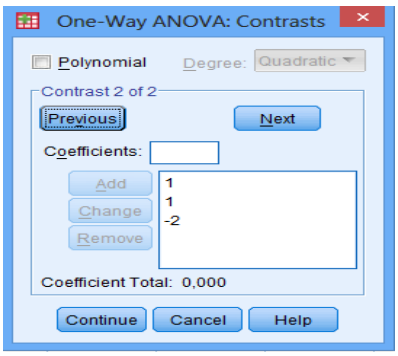


Figure 3b. Second contrast estimation coefficients

Here, the ***Homegenetiy of variance test*** box, which is used to test the homogeneity of the window variances that come with the ***Options...*** button, should be selected (tick) (Figure 4). From this window, press ***Continue*** button in the lower left corner and return to the ***One- Way Anova*** window.

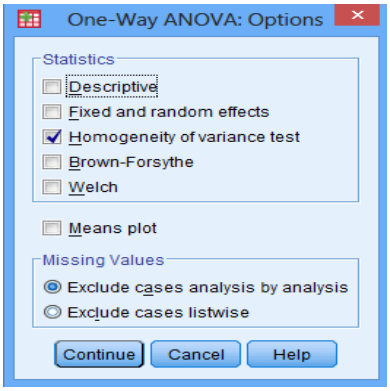


Figure 4. Homogeneity test for One Way Anova

Finally, click **OK** to save the results. Following the analysis performed, the SPSS results of the variance analysis for the data in Table 1 are listed below respectively.

Table 3. Homogeneity test of variances

Test of Homogeneity of Variances			
	Dry matter		
Levene Statistic	df1	df2	Sig.
,784	2	21	,469

If the end result of the Levene test is meaningful, the variances may differ significantly and the assumption of equality of variances may be violated. When evaluated according to Table 3; Assuming that the Levene test is not significant (p> 0.05), it is assumed that the variances are

equal and the variance analysis the results are believed to be reliable. In Table 4, the results of classical variance analysis in SPSS are given (Karpinski, 2006; Field, 2016).

Table 4. Dry matter classical ANOVA results for the three methods identified

ANOVA					
Dry matter	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	50,083	2	25,042	6,053**	,008
Within Groups	86,875	21	4,137		
Total	136,958	23			

**: p<0.01

According to the analysis of classical variance, it is seen that there is a difference between the mean of the methods (p <0.01). At this stage, all possible binary mean differences are tested with one of the multiple comparison methods. In this study, however, there are only two comparisons that the investigator is interested in. Depending on this situation, the contrast coefficients are assigned. The assignment of the coefficients determined for the planned comparisons is shown in Table 5.

Table 5. Contrast estimation coefficients for the three methods identified

Contrast Coefficients			
Contrast	Groups Method1	Method2	Method3
1	1	-1	0
2	1	1	-2

The results of the contrast analysis using these coefficients are given in Table 6.

Table 6. Contrast tests for the three determined methods

Contrast Tests							
		Contrast	Value of Contrast	Std. Error	t	df	Sig. (2-tailed)
Dry matter	Assume equal variances	1	,13	1,017	,123	21	,903
		2	-6,13	1,761	-3,477	21	,002**
	Does not assume equal variances	1	,13	1,129	,111	13,360	,913
		2	-6,13	1,543	-3,969	19,118	,001

**: p<0.01

According to the results of this test, the first contrast estimate is not significant (p> 0.05) but the second contrast estimate is significant (p <0.01). For the sample; according to these results, the mean of the first and second methods were the same (p> 0.05) and the third method was different from the mean of the first and second methods (p <0.01).

CONCLUSIONS

In this study, how to use contrast in single-factor experiments was analyzed in variance analysis. At the same time, one-way contrast analysis with SPSS statistical software was discussed and presented in the form of analysis.

Numerical examples of dry matter quantities determined by three different methods were used in the study. Two special questions of the researcher were hypothesized. The effect of the differences between the methods with respect to these questions was examined with the contrast estimates, each of which was determined with 1 degree of freedom and based on the estimator of the investigator. For this, contrast analysis was done with the coefficients which are formed according to these estimations.

As a result, the first and second method means were found to be the same (p> 0.05). In addition, it shows that the mean dry matter determined by the third method is different from the mean dry matter means determined by the other two methods (p <0.01). In other words, the third method mean is different from the first and second method means.

It is expected that this study will be a guide for the hypothesis that the researcher focuses only on specific questions, to determine the contrast coefficients of these hypotheses, and to test the hypotheses dealing with the results of variance analysis with the aid of contrast estimates.

REFERENCES

Abdi, H., Edelman, B., Valentin, D., Dowling, W.J., 2009. Experimental Design and Analysis for Psychology. Oxford: Oxford University Press, New York, USA

Bek, Y., Efe, E., 1988. Araştırma ve Deneme Metodları I. Ç.Ü. Ziraat Fakültesi Ders Kitabı no:71, Ç.Ü Ziraat Fakültesi Ofset ve Teksir Atölyesi, Adana, 395 s.

Benton, R., 1989. Planned comparisons as better alternatives to ANOVA omnibus test. Paper presented at the annual meeting of the Mid-South Educational Research Association, Little Rock, AR. (ERIC Document Reproduction Service No. ED 312 296).

Çanga, D., Efe, C., 2017. Using Contrasts in One-Way Analysis of Variance with Control Groups and an Application. Journal of Agricultural Science and Technology A: David Publishing: 474-478. USA.doi: 10.17265/2161-6256/2017.07.003

Çanga, D., 2018. Ortalamaların Karşılaştırılmasında Kontrast Kullanımı. Doktora tezi. Kahramanmaraş Sütçü İmam Üniversitesi. Fen Bilimleri Enstitüsü., 121s.

Darlington, R. B., Hayes, A. F., 2016. Regression Analysis and Linear Models: Concepts, Applications, and Implementation. New York: Guilford Publications.

DuRapau, T. M., 1988. Benefits of using planned comparisons rather than post hoc tests: a brief review with examples. Paper presented at the annual meeting of the Mid-South Educational Research Association, Louisville, KY. (ERIC Document Reproduction Service No. ED 203 490).

Efe, E., Bek, Y. ve Şahin, M., 2000. SPSS'te Çözümleri ile İstatistik Yöntemler II. Kahramanmaraş Sütçü İmam Üniversitesi Rektörlüğü Yayın No: 73, Ders Kitapları, Yayın No:9, K.S.Ü. Basımevi, Kahramanmaraş, 223s.

Field, A.P., 2016. Contrast and Post Hoc Tests for One-Way Independent ANOVA Using SPSS. URL(erişim tarihi: 08.01.2018). https://www.discoveringstatistics.com/repository/contrasts.pdf

Gonzalez, R., 2016. Contrasts and Post Hoc tests. URL(erişim tarihi: 08.01.2018). http://www-personal.umich.edu/~gonzo/coursenotes/file3.pdf

Karpinski, A., 2006. Chapter 5 Contrasts for one-way ANOVA. URL (erişimtarihi: 08.1.2018). https://marekrychlik.com/sites/default/files/05_contrasts1.pdf

Kuehne, C.C., 1993. The advantages of using planned comparisons over post hoc tests. Paper presented at the annual meeting of the Mid-South Educational Research Association, New Orleans, LA. (ERIC Document Reproduction Service No. ED 364 597).

Kwon, M., 1996. The Use of Planned Comparisons in Analysis of Variance Research. Paper Presented at Annual Meeting of the Southwest Educational Research Association (New Orleans, LA:).

Özdamar, K., 1999. Paket programlar ile istatistiksel veri analizi. *Kaan Kitabevi, Eskişehir*, 257s.

Rosenthal, R., Rosnow, R.L., 1985. Contrast analysis: Focused comparisons in the analysis of variance. Cambridge, England:

Rosnow, Ralph L., Rosenthal R., Donald B. R., 2000. Contrasts and correlations in effect-size estimation. Psychol.ogical Science 11(6): 446-453.

Shavelson, R. J., 2016. Statistical reasoning for the behavioral sciences. N. Güler, (Ed.), PegemA: Ankara. (Orijinal yayınlanma tarihi 1988).

Thompson, B., 1988. The importance of planned or focused comparisons in OVA research. Measurement and Evaluation in counseling and Development, 21, 99-101.

Tucker, M.L., 1991. A compendium of textbook views on planned versus post hoc tests. In B. Thompson (Ed.), Advances in educational research: substantive findings, methodological developments, *1:107-118*. Greenwich, CT: JAI Press.

Üçkardeş, F., 2006. İstatistik Testler Üzerine Bir Çalışma. Yüksek Lisans Tezi. Kahramanmaraş Sütçü İmam Üniversitesi. Fen Bilimleri Enstitüsü., 249s.

Zieffler, A. S., Harring, J. R., Long, J. D., 2011. Comparing groups: Randomization and bootstrap methods using R. John Wiley & Sons.

DETERMINING SAMPLE SIZE IN LOGISTIC REGRESSION WITH G-POWER

Aysel YENIPINAR[1], Seyma KOC[1], Demet CANGA[2], Fahrettin KAYA[3]

[1]Kahramanmaraş Sütçü Imam University, Institute of Science and Technology, Department of Animal Science, TR46040, Onikişubat, Kahramanmaraş, TURKEY
[2]Osmaniye Korkut Ata University, Department of Food Processing, TR80050, Bahçe, Osmaniye, TURKEY
[3]Kahramanmaraş Sütçü Imam University, Andırın Vocational School, Computer Technology, Department of Animal Science, TR46410, Onikişubat, Kahramanmaraş, TURKEY

Corresponding author e-mail: ayselyenipinar46@gmail.com

Abstract

There are several methods used to determine the sample size. Investigator; because of the insufficient precious resources such as time, labor, money, tools and equipment, it works by pulling the sample with a suitable sampling method from the population it is examining. According to the statistics obtained from the sample, he will make comments about the population and make decisions. The correctness of the decisions made is closely related to the size of the sample. For this reason, the problem of determining sample size is one of the first and important problems of an investigator. A small sample of information causes loss of information and misjudgments. A very large sample is contrary to the purpose of sampling and resources are wasted. The calculation of the sample size can now be done very easily via free programs.

Key words: *sample size determination, g-power, logistic regression*

INTRODUCTION

G * Power is one of them, It is a program of 17 Mb size, easy to install and use. G*Power (Erdfelder, Faul, & Buchner, 1996) was designed as a general stand-alone power analysis program for statistical tests commonly used in social and behavioral research. But it can also be used for science and medicine. G*Power is a major extension of, and improvement over, the previous versions. It runs on widely used computer platforms (Windows XP, Windows Vista, and Mac OS X 10.4) and covers many different statistical tests of the t, F, and chi2 test families. In addition, it includes power analyses for z tests and some exact tests. G*Power provides improved effect size calculators and graphic options, supports both distribution-based and design-based input modes, and offers all types of power analyses in which users might be interested. In this study, it was aimed to assist the researcher by explaining g-power in determining the sample size in the logistic regression analysis widely used in science and medicine.

G*Power (Fig. 1 shows the main window of the program) covers statistical power analyses for many different statistical tests of the F test, t test, χ^2-test and z test families and some exact tests. G*Power provides effect size calculators and graphics options. G*Power supports both a distribution-based and a design-based input mode. It contains also a calculator that supports many central and noncentral probability distributions. G*Power is free software and available for Mac OS X and Windows XP/Vista/7/8.

Types of analysis; G*Power offers five different types of statistical power analysis:

1. A priori (sample size N is computed as a function of power level 1−β, significance level α, and the to be detected population effect size) 2. Compromise (both α and 1−β are computed as functions of effect size, N, and an error probability ratio q = β/α)
3. Criterion (α and the associated decision criterion are computed as a function of 1−β, the effect size, and N)

4. Post-hoc(1−β is computed as a function of α,the population effect size, and N) 5. Sensitivity (population effect size is computed as a function of α, 1−β, and N)
Program handling; Perform a Power Analysis Using G*Power typically involves the following three steps:
1. Select the statistical test appropriate for your problem.
2.Choose one of the five types of power analysis is available
3. Provide the input parameters required for the analysis and click "Calculate".
Plot parameters; In order to help you explore the parameter space relevant to your power analysis, one parameter (α, power (1−β), effect size, or sample size) can be plotted as a function of another parameter.
1.2.1 Select the statistical test appropriate for your problem In Step1, the statistical test is chosen using the distribution based or the design-based approach.
Distribution-based approach to test selection First select the family of the test statistic (i.e., exact, F, t, χ^2, or z test) using the Test family menu in the main window. The Statistical test menu adapts accordingly, showing a list of all tests available for the test family.

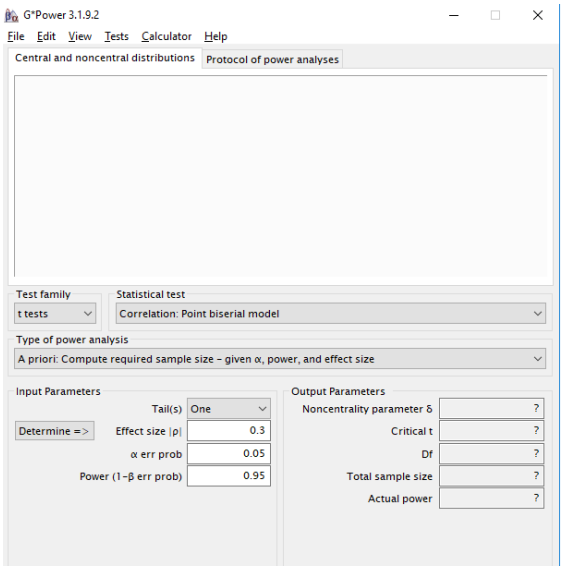


Figure 1. The main window of G*Power

MATERIAL AND METHOD

Material

In this study, a numerical example is used to understand the use of G power. In our example, 45% male X = 1, 55% female and X = 0. 70% of the girls and 80% of the boys were taken as normal birth weight. These numerical sample values were obtained from my doctoral thesis which has not yet been published. Probability of error (significance level) α = 0.05 and The power of the test was taken as 1-β = 0.95. Impact magnitude (calculated in one way or look at previous work).

Method

A logistic regression model describes the relationship between a binary response variable Y (with Y = 0 and Y = 1 denoting non-occurance and occurance of an event, respectively) and one or more independent variables (covariates or predictors) Xi. The variables Xi are themselves random variables with probability density function f X(x) (or probability distribution f X(x) for discrete X).
In a simple logistic regression with one covariate X the assumption is that the probability of an event P = Pr (Y = 1) depends on X in the following way:

$$P = \frac{e^{\beta_0 + \beta_1 x}}{1 + e^{\beta_0 + \beta_1 x}} \qquad (1)$$

For $\beta_1 \neq 0$ and continuous X this formula describes a smooth S-shaped transition of the probability for Y = 1 from 0 to 1 ($\beta_1 > 0$) or from 1 to 0 ($\beta_1 < 0$) with increasing x. This transition gets steeper with increasing β_1. Rearranging the formula leads to: $\log(P/(1-P)) = \beta_0 + \beta_1 X$. This shows that the logarithm of the odds P/(1−P), also called a logit, on the left side of the equation is linear in X. Here, β_1 is the slope of this linear relationship. The interesting question is whether covariate Xi is related to Y or not. Thus,in a simple logistic regression model, the null and alternative hypothesis for a two-sided test are:

$$H_0: \beta_1 = 0$$
$$H_1: \beta_1 \neq 0 \qquad (2)$$

The procedures implemented in G*Power for this case estimates the power of the Wald test. The standard normally distributed test statistic of the Wald test is:

$$z = \frac{\widehat{\beta_1}}{\sqrt{var(\widehat{\beta_1})/N}} = \frac{\widehat{\beta_1}}{SE(\beta_1)} \quad (3)$$

where $\widehat{\beta_1}$ is the maximum likelihood estimator for parameter β_1 and var($\widehat{\beta_1}$) the variance of this estimate.

Effect size index

In the simple logistic model the effect of X on Y is given by the size of the parameter β_1. Let p_1 denote the probability of an event under H_0, that is $\exp(\beta_0) = p_1/(1-p_1)$, and p_2 the probability of an event under H_1 at X = 1, that is $\exp(\beta_0 + \beta_1) = p_2/(1-p_2)$.Then $\exp(\beta_0 + \beta_1)/\exp(\beta_0) = \exp(\beta_1) = [p_2/(1-p_2)]/[p_1/(1- p_1)]$:= odds ratio OR, which implies $\beta_1 = \log[OR]$ (Şahin, 1999).

Given the probability p_1 (input field Pr(Y=1|X=1) H_0) the effect size is specified either directly by p_2 (input field Pr(Y=1|X=1) H_1) or optionally by the odds ratio (OR) (input field Odds ratio). Setting $p_2 = p_1$ or equivalently OR = 1 implies $\beta_1 = 0$ and thus an effect size of zero. An effect size of zero must not be used in a priori analyses. Besides these values the following additional inputs are needed. (Faul at al,2009).

R^2 other X:

In models with more than one covariate, the influence of the other covariates X_2, ..., X_p on the power of the test can be taken into account by using a correction factor. This factor depends on the proportion $R^2 = \rho^2_{1\cdot23\ldots p}$ of the variance of X_1 explained by the regression relationship with $X_2,\ldots,X_p$.If N is the sample size considering X_1 alone, then the sample size in a setting with additional covariates is: $N^{|} = N/(1-R^2)$. This correction for the influence of other covariates has been proposed by Hsieh, Bloch, and Larsen (1998). R^2 must lie in the interval [0,1].

X distribution:

1. Binomial [$P(k) = \binom{N}{k}\pi^k(1-\pi)^{N-k}$, where k is the number of successes (X = 1) in N trials of a Bernoulli process with probability of success π, $0 < \pi < 1$]
2. Exponential [$f(x) = (1/\lambda)e^{-1/\lambda}$, exponential distribution with parameter $\lambda > 0$]
3. Lognormal [$f(x) = 1/(x\sigma\sqrt{2\pi}) \exp[-(\ln x - \mu)^2/(2\sigma^2)]$, lognormal distribution with parameters μ and $\sigma > 0$.]
4. Normal [$f(x) = 1/(\sigma\sqrt{2\pi}) \exp[-(x - \mu)^2/(2\sigma^2)]$, normal distribution with parameters μ and $\sigma > 0$)
5. Poisson ($P(X = k) = (\lambda k/k!)e^{-\lambda}$, Poisson distribution with parameter $\lambda > 0$)
6. Uniform ($f(x) = 1/(b-a)$ for $a \le x \le b$, $f(x) = 0$ otherwise, continuous uniform distribution in the interval [a,b], a < b)
7. Manual (Allows to manually specify the variance of $\hat{\beta}$ under H_0 and H_1)

G*Power provides two different types of procedure to calculate power: An enumeration procedure and large sample approximations. The Manual mode is only available in the large sample procedures.

Options

Input mode

You can choose between two in put modes for the effect size: The effect size may be given by either specifying the two probabilities p_1, p_2 defined above, or instead by specifying p1 and the odds ratio OR.

Procedure G*Power provides two different types of procedure to estimate power. An"enumeration procedure"proposed by Lyles, Lin, and Williamson (2007) and large sample approximations. The enumeration procedure seems to provide reasonable accurate results over a wide range of situations, but it can be rather slow and may need large amounts of memory. The large sample approximations are much faster. Results of Monte-Carlo simulations indicate that the accuracy of the procedures proposed by Demidenko (2007) and Hsieh et al. (1998) are comparable to that of the enumeration procedure for N > 200. The procedure base on the work of Demidenko (2007) is more general and slightly more accurate than that proposed by Hsieh et al.

(1998). We thus recommend to use the procedure proposed by Demidenko (2007) as standard procedure. The enumeration procedure of Lyles et al. (2007) may be used to validate the results (if the sample size is not too large). It must also be used, if one wants to compute the power for likelihood ratio tests.

1. The enumeration procedure provides power analyses for the Wald-test and the Likelihood ratio test. The general idea is to construct an exemplary data set with weights that represent response probabilities given the assumed values of the parameters of the X distribution. Then a fit procedure for the generalized linear model is used to estimate the variance of the regression weights (for Wald tests) or the likelihood ratio under H_0 and H_1(for likely hood ratio tests). The size of the exemplary data set increases with N and the enumeration procedure may thus be rather slow (and may need large amounts of computer memory) for large sample sizes. The procedure is especially slow for analysis types other then "post hoc", which internally call the power routine several times. By specifying a threshold sample size N you can restrict the use of the enumeration procedure to sample sizes < N. For sample sizes ≥ N the large sample approximation selected in the option dialog is used. Note: If a computation takes too long you can abort it by pressing the ESC key. 2. G*Power provides two different large sample approximations for a Wald-type test. Both rely on the asymptotic normal distribution of the maximum likelihood estimator for parameter β_1 and are related to the method described by Whittemore (1981). The accuracy of these approximation increases with sample size, but the deviation from the true power may be quite noticeable for small and moderate sample sizes. This is especially true for X-distributions that are not symmetric about the mean, i.e. the lognormal, exponential, and poisson distribution, and the binomial distribution with $\pi \neq 1/2$. The approach of Hsieh et al. (1998) is restricted to binary covariates and covariates with standard normal distribution. The approach based on Demidenko (2007) is more general and usually more accurate and is recommended as standard procedure. For this test, a variance correction option can be selected that compensates for variance distortions that may occur in skewed X distributions (see implementation notes). If the Hsieh procedure is selected, the program automatically switches to the procedure of Demidenko if a distribution other than the standard normal or the binomial distribution is selected (Faul at al., 2007).

RESULTS AND DISCUSSION

Let's define:
Is there a relationship between birth weight and gender?
Is it a predictor for gender X addiction?
In our example, 45% male X = 1, 55% female and X = 0. 70% of the girls and 80% of the boys were taken as normal birth weight. Probability of error (significance level) α = 0.05 and The power of the test was taken as 1-β = 0.95. Impact magnitude (calculated in one way or look at previous work).

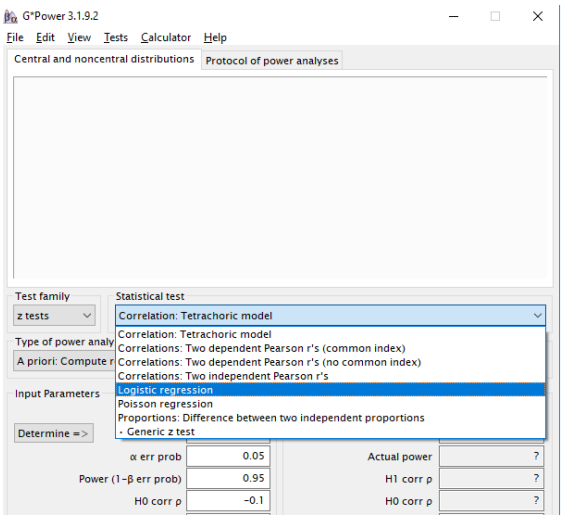


Figure 2. Choice of logistics regression from the windows

In order to select the logistic regression menu from the statical test, the test family Z test should be selected first.

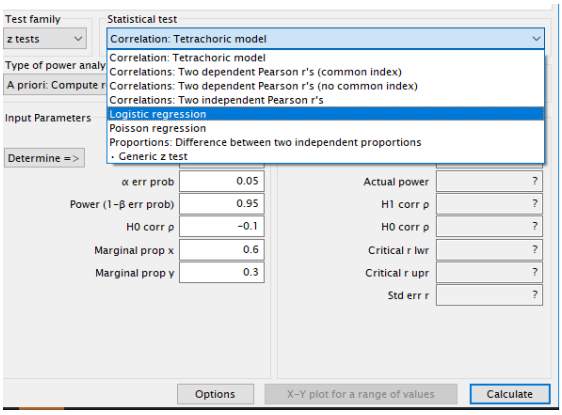


Figure 3. Choice of options menu from the windows

On the pre-pop-up screen there is a section called option, from which we can calculate the sample size from odds ratio or two probabilities from two different locations. Specially with variance correction, the sample size increases slightly. We do not make any changes as other features are turned off selectively.

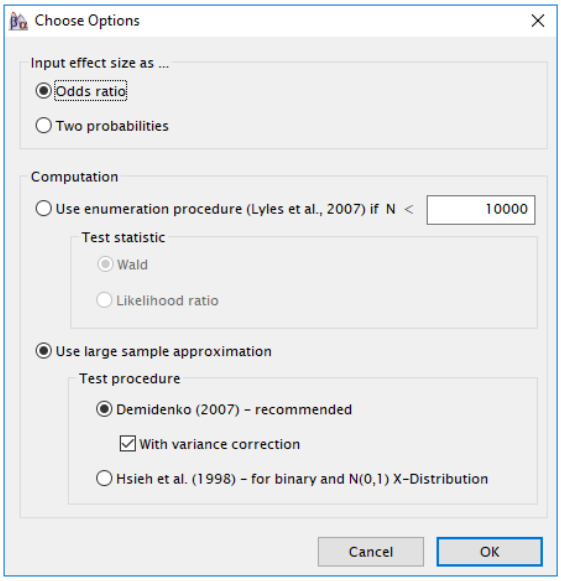


Figure 4. If you want you can check the with variance correction option

Define the following values:

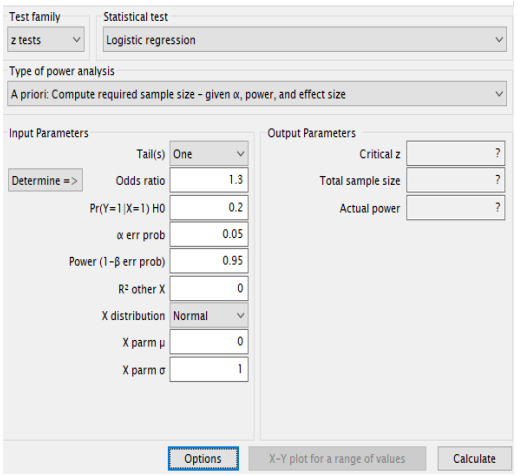


Figure 5. Probability of error and power values

Probability of error (significance level) α = 0.05.
The power of the test was taken as 1-β = 0.95.
Impact magnitude (calculated in one way or look at previous work).

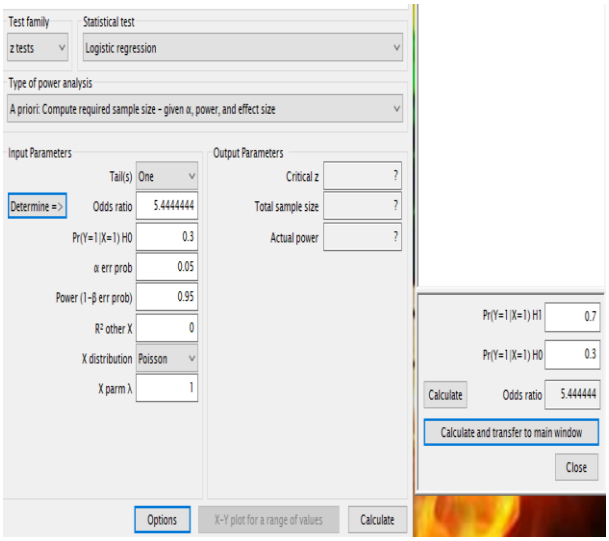


Figure 6. Choose Determine and write next window H_0 and H_1values

The odds ratio is found when H_1 and H_0 values are entered and calculated. When we transfer it to the other window it looks like these. We have type 1 error 0.05 power 0.95. We take R 0, we must enter the X distribution binominal.
Pr(Y=1| X=1)= H_1 =0.7 factor + probability of occurrence
Pr(Y=1| X=1)= H_0 =0.3 factor - probability of occurrence

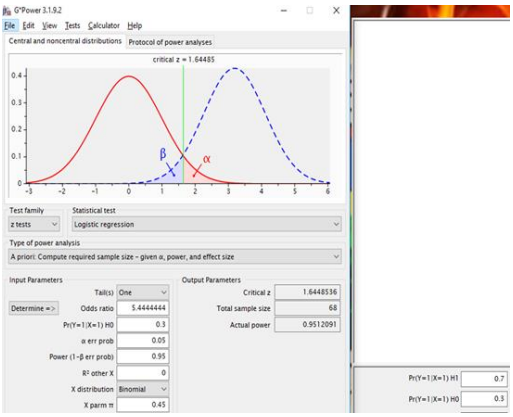
And after calculating chose the calculate and transfer to main window.

R^2other =X In the presence of other variables, the variance of the main locator is '0' if there is no other locator. If there is correlation, it is squared according to Low / medium / high correlation. For example R = 0.20 then R^2 = 0.04

X parm μ: Factor + events should be available in reference studies. If factor + and factor - equals 0.50 must be entered

In our example + factor % 45 so that we must use %45.

We should enter the X distribution binominal.



After than calculate.

CONCLUSIONS

In this study, we explain how to calculate the sample size by g power in logistic regression analysis. As a result, we have a sample size of 68 in our numerical sample and the probability of correctly rejecting the H_0 hypothesis indicating that there is no relation between the main predictor variable and result variable is 95%. The limit of the work is more than one argument. The individual effect size for each variable will be difficult to calculate. So experts advise us to calculate the power for the most striking variable. And if there is correlation, we affect them.

REFERENCES

Demidenko, E. (2007). Sample size determination for logistic regression revisited. Statistics in Medicine, 26, 3385-3397.

Whittemore, A. S. (1981). Sample size for logistic regression with small response probabilities. Journal of the American Statistical Association, 76, 27-32.

Efe,E.İstatistiks el Örnek Büyüklüğü e Yayın No: 73 Ders Kitapları Yayın No: 9 (özel baskı) Kahramanmaraş 2000.

Erdfelder, E., Faul, F., & Buchner, A. (1996). Gpower: A general power analysis program. Behavior Research Methods, Instruments, & Computer, 28, 1-11.

Faul F.,Erdfelder,E.,Lang,A.-G.,&Buchner,A.(2007).

G*power3: A flexible statistical power analysis program for the social , behavioral,andbiomedical sciences, Behavior Resarch Methods,39,175-191.

Faul F., Erdfelder, E., Buchner,A.,&Lang,A.-G.(2009). Statistical power analyses using G* Power 3.1: Tests forncorrelationand regression analyses. Behavior Resarch Methods,41,1149-1160. Program

Hsieh, F. Y., Bloch, D. A., & Larsen, M. D. (1998). A simple method of sample size calculation for linear and logistic regression. Statistics in Medicine, 17, 1623-1634.

Lyles, R. H., Lin, H.-M., & Williamson, J. M. (2007). A practial approach to computing power for generalized linear models with nominal, count, or ordinal responses. Statistics in Medicine, 26, 1632-1648.

Şahin, M., 1999. Lojistik Regresyon Ve Biyolojik Alanlarda Kullanımı. Yüksek Lisans Tezi. Kahramanmaraş Sütçü İmam Üniversitesi Fen Bilimleri Enstitüsü Zootekni Ana Bilim Dalı. Kahramanmaraş.

INVESTIGATING THE EFFECT OF HEAT STRESS ON EGG YIELD DURING 23th AND 71th WEEKS WITH DATA ENVELOPMENT ANALYSIS (DEA)

Hande KUCUKONDER[1], Pinar CELEBI DEMIRARSLAN[2], Aykut BURGUT[3], Mustafa BOGA[4]

[1] Bartın University, Faculty of Economics and Administrative Sciences, 74000 Ağdacı, Bartın, TURKEY
[2] Bartın University, Faculty of Economics and Administrative Sciences, 74000 Ağdacı, Bartın, TURKEY
[3] Çukurova University Faculty of Agriculture 01230 Yüreğir, Adana, TURKEY
[4] Niğde Omer Halisdemir University, Bor Vocational School, 51700 Bor, Niğde, TURKEY

Corresponding author e-mail: mustafaboga79@gmail.com

Abstract

In this study, the effect of heat stress on egg yield and viability during 71-week period in a caged poultry house is examined by Data Envelopment Analysis (DEA). In the analysis of the data provided from a commercial enterprise; egg production (%) calculated on the hen-poultry basis and survival rate (%) are set as output variables and the temperature-humidity index (THI) on the basis of dry-bulb temperature (18.143°C to 30°C) and wet-bulb temperature (12.426°C to 24.638°C) is set as the input variable. Each period between the 23rd week, when the hens have 50% production age, and 71st week (age) is defined as a decision making unit (DMU) in order to measure effectiveness. As a result of the analysis using the DEA-BCC (input-oriented) model, it was found that the production performance was effective in the weeks between 23 and 37 (ages) and not effective in other weeks. It is determined that the projected value required for ineffective weeks to become effective is THI=18.39°C. Based on the findings with DEA-BCC (input-oriented), egg production and survival can be reduced if the THI level exceeds 18.39°C (THI>18.39°C), and 54th week is the most critical week in which the production performance is the lowest.

Key words: *DEA-BCC, THI, hens, egg production*

INTRODUCTION

Data Envelopment Analysis (DEA) is a non-parametric and linear programming-based method that can measure the relative effectiveness of homogeneous decision making units (DMU) that produce the same type of output using the same set of inputs (Silva et al., 2014; Wang et al., 2013). The decision making units can be separated into two different groups, active or inactive, by comparing the input and output values in DEA, which was introduced to literature in 1978 by Charnes, Cooper and Rhodes (Ozbek, 2017). In other words, when two decision-making units with the same output amount are compared, unit used the least input is considered effective. In this sense, a reference set and target values are determined so that ineffective decision units can reach the efficiency limit. According to the definition of the production process, two different approaches considering inputs or outputs can be modeled in DEA(Ulucan and Atıcı, 2010)..

Models for input-oriented are preferred in order to minimize inputs when there is little or no control over outputs; output-oriented models are preferred in cases where the output is desired to be maximized without modifying in the inputs (Isbilen Yucel, 2017). In the input-oriented models, the goal is to find the optimal amount of input needed to produce a certain amount of output, while in the output-oriented models, the goal is to find the maximum amount of output that can be achieved with a given amount of input (Cooper et al., 2007). Input and output factors can be numerous in DEA as well as in different units. Therefore, this advantage allows

simultaneous evaluation of a large number of inputs and outputs (Isbilen Yucel, 2017). Three types of efficiency measurement can be done in DEA. These are technical efficiency, scale efficiency and total efficiency. Technical efficiency is the achievement of obtaining the maximum possible output with the most appropriate input composition in an examined system; scale efficiency, success in achieving appropriate scale production; whereas total efficiency refers to the efficiency achieved by multiplying these two efficiency scales (Ozden, 2008). It is possible to come across that the DEA method, which is frequently used in different disciplines (social, economic, industrial, health etc.) in the literature, is also used in local and foreign studies concerning animal science (Özden 2016; Demir et al., 2012; Areerat et al., 2012a; Rahimi and Behmanesh, 2012; Areerat et al., 2012b; Sefeedpari et al., 2012; Heidariet et al., 2011; Romero et al., 2010; Reig-Martinez and Picazo-Tadeo, 2004)

In this study, it is aimed to examine the effect of heat stress on both egg production and survival rate using data envelopment analysis (DEA) during 71 week (age) period in a commercial laying hen.

MATERIALS AND METHODS

The material of the study consisted of 4000 Lohmann Brown hens. The hens raised in the growth cages up to 16 weeks were taken to the experimental cages in the 17th week. In DEA, in terms of data provided from a commercial enterprise, THI (°C) is defined as input, both egg yield (hen-poultry, %) and survival rate (%) are defined as output variables. The effect of heat stress has been investigated during the period between the 23rd week, when the hens have 50% production (Ayyildiz, 2012), and the end of 71st week.

In DEA, all weeks (ages) between 23 and 71 were chosen as decision-making units. A total of 49 different DMUs have been defined for the DEA-BCC model consisting of 1 input and 2 outputs. Temperature-Humidity Index values (THI) are calculated according to the formula given in Equation (1) below, depending on wet and dry thermometer temperature (Zulovich and DeShazer, 1990).

$THI_{layers} = 0.6\ T_{db} + 0.4\ T_{wb}$ (1)

where; THI = temperature-humidity index, °C; T_{db} = dry-bulb temperature, °C; T_{wb} = wet-bulb temperature, °C. For DEA calculations, OSDEA program was used.

Table 1. Input-Oriented BCC Model

Input-Oriented BCC	
LP MODEL	**DUAL MODEL**
$E_k = maks \sum_{r=1}^{s} u_r\, y_{rk} - u_k$	$E_k = min\theta - \varepsilon(\sum_{i=1}^{m} S_i^- + \sum_{r=1}^{s} S^+)$
Subject to	**Subject to**
$\sum_{i=1}^{m} v_i\, x_{ik} = 1$	$\sum_{j=1}^{n} x_{ij}\lambda_j - \theta x_{ik} + S_i^- = 0$
$\sum_{r=1}^{s} u_r\, y_{rj} - u_k \le \sum_{i=1}^{m} v_i\, x_{ij}$	$\sum_{j=1}^{n} y_{rj}\lambda_j - y_{rk} - S_r^+ = 0$
$j = 1,2,\dots,n \quad v_i, u_r \ge \varepsilon$	$\lambda_j, S_i^-, S_r^+ \ge 0$
$r = 1,2,\dots,s \quad i = 1,2,\dots,m$	$r = 1,2,\dots,s,\ \sum_{j=1}^{m} \lambda_j = 1$
	$i = 1,2,\dots,m \quad j = 1,2,\dots,n$

θ: efficiency score. $S_i^- and\ S_r^+$ variables indicate the excess in input and deficiency in output; respectively. $i = 1,2,\dots,r$ inputs. $j = 1,2,\dots,s$ outputs. $k = 1,2,\dots,n$ DMUs, E_k, relative efficiency of k^{th} DMU, x_{ik}, the amount of i^{th} input used by k^{th} DMU. y_{jk}, the amount of j^{th} output used by k^{th} DMU. $u_j, v_i \ge 0$ are the weight of j^{th} output and i^{th} input; respectively. r the number of inputs. s the number of outputs.

Among DEA techniques, CCR and BCC are commonly used models. BCC model is proposed by Banker, Charnes and Cooper (1984) and based on returns-to-scale assumption (Orkcu and Dogan, 2015). The BCC model is constructed by constraining λ_j to $\sum_{j=1}^{m} \lambda_j = 1$, where λ_j plays a role in determining the reference set in the CCR model. The main feature that distinguishes BCC and CCR models is that in the CCR model, the efficiency line has to pass through the origin, while in the BCC model, there is no requirement to pass through the origin (Orkcu and Dogan, 2015). Linear programming (LP) and dual models of the BCC are shown in Table 1 (Okursoy and Tezsurucu, 2014).

In the BCC model defined as in Table 1, when the E_k efficiency score is equal to 1, the related DMU is evaluated as effective and if the E_k is less than 1, it is evaluated as infective (Cooper et al., 2007). In order to be effective of ineffective DMUs, as a result of the analysis, it is possible to see which DMUs need to be referenced and how much improvement should be made with projection values.

RESULTS AND DISCUSSION

Descriptive statistics of input and output variables in DEA are as in Table 2.

In the DEA method, an input-oriented model is chosen since egg production and viability variables cannot be controlled in production efficiency. In other words, it is aimed to determine the optimum THI level that provides the maximum output. Efficiency scores, projection values required for THI and reference set information obtained from DEA according to BCC input-oriented model are given in Table 3.

According to Table 3, it is seen that the production performance is effective between the 23rd and 37th week (including the 37th week) as a result of the analysis with the BCC model for egg production and survival rate. The average efficiency level of the enterprise is 85.9% over the 49-week period. According to these findings, it can be said that production performance depending on THI level is not effective from the 38th week (i.e. ES <1 between 38-71 weeks).

Table 2. Descriptive statistics of input and output variables

	Input	**Output**	
	THI (°C)	Egg Production (hen-cage,%)	Survival Rate (%)
Maksimum	27.855	98.725	93.734
Minumum	18.393	92.400	74.409
Average	22.043	95.486	84.837
Standard Deviation	2.844	1.961	5.757

Retzlaff and Roberts (1996) suggest that a more appropriate approach would be to define input and output variables in DEA as negative and positive influential variables. In addition, if the increase status makes the DMU better assessed, the variables are said to be positive influential; otherwise, if the decrease makes the DMU better assessed, the variables should be taken as negative influential (Orkcu and Kardiyan, 2006, Bal and Orkcu, 2005). Based on this, it can be said that THI has a negative effect on survival rate and egg production according to the DEA-BCC model, and the performance level might be decreased due to the high THI value. On the other hand, when the correlation values between THI and survival rate and egg production are examined, the correlation between THI and survival rate is -0.717 and the correlation between THI and egg production is -0.504. The occurrence of a negative relationship in both cases supports the findings of DEA-BCC.

It was observed that during the 49-week period, production performance is at the lowest 54th week (EV = 0.66), followed by the weeks 51 and 56 (Table 2). The reason of the decrease in efficiency scores during 51-56 weeks can be that this time interval coincides with August and the temperature exceeds 25°C in this month. This finding conforms the various researchers (Yertürk et al., 2005; Cetin et al., 2006; Lara and Rostagno, 2013) reported that high ambient temperature could lead to loss of efficiency in poultry. In addition, it is reported in Karslı and Dönmez (2007) that the ideal ambient temperature in poultry

farming is between 15-25°C. Consistent with these notifications, it can be said that between the 51st and 56th weeks, the chickens were exposed to more heat stress, resulting in a decrease in production performance.

When the THI projection values are examined, it is seen that the most appropriate THI level is 18.393°C (32th week) in terms of egg production (Table 3). According to this, it can be said that when the THI level exceeds 18.393°C (THI> 18.393°C), egg production and viability can be reduced. This value is found to be lower than the average THI value in the study of Kilic and Simsek (2013), which explores the relation between THI level and egg yield and quality. This situation is thought to have arisen because of the regional difference in which the test was conducted. It is observed that the reference set is the 32th week based on the amount of improvement and target values necessary for the enterprise to be effective in the weeks when production performance is not effective (Table 3). Accordingly, it can be said that the 54th week is the most critical week for the hens to avoid heat stress.

Table 3. Results of BCC Model

DMU	38. week	39. week	40. week	41. week	42. week	43. week	44. week	45. week	46. week
ES	0.873	0.857	0.863	0.840	0.836	0.816	0.781	0.764	0.767
THI-PV	18.393	18.393	18.393	18.393	18.393	18.393	18.393	18.393	18.393
Δ (%)	-12.718	-14.307	-13.670	-15.962	-16.363	-18.376	-21.897	-23.590	-23.338
Referans Set	32. Week								
DMU	47. week	48. week	49. week	50. week	51. week	52. week	53. week	54. week	55. week
ES	0.747	0.740	0.733	0.715	0.686	0.696	0.673	0.660	0.664
THI-PV	18.393	18.393	18.393	18.393	18.393	18.393	18.393	18.393	18.393
Δ (%)	-25.282	-26.034	-26.683	-28.512	-31.416	-30.378	-32.661	-33.970	-33.584
Referans Set	32. Week								
DMU	56. week	57. week	58. week	59. week	60. week	61. week	62. week	63. week	64. week
ES	0.680	0.703	0.741	0.783	0.851	0.834	0.868	0.952	0.856
THI-PV	18.393	18.393	18.393	18.393	18.393	18.393	18.393	18.393	18.393
Δ (%)	-31.984	-29.661	-25.861	-21.703	-14.898	-16.576	-13.180	-4.752	-14.384
Referans Set	32. Week								
DMU	65. week	66. week	67. week	68. week	69. week	70. week	71. week		
ES	0.835	0.840	0.901	0.904	0.857	0.890	0.895		
THI-PV	18.393	18.393	18.393	18.393	18.393	18.393	18.393		
Δ (%)	-16.506	-15.964	-9.862	-9.575	-14.274	-10.982	-10.528		
Referans Set	32. Week								

ES: Efficiency Score, PV: THI Projection Value, DMU: Decision Making Unit. Since the weeks between 23-37 are efficient, they have efficiency score 1 and don't involved in the table. Egg yield is calculated on the basis of chicken-poultry (%) method. Δ *(%) indicates the ratio and direction of improvements.*

CONCLUSIONS

In poultry farming, it is important that hens are housed in suitable environmental conditions in order to reduce economic losses and increase productivity. For this reason, the effect of heat stress, egg production and survival rate on laying hens

during the 71-week period is investigated by using the input-oriented BCC model. In the analysis results obtained with this model, it is determined that the production performance is effective during the week ages between 23-37, and not effective for the other weeks.

When the amount of improvement and target values required for the ineffective weeks to be effective are examined, it is determined that the weekly ages to be improved most are between 51. and 56. weeks, and least is 63. weeks. When the reference sets of ineffective DMUs are examined, it can be said that taking 32. week as reference can provide an increase in both survival rate and egg yield. In addition, when the raw data of the ineffective weeks (ages) are examined, it is seen that the lowest THI level is 18.393 °C and the highest is 27.855 °C.

The average projection value is 18.393° C in these weeks. As a result, based on these findings with DEA, it can be said that when the THI level exceeds 18.393 °C (THI>18.393 °C), egg production and living ability can be decreased. Hens may be exposed to heat stress at THI level over 18.393 °C. This value can also be considered as a threshold value at which hens are exposed to heat stress. In future studies, the effect of heat stress can be examined using different DEA models or Fuzzy DEA methods.

REFERENCES

Areerat,T. I., Hiroshi, L., Kamol, N., and Koh-En, Y. 2012a. Production Efficiency of Broiler Farming in Thailand: A Stochastic Frontier Approach. Journal of Agricultural Science; 4(12): 58-71.

Areerat T, Hiroshi K, Kamol N, Koh-en Y. 2012b. Economic Efficiency of Broiler Farms in Thailand: Data Envelopment Analysis Approach. British Journal of Economics, Finance and Management Sciences. Vol. 5 (1): 33-43.

Ayyıldız A. 2012. Tavuk Yetiştiriciliği-tavuk. https://www.tavsiyeediyorum.com/makale_9919.htm Erişim tarihi: 23.08.2018

Bal H, Orkcu HH. 2005. Combining the Discriminant Analysis and the Data Envelopment Analysis in view of Multiple Criteria Decision Making: A New Model. G.U. Journal of Science 18(3): 355-364.

Cetin N, Cetin E, Kucuk O. (2006). Effect of Magnesium Supplementation to Ration on Some Hematological Parameters in Japanese Quails Exposed to Heat Stress (35 °C). J Fac Vet Med Univ Erciyes. 3(1): 15-20.

Cooper WW, Seiford LM and Tone, K. 2007. Data envelopment analysis: Acomprehensive text with models, applications, references and DEA-solver software (Second Edition). Boston: Kluwer Academic Publishers, 367-371.

Demir P, Derbentli O, Sakarya E. 2012. Measurement the Efficiency of Dairies in the Kars Province with Data Envelopment Analysis. Kafkas Univ Vet Fak Derg. 18 (2): 169-176.

Heidari MD, Omid M, Akram A. 2011. Optimization of Energy Consumption of Broiler Production Farms using Data Envelopment Analysis Approach. Modern Applied Science. 5 (3): 70-78.

Isbilen Yucel L. 2017. Veri Zarflama Analizi. Page:164. Der Yayınları.

Karslı MA and Donmez HH. 2007. Effects of Plant Extract on Growth Performance and Villi of the Small Bowel in Heat Stressed Broiler. Atatürk Üniversitesi Vet. Bil. Derg. 2 (4):143-148.

Kılıc I and Simsek E. 2013. The effects of heat stress on egg production and quality of laying hens. Journal of Animal and Veterinary Advances. 12(1): 42-47.

Lara LJ and Rostagno MH. 2013. Impact of Heat Stress on Poultry Production. Animals, 3: 356-369. Doi:10.3390/ani3020356

Okursoy A and Tezsurucu D. 2014. Comparison of the Relative Efficiencies by the Data Envelopment Analysis: An Application in Turkey for the Provinces of Cultural Indicators. Yönetim Ve Ekonomi: Celal Bayar Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi. 21(2):1-18.

Orkcu HH, Dogan Mİ. 2015. A New Hybrid Two-Group Classification Model Based on the Data Envelopment Analysis Model. Süleyman Demirel University Journal of Natural and Applied Sciences. 19(3): 26-38.

Orkcu HH, Kardiyen F. 2006. A Study on the Comparison of Data Envelopment Analysis and Multivariate Statistical Methods in Ranking and Classifying Provinces Development Level in Turkey. H. Ü. İktisadi ve İdari Bilimler Fakültesi Dergisi, 24(2): 127-152.

Ozbek A. 2017. Çok Kriterli Karar Verme Yöntemleri ve Excel İle Problem Çözümü Kavram, Teori, Uygulama. Seçkin Yayınları. Page: 336

Ozden A. 2016. Performance Level Determination of Dairy Farms Using Dea. Turkish Journal Agricultural Economics, 22(1): 49-55 (in Turkish).

Rahimi I and Behmanesh R. 2012. Improve poultry farm efficiency in Iran: using combination neural networks, decision trees, and data envelopment analysis (DEA). International Journal of Applied Operational Research 2 (3): 69-84.

Reig-Martinez and Picazo-Tadeo AJ. 2004. Analysing farming systems with Data Envelopment Analysis: citrus farming in Spain. Agricultural Systems. 82: 17-30.

Retzlaff-Roberts DL. 1996. Relating Discriminant Analysis and Data Envelopment Analysis to One Another. European Journal of Operational Research. 23: 311-322.

Romera LF, Zuidhof MJ, Jeffrey SR, Naeima A, Renema RA, and Robinson FE. 2010. A data envelope analysis to assess factors affecting technical and economicefficiency of individual broiler breeder hens. Poultry Science. 89: 1769–1777.

Sefeedpari P, Rafiee S, Akram A. 2012. Selecting Energy Efficient Poultry Egg Producers: A Fuzzy Data Envelopment Analysis Approach. International Journal of Applied Operational Research 2(2): 77-88.

Silva DA, Alves GI, Mattos Neto PS and Ferreira TA. 2014. Measurement of Fitness Function Efficiency Using Data Envelopment Analysis. Expert Systems with Applications, 41, 7147-7160.

Ulucan A and Atıcı K. 2010. Non-Parametric Efficiency Analysis in Energy and Environment Issues and A Turkey Application on Energy Efficiency. Hacettepe Üniversitesi İİBF Dergisi, 28(1): 173-203.

Wang, K, Yu, S and Zhang, W. 2013. China's regional energy and environmental efficiency: a DEA window analysis based dynamic evaluation. Mathematical and Computer Modelling, 58(5-6): 1117–1127.

Yertürk M, Avcı M, Kaplan O. 2005 Sıcak Stresi Altında Yetiştirilen Japon Bıldırcınlarında Gece Yemlemenin

Performans ve Bazı Kan Parametreleri Üzerine Etkisi. YYÜ Vet Fak Derg 16(2): 11-15.

Zulovich JM and DeShazer JA. 1990. Estimating egg production declines at high environmental temperatures and humidities. Page 15 in ASAE. American Society of Agricultural Engineers (ASAE), St. Joseph, MI, USA.

IMPACT OF SUPPLEMENTATION OF MORINGA OLEIFERA AND LEUCAENA LEUCACEPHA TREE FODDER ON THE PRODUCTION OF INDIGENOUS GOATS IN MOZAMBIQUE

Gracinda Andre MATAVEIA[1,2], Carmen Maria Lucas Pedro GARRINE[3], Alberto PONDJA[3], Abubeker HASSEN[2], Carina VISSER[2]

[1] Department of Clinics, Faculty of Veterinary, University of Eduardo Mondlane, Maputo, MOZAMBIQUE
[2] Department of Animal and Wildlife Sciences, Faculty of Natural and Agricultural Sciences, University of Pretoria, SOUTH AFRICA
[3] Department of Animal Production, Faculty of Veterinary at University of Eduardo Mondlane, Maputo, MOZAMBIQUE

Corresponding author e-mail: gracindaamataveia@gmail.com

Abstract

This study was conducted to assess the effect of supplementation with Leucaena leucacepha (LL), and Moringa oleifera (MO) tree leaves on growth and reproduction performance of indigenous goats in southern Mozambique. Fifty-six indigenous goats with an average age of 8 months and a body weight of 17.4 kg were randomly divided into seven treatments groups of 4 castrated males and 4 females each. Treatment 0 served as the control group (Co), and animals only grazed on natural pasture without any supplementation. In addition to the natural pasture, three groups received 50 g (LL50), 75 g (LL75) and 100 g (LL100) of L. lecocephala dried leaves, respectively while groups 4 to 6, received 40 g (MO40), 60 g (MO60) and 80 g (MO80), of M. oleifera dried leaf meal respectively. Leucaena leucocephala contained 23.7% crude protein (CP) and 2.55 Mcal/kg metabolizable energy (ME), while M. oleifera leaves 28.8% CP and 1.68 Mcal/kg ME. The study lasted for 16 months. Supplementation of the tree leaves, irrespective of level, had a significant effect ($p<0.05$) on body weight gain. Final body weight of the goats ranged from 26.6 to 31.1 kg for LL and from 26.9 to 30.9, for MO, compared to 20.7 kg for the control group. However, the final body weight did not differ ($p>0.05$) between the two supplementation sources (L. lecocephala versus M. oleifera dried leaf). Average daily gain, during the dry season, ranged from -2.35 to 1.84 g/day for goats fed LL leaves and from -2.77 to 2.35 g/day for goats fed MO and these values were higher ($p<0.05$) compared to values recorded for the control goats (-9.33 to -2.68 g/day). All female reproduction efficiency parameters measured such as birth rate, twinning rate, birth weight and weaning were significantly ($p>0.05$) higher in supplemented goats compared to the control goats. Body weights at birth and weaning weight of the offspring of supplemented goats were however not significantly affected by supplementation. The highest survival rate (100%) was observed in goat fed with M. oleifera (MO40), while the lowest was recorded in goats fed with L. leucocephala leaves (LL75). The results of this study suggest that L. leucacepha and M. oleifera tree leaves could be used as supplementation to goats to overcome the adverse effects of seasonal fluctuations in feed quality on growth and reproductive performance.

Key words: *fodder trees, growth, reproductive, smallholder, goats, supplementation*

COMPARISON OF SOME RANDOM REGRESSION MODELS FOR RACING PERFORMANCES OF THE BRITISH RACING HORSES IN TURKEY

Samet Hasan ABACI[1], Umit COSKUN[1], Hasan ONDER[1]

[1]Ondokuz Mayis University, Faculty of Agriculture, Department of Animal Science, TR55139, Atakum, Samsun, TURKEY

Corresponding author e-mail: samet.abaci@omu.edu.tr

Abstract

This study was conducted to compare some random regression models applied to Legendre polynomials (L (2.2), L (2.3), L (3.2), L (3.3)) for that run on racing performance in British horses in Turkey. For this purpose, a total of 146850 race time record up to 15 races at different distances of 13625 horse taken from the Jockey Club of Turkey between the years of 2005 and 2016 was used. In this study, the genetic correlations between covariance components, heritabilities and race days for race completion times were estimated by using the DXMRR option in the DFREML statistical package program. The track type, the year and the horse's age, the fixed effect, the track distance were taken as covariates and the breeding value estimates were made. -2logL, Akaike information criterion (AIC), Bayesian information criterion (BIC), Error Variance (RV) and Log likelihood values were used to compare models. Heritabilities (0.24 to 0.28), additive genetic correlations (0.87 to 0.99) and phenotypic correlations (0.22 to 0.55) were estimated by L(2,3) random regression model which had the lowest -2LogL and BIC values. As a result, the L (2.3) model can be used for genetic evaluation and breeding of British racing horses.

Key words: *British horse, race, heritabilities, additive genetic correlations, phenotypic correlations*

INTRODUCTION

Horse racing emerges as a sport and entertainment game where money transfers take place economically in large quantities. Officially, the contribution of the horse races made in every community and culture from the 17th century to the present day to the country's economy is increasing steadily. While horses are bought and sold at very high prices, the high-performing horses in the races are making significant gains to their owners (Cansabuncu Kanman, 2006; Köseman ve Şeker, 2016). The performance of horses in races is under the influence of genetic and environmental factors (Köseman ve Şeker, 2018). There are differences in performance between both breeds and among the individuals of the same race. British and Arabian horses perform differently at the same distance. This difference is due to the effect of genotype. British horses have become favorite horse races of horse racing due to their physical characteristics and fast running. In addition, the British horse is a breed that maintains its speed at distances that are too long, and has been produced for many years as a symbol of speed and endurance in horse breeders' field (Anonymous, 2018). Therefore, the selection of breeding animals to be allocated is of great importance. The horses that are taken into or out of the sport must be selected according to the highest possible genetic value. However, this is not possible in practice. Generally, selection is made by looking at phenotypes of horses. However, the most reliable estimation of genotypic value is possible with calculations made from phenotypic values (Köseman and Seker, 2018). While the random regression models developed in recent years are used extensively in determining the breeding values for the economic characteristics of different animals (Takma and Akbaş, 2009; Alkan et al., 2012; Onder et al., 2015), there is a growing interest in predicting the breeding values of animals used in horse racing with random regression models (Buxadera and da Mota, 2008). Until today, studies on horse races sufficient work has not been observed for the fitting performance of

different ordered legendre polynomials. In this study, it is aimed to compare the fitting performance of the random regression models applied to the orthogonal Legendre polynomial on the race completion time (min) of British racing horses.

MATERIALS AND METHODS

In the study, 146850 test day race completion time (sec) records of 13625 British horse raced taken from the Jockey Club of Turkey between 2005 and 2016 were used. Records up to the 15th run of a horse have been used. Some of the animals that were recorded less than two races and some animals whose parents were not reached were excluded from the study. In the study, the race tracks type, the race year and the age of the horse were fixed, and the race tracks distance were taken as covariates.

L (2,2), L (2,3), L (3,2) and L (3,3) models of Legendre polynomial function for additive genetic and permanent environmental effects was estimated by the DXMRR option in the DFREML package program (Meyer, 1997) with the individual model approach using sire and dam pedigree information. The following model was used to apply the random regression model.

$$y = RT_i + Y_j + A_k + \sum_{m=1}^{K_B} \beta_m x_{(m)}(t_{ij}) + \sum_{m=1}^{K_A} \alpha_{jm} \varphi_m(t_{ij}) + \sum_{m=1}^{K_p} P_{jm} \varphi_m(t_{ij}) + e$$

In this model; RTi: ith race tracks (sand, grass, artificial grass); Y_j: jth race year (2005-2016);

A_k: kth horse age (2-18); β_m: mth fixed regression coefficients for horse j; t_{ij}: ith test day of the horse j; $x_{(m)}$ (t_{ij}): mth covariates (race tracks distance: from 800 to 2400, with an increase of 100); α_{jm}: mth additive genetic random regression coefficients for horse j; P_{jm}: mth permanent environmental random regression coefficients for horse j; ϕ_m: mth polynomial evaluated for the race t_{ij}; K_B, K_A and K_P are the order of fitted fixed, random additive and random permanent regression coefficients; e: random residual effect for y. -2logL, Akaike information criterion (AIC), Bayesian information criterion (BIC), Error Variance (RV) and Log likelihood values were used to compare random regression models.

RESULTS AND DISCUSSION

Estimated -2LogL, AIC, BIC and RV values used to compare the random-regression models were given in Table 1. In studied models where the number of parameters ranged from 7 to 13, -2LogL values were changed 529471.7 and 538709.7. The lowest -2logL value was observed in the L(2.3) model. The lowest AIC value was observed in the L(3.3) model while the lowest BIC value was observed in the L(2.3) model. The RV values were found to be similar in these two models L(2.3) and L(3.3). Changes of the maximum log likelihood values in different models were presented in Table 2.

Table 1. Criteria used for comparison of the models

Models	Number of parameters	-2LogL	AIC	BIC	RV
L (2.2)	7	531285.5	513514.4	513583.6	9.75
L (2.3)	10	529471.7	511706.5	511805.5	9.38
L (3.2)	10	538709.7	512051.9	512150.9	9.42
L (3.3)	13	538335.4	511683.6	511812.2	9.38

-2LogL: logarithm of the likelihood function, AIC: Akaike's information criterion, BIC: Bayesian information criterion, RV: residual variance

Log likelihood changes values were found be significant in L(2.3) and L(3.3) legendre polynomial models (P<0.05). The highest change was observed in L(2.3) model.
The first 3 eigenvalues and ratios (in parentheses) of the predicted additive genetic (co)variance matrices for the legendre polynomial models are given in Table 3. For additive genetic effect, the first eigenvalues except L(3.2) model account for about 97% of the total variation.

Table 2. Maximum log likelihood values and changes in the log likelihoods at the different models

Models	Number of parameters	Log likelihood	Changes in Log likelihood	Changes in Log Likelihood (%)	X^2
L (2.2)	7	-256750.1	-	-	-
L (2.3)	10	-255843.2	906,9*	0.35	7.81
L (3.2)	10	-256015.9	-	-	
L (3.3)	13	-255828.8	187.1*	0.07	7.81

*Significant change (*P*<0.05)

Table 3. Eigenvalues of the additive genetic (co)variance matrix and the proportion of total variance (%) estimated from Legendre models.

Models	First	Second	Third
L(2.2)	8.66026 (97,62)	0.211322 (2.38)	-
L(2.3)	8.47599 (97.78)	0.192417 (2.22)	-
L(3.2)	9.26655 (86.15)	1.34219 (12.48)	0.0468867 (1.37)
L(3.3)	8.68255 (97.38)	0.221374 (2.48)	0.0121879 (0.14)

The eigenvalues and ratios (in parentheses) of the predicted permanent environmental (co) variance matrices for the legendre polynomial models are given in Table 4. The first eigenvalues for legendre polynomial model belonging to permanent environmental effect account for over 70% of total variation.

Table 4. Eigenvalues of the permanent environmental (co)variance matrix and the proportion of total variance (%) estimated from Legendre models

Models	First	Second	Third
L(2.2)	4.36048 (79.15)	1.14861 (20.85)	-
L(2.3)	4.56540 (72.93)	1.61273 (25.76)	0.0817904 (1.31)
L(3.2)	4.18318 (87.54)	0.595537 (12.46)	
L(3.3)	4.35628 (71.77)	1.59157 (26.22)	0.122253 (2.01)

Heritabilities for racing order estimated from legendre polynomials were given in Figure 1. Heritabilities were changed from 0.21 to 0.36. Heritabilities, additive genetic and phenotypic correlations between racing order from L(2.3) models were given in Table 5. Heritabilities (0.24 to 0.28), additive genetic correlations (0.87 to 0.99) and phenotypic correlations (0.22 to 0.55) were estimated by L(2,3) random regression model which had the lowest -2LogL and BIC values.

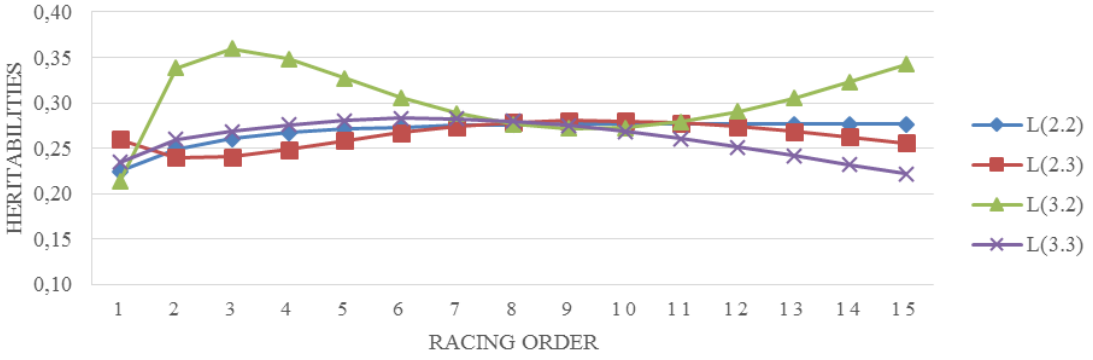


Figure 1. Changes of heritability for racing order estimated from Legendre polynomial models

Estimated heritabilities from legendre polynomials except L(3.2) model was found as nearly similar. Buxedera and Mota (2008) similar results were reported for Brazil horses running from 1000 to 1200 meter. But it was found higher than it found by Gómez et al. (2011) for Spanish Trotter horses.

Table 5. Heritabilities (diagonal), additive genetic (below diagonal) and phenotypic (above diagonal) correlations among race number

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	**0.26**	0.34	0.33	0.33	0.32	0.31	0.30	0.29	0.28	0.27	0.26	0.25	0.24	0.23	0.22
2	0.99	**0.24**	0.43	0.42	0.41	0.40	0.38	0.36	0.34	0.32	0.30	0.28	0.26	0.23	0.22
3	0.97	1.00	**0.24**	0.44	0.44	0.43	0.41	0.39	0.37	0.35	0.33	0.31	0.29	0.27	0.25
4	0.96	0.99	1.00	**0.25**	0.45	0.44	0.43	0.41	0.40	0.38	0.36	0.34	0.33	0.31	0.29
5	0.94	0.98	1.00	1.00	**0.26**	0.45	0.44	0.43	0.42	0.41	0.39	0.38	0.36	0.34	0.33
6	0.93	0.98	0.99	1.00	1.00	**0.27**	0.45	0.44	0.44	0.43	0.42	0.41	0.39	0.38	0.37
7	0.92	0.97	0.99	0.99	1.00	1.00	**0.27**	0.45	0.45	0.45	0.44	0.43	0.42	0.41	0.40
8	0.91	0.96	0.98	0.99	1.00	1.00	1.00	**0.28**	0.46	0.46	0.46	0.45	0.45	0.44	0.43
9	0.91	0.96	0.98	0.99	0.99	1.00	1.00	1.00	**0.28**	0.47	0.47	0.47	0.47	0.47	0.46
10	0.90	0.95	0.98	0.99	0.99	1.00	1.00	1.00	1.00	**0.28**	0.48	0.49	0.49	0.49	0.49
11	0.89	0.95	0.97	0.98	0.99	0.99	1.00	1.00	1.00	1.00	**0.28**	0.50	0.50	0.51	0.51
12	0.89	0.95	0.97	0.98	0.99	0.99	1.00	1.00	1.00	1.00	1.00	**0.27**	0.52	0.52	0.53
13	0.88	0.94	0.97	0.98	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	**0.27**	0.53	0.54
14	0.87	0.94	0.96	0.98	0.99	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00	**0.26**	0.55
15	0.87	0.93	0.96	0.97	0.98	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	**0.26**

CONCLUSIONS

In conclusion, there is no consensus in literature for British horse about the best order of fit legendre polynomial models to be used to model of racing order with RRM. So, several RRMs obtained with different legendre polynomial models have been compared for fitting performance. As a result, the L (2.3) model can be used for genetic evaluation and breeding of British racing horses. Further studies should be conducted with different order legendre polynomials.

ACKNOWLEDGEMENT

The authors wish to thank the Jockey Club of Turkey for assistance.

REFERENCES

Alkan S, Karslı T, Galiç A, Karabağ K, Balcıoğlu MS. 2012. Estimation of Genetic Parameters for Body Weight of Japanese Quails (Coturnix coturnix japonica) Using Random Regression Model. Kafkas Univ. Vet. Fak. Derg, 18 (6): 985-939.

Anonymous, 2018. https://www.at.gen.tr/ingiliz-ati.html (date of access: 06.08.2018)

Buxadera AM, da Mota MDS. 2008. Variance component estimations for race performance of thoroughbred horses in Brazil by random regression model. Livestock Science, 117 (2-3): 298-307.

Cansabuncu Kanman, G. 2006. The relationship between the quantity, counting and measurement of erytrocytes and the performance of horses during competition season. Master Thesis, Ege University, Institute of Science, İzmir.

Gómez MD, Molina A, Menendez-Buxadera A, Valera M. 2011. Estimation of genetic parameters for the annual earnings at different race distances in young and adult Trotter Horses using a Random Regression Model. Livestock Science, 137 (1-3): 87-94.

Köseman A, Şeker İ. 2016. Biosecurity and its importance in the Horse Farms, Journal of Bahri Dagdas Animal Research, 5 (1): 33-39.

Köseman A, Şeker, İ. 2018. Atların yarış ve yarışma performansları üzerine etkili faktörler ve performansı artırma yolları. Uludag University Journal of the Faculty of Veterinary Medicine, 37 (1): 38-41.

Meyer K. 1997. DFREML 3.0α program package and user notes. Genetics and Breeding Unit, Univ. New England, Armidale, New South Wales, Australia.

Onder H, Sen U, Takma C, Ocak S, Abaci SH. 2015. Genetic parameter estimates for growth traits in Saanen kids. Kafkas Univ Vet Fak Derg,, 21 (6): 799-804.

Takma C, Akbas Y. 2009. Comparison of fitting performance of random regression models to test day milk yields in Holstein Friesians. Kafkas Univ Vet Fak Derg, 15 (2): 261-266.

EFFECTS OF EXCHANGE RATE AND FEED PRICES ON RED MEAT PRICES

Lutfi BAYYURT[1], Cem TIRINK[1], Samet Hasan ABACI[1], Hasan ONDER[1]

[1]Ondokuz Mayis University, Faculty of Agricultural, Department of Animal Science, TR55139, Atakum, Samsun, TURKEY

Corresponding author e-mail: bayyurt_25@hotmail.com

Abstract

In this study, the effect of exchange rate and feed prices on red meat prices was examined. The study material consists of annual data from Turkey between 2005 and 2007. The data were analyzed by Granger Causality Test method. As a result of analysis ıt has been determined that exchange rate and feed prices are the reason for red meat price. Moreover, according to the result of two-way causality test, it is determined that the exchange rate is not the reason for the feed prices and the price of red meat is not the reason for exchange rate.

Key words: *red meat, feed price, exchange rate, granger causality test.*

INTRODUCTION

The majority of the animal production in Turkey; small-scale enterprises that do not have the knowledge of quality and price formation, and often lack the traditional methods and economic consciousness of breeding. The traditional and irrational structure in these businesses weakens the bargaining power of producers. Prices for animal and animal products are formed in an oligopoly market where a limited number of buyers, especially those involved in the price, cooperate with numerous and unorganized producers (Aral, 1971; Aral and Cevger, 2001; Kaygısız, 2001). Formation of red meat prices in Turkey; fattening material, feed, workmanship, etc. the price of substitute products (sheep-goat meat, beef), import or export status, the existence of state intervention, animal husbandry support, interest rates, instability in milk prices, consumer demand, consumer preferences as well as input costs and purchasing power can affect directly or indirectly at different levels (Cevger and Sakarya, 2006). Immediate drop in price movements in relation to red meat prices affect the decision of producers, consumers and policy makers even more negatively on the development of this sector. Even so, after financial indicators such as stock exchange, gold, exchange rate and interest rates, meat prices have become tracked by earning daily news value. Policy makers are pushing for immediate and short-term solutions in order to reduce the news from the agenda and to stabilize meat prices. However, imports of animal products seem to have offset the market price of meat in the short run, causing them to go bankrupt by hitting small producers. As the number of producers decreases, these misguided policies applied in the animal husbandry sector, which is embodied in oligopoly structure, provide for the monopolization of the firms with high capacities. As a result of the longstanding structural problems in farming and animal husbandry policies of Turkey between 2009-2010, before the sheep and goat meat prices, beef prices after the increase in real terms has occurred. Decision makers have sought to balance the rising red meat prices through imports. To this end, a number of Ministerial Council resolutions have been adopted since 2010 to make livestock and red meat imports attractive by lowering customs duties. The authority to make imports is given firstly by the Meat and Fish Institution and then by the private sector (Aydın et al., 2011).

MATERIALS AND METHODS

For the study of the effect of exchange rate and feed prices on the red meat prices, the data for the period 2005-2017 was used. Turkey Statistical Institute (TUIK), red meat prices obtained by averaging the local culture and cross breed cattle with buffalo meat prices have been determined. Foreign exchange rate data were obtained from the General Directorate of Budget and Financial Control (BUMKO). The feed price data has been obtained from the Directorate of Agricultural Economics and Policy Development Institute (TEPGEM) and the General Directorate of Protection and Control of the Ministry of Agriculture and Rural Affairs. In the series with natural logarithms, the Granger Causality Analysis test was used to determine whether the change in exchange rate and feed prices affected the red meat prices. Exchange rates, feed and red meat prices are shown in Table 1. The exchange rate is set in dollars (TUIK, 2017; BUMKO, 2017; TEPGEM, 2017).

Table 1. Exchange rate, feed and red meat prices

Year	Exchange Rate (TL/1USD)	Feed Prices (kg)	Red Meat Prices (kg)
2005	1.34	0.30	9.56
2006	1.43	0.31	10.29
2007	1.3	0.40	11.16
2008	1.293	0.52	11.72
2009	1.5474	0.42	13.41
2010	1.5011	0.48	18.41
2011	1.6708	0.62	18.54
2012	1.7921	0.68	17.51
2013	1.902	0.71	15.83
2014	2.1881	0.74	17.1
2015	2.7209	0.74	21.14
2016	3.0223	0.95	25.03
2017	3.6491	0.99	27.44

Unit Root Test

Time series used in Granger causality analysis should be stable. For this reason, a generalized Dickey Fuller (ADF) unit root test was performed to determine whether variables were stationary (Dickey and Fuller, 1979)

Granger Causality Analysis

Granger, Geweke-Meese-Dent, Sims, Pierce-Haugh and Geweke analysis methods can be used to determine the direction of the single or double-sided causality relationship between two variables. From these tests, the Granger causality test is preferred because of its advantages such as ease of implementation, availability of some test results, predictability and externality test according to other causality tests (Narayan and Smyth, 2005; Gul et al., 2007).

RESULTS AND DISCUSSION

According to Table 2, where unit root test results are included, exchange rate which is not stable in fixed and fixed trend becomes stable at the level of 5% significance when the price of series is taken into account. The feed series has become stationary at a trending 5% significance level. In the ADF test, Granger Causality Analysis was adopted because it was determined that all of the series were stationary.

Table 2. Unit root test results

	Intercept	Intercept and Trend	1st Difference Trend	1st Difference Intercept and Trend
ADF		t-Statistic		
dollar	2.56397	-0.06862	-1.19094	-4.67979
	(0.999)	(0.984)	(0.627)	(0.021**)
meat	-0.40046	-3.32785	-2.69479	-2.88983
	(0.880)	(0.114)	(0.111)	(0.080***)
feed	-1.04236 (0.692)	-4.76310 (0.016**)	-4.23429 (0.012**)	-3.57710 (0.093***)

The table also contains the T statistic values, critical values within parentheses. * 1%, ** 5% and *** 10% indicate that the series are stationary.

According to Table 3, the hypotheses that dollar and oat are not attributable to red meat prices were rejected at 5% significance level. On the other hand, when the results of the two-way causality analysis are examined, the hypothesis that the dollar is not the reason for the feed prices and the hypothesis that the red meat prices are not the cause of the dollar are accepted at the 5% significance level.

Table 1. Granger causality analysis results

Null Hypothesis	F-Statistic	Prob.
Meat does not Granger Cause Feed	2.74789	0.1422
Feed does not Granger Cause Meat	10.7594	0.0104
Dollar does not Granger Cause Feed	2.74790	0.1422
Feed does not Granger Cause Dollar	4.27330	0.0482
Dollar does not Granger Cause Meat	4.85164	0.0401
Meat does not Granger Cause Dollar	0.36449	0.7089

CONCLUSIONS

Although many incentives have been given to agriculture and livestock sector in recent years, red meat prices have been controlled and have not been withdrawn at desired levels. As a short-term solution, the government has focused on importing red meat and live animals. However, long-term permanent policies have not been implemented on the basis of the problem. Most of the policies applied to the sector, especially imports, favor high-scale enterprises. As a result, the number of producers in the livestock sector is decreasing day by day, while larger firms are growing even more (Arslan, 2017). If the gain can be increased by lowering costs in the livestock sector, the number of producers and production amount will increase. In this respect, feed prices, one of the basic costs of the livestock sector, and the effects on the sectoral production of the increase in the exchange rate, which seemed to indirectly affect the direct production costs, were investigated. It has been determined that exchange rate and feed prices affect red meat prices as a result of studying the effect of exchange rate and feed prices on red meat prices through Granger causality test. In one case, price increases are inevitable if supply can not meet demand. Increasing the number of producers and producers is necessary in order to control the price increases caused by the supply which is insufficient in the animal husbandry sector. Therefore, policies should be applied to increase sector incentives and reduce costs. Therefore, policies on factors such as feed

and exchange rates that increase costs in the livestock sector should be developed.

REFERENCES

Aral S. 1971. Memleketimizde et ve mamüllerinin sürümünde et ve bal›k kurumunun yeri ve önemi. Doktora Tezi. Ankara Üniversitesi, Ankara, Türkiye.

Aral S., Cevger Y. 2000. Türkiye'de Cumhuriyet'ten Günümüze İzlenen Hayvancılık Politikaları, Hayvancılık Kongresi, 31 Mart-2 Nisan 2000, Kızılcahamam, Ankara. Türkiye.

Arslan S. 2017. Akaryakit Fiyatlarinin Küçük Ve Büyük Baş Hayvan Fiyatlarina Etkisi. Uluslararası Yönetim İktisat ve İşletme Dergisi, 13(5), 284-291.

Aydın E, Aral Y, Can MF, Cevger Y, Sakarya E, İşbilir S. 2011. Türkiye'de son 25 yılda kırmızı et fiyatlarındaki değişimler ve ithalat kararlarının etkilerinin analizi. Vet Hek Der Derg, 82 (1): 3-13

Cevger Y, Sakarya E. 2006. Meat prices and factors affecting them in Turkey. Turk J Vet Anim Sci, 30(1) 1-6

Dickey D A, Fuller, W A. 1979. Distribution of the estimators for autoregressive time series with a unit root. Journal of the American statistical association, 74.366a: 427-431.

Gül E, Ekinci A, Özer M. 2007. Türkiye'de Faiz Oranları ve Döviz Kuru Arasındaki Nedensellik İlişkisi: 1984-2006. İktisat, İşletme ve Finans, Yıl: 22, Sayı: 251.

Kaygısız HF . 2001. Uygulanan genel ekonomik politikaların hayvancılık sektörü üzerindeki etkileri. İktisat Derg, 412, 66-74 .

Narayan PK, Smyth R. 2005. Electricity consumption, employment and real income in Australia evidence from multivariate Granger causality tests. Energy policy, 33(9), 1109-1116.

BUMKO.2017.http://www.bumko.gov.tr/TR,146/istatistikler.html (Erişim Tarihi 05.8.2018)

TEPGEM. 2017. http://arastirma.tarim.gov.tr/tepge. (Erişim Tarihi 01.8.2018).

TUIK.2017.http://www.tuik.gov.tr/UstMenu.do?metod=temelist (Erişim Tarihi 10.8.2018).

EVALUATION OF DAIRY CATTLE MILK PRODUCTION IN BLACK SEA REGION BY CLUSTER ANALYSIS

Cem TIRINK[1], Lutfi BAYYURT[1], Samet Hasan ABACI[1], Hasan ONDER[1]

[1]Ondokuz Mayis University, Faculty of Agriculture, Department of Animal Science, TR55139, Samsun, TURKEY

Corresponding author e-mail: cem.tirink@gmail.com

Abstract

The aim of the study evaluates to the situation of milk production in dairy cattle for 18 cities in Black Sea Region. For this aim, 18 cities have been compared and classified about milk production. Data is including numbers of dairy cattle, milking dairy cattle and dairy cattle milk production for Black Sea Region. The data were obtained from Turkish Statistical Institute between 2013 and 2017 years. As a result of cluster analyzes for milk production in Black Sea Region shows that two groups such as Artvin, Rize, Giresun, Sinop, Gumushane, Zonguldak, Bartin, Duzce, Karabuk, Trabzon, Tokat, Bayburt, Bolu, Samsun and Corum, Ordu, Kastamonu, Amasya.

Key words: *Cluster analysis, Dairy cattle, Milk production, Black Sea Region*

INTRODUCTION

According to the TUIK data in 2017, there are 15.943.586 head of dairy cattle and 18.762.319 tons of milk is produced in Turkey. (TUIK, 2017). The Black Sea Region which constitutes the data of the study has significant potential for country animal husbandry. The Black Sea Region has 2.416.955 dairy cattle and has about 14% of total milk production. The city with the highest milk production in the Black Sea is Kastamonu with 370.034 tons and the lowest milk production is in Rize (23,879 tons). The research data were consisted from total cattle presence in the East, Central and Western Black Sea Region. The total number of cattle in the regions are 466.593, 1.230.904 and 719.458 million, respectively, and milk production quantities of these regions are 524.423, 1.287.416 and 844.439 tons. This information is crucial to the livestock potential of the Black Sea Region.

For this reason, differences and similarities in dairy cattle in regional cities can be demonstrated by comparison with multivariate statistical methods.

Multivariate statistical analysis refers to multiple advanced techniques for examining and interpretation of relationships among multiple variables at the same time (URL-1) There are many multivariate statistic methods for multivariate statistical analysis like discriminant analysis, cluster analysis, principal component analysis, canonic correlation

analysis and multi-dimensional scaling analysis etc. (Gevrekci et al., 2011).

In this study, we used cluster analysis as one of multivariate statistical methods. Cluster analysis is used for classify obscure and ungrouped data by group similarity or distances (Gevrekci et al., 2011).

MATERIAL AND METHOD

Data were obtain from Turkish Statistical Institute between 2013 and 2017 years for milk production, number of milking dairy cattle and number of dairy cattle to 18 cities (Bolu, Bartın, Düzce, Karabük, Kastamonu, Sinop, Zonguldak, Amasya, Çorum, Ordu, Samsun, Tokat, Artvin, Bayburt, Giresun, Gümüşhane, Rize, Trabzon) in Black Sea Region.

Cluster analysis aims to group the n items of the p variables according to their similarities. In the clustering process, two observations are examined according to similarity and distance measurements. Cluster analysis is similar to discriminant

analysis because it aims to aggregate similar objects in the same groups. However, cluster analysis is different from discriminant analysis because it performs clustering during analysis. In addition, cluster analysis is similar to factor analysis because of its classification of variables (Cakmak, 1999).

The cluster analysis consists of two algorithms (Isildar, 2017). First algorithm is a hierarchical set of operations that makes it easier to explain clusters created using graphics called dendrograms. The second algorithm is the k- means cluster in which the number of clusters is determined before analysis.

There are two hierarchical cluster methods as agglomerative and divisive (Ceylan et al., 2017). In agglomerative hierarchical cluster method: Firstly, each observation is considered as a cluster. After that two closest observations are combined in the new cluster but sometimes there are three observations are closest, so three observations are in the same cluster. The number of clusters decreases at each step where observations are combined. Consequently, all observations are grouped in a cluster.

RESULTS AND DISCUSSION

When the cluster analysis results are examined (Figure 1.), 99% similarity was detected in the three groups. First group is include Artvin, Rize, Giresun, Sinop, Gumushane and Zonguldak cities; second group is include Bartin, Duzce and Karabuk cities and the third group is include Tokat and Bayburt cities. Nevertheless, there are two groups with %98 similarity, first group is include Artvin, Rize, Giresun, Sinop, Gumushane, Zonguldak, Gumushane and Trabzon cities and second group is includeTokat and Bolu cities. Finally, Çorum and Ordu have a %97 similarity.

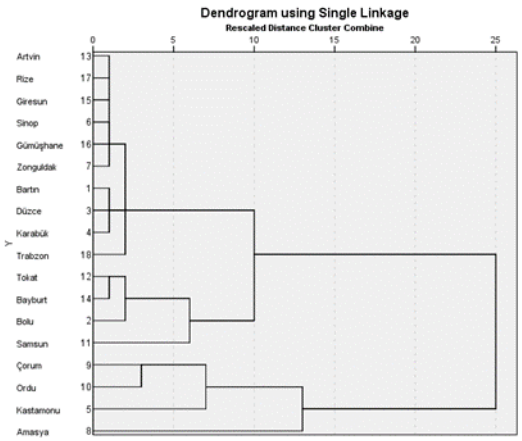


Figure 1. Dendogram for 18 cities in Black Sea Region

CONCLUSIONS

Cluster analysis was used for evaluation of milk production potential in the Black Sea Region and dairy cattle breeding based on provinces in this region has been evaluated for the future.

According to the study, it is attention that the geographical structure of cities showing similarity in terms of production is similar. In addition, policies should be established in the Black Sea Region in order to promote dairy farming because of the similarity of less population cities.

REFERENCES

Cakmak, Z., 1999. Evaluation of Validity Problem and Clustering Analysis. Journal of Social Sciences, Dumlupinar University; (3): 87-205.

Ceylan, Z., Gursev, S., Bulkan, S., 2017. Evaluation of Customer Profile in Individual Pension Sector by Two-Step Cluster Analysis. International Journal of Informatics Technologies; 10(4): 475-485.

Gevrekci, Y., Atac, F. E., Takma, C., Akbas, Y., Taskin, T., 2011. Classification of West Anatolian Cities for Sheep Production. Journal of the Faculty of Veterinary Medicine, Kafkas University; 17(5): 755-760.

Isildar, E., 2017. Examination of Health Indicators with Multidimensional Scaling and Clustering Analysis. Master Thesis, Istanbul University, Institute of Social Sciences.

URL-1: https://classroom.synonym.com/multivariate-statistical-analysis-2448.html (Date of Access:06.09.2018-15:23).

Turkish Statistical Institute (TUIK): http://www.tuik.gov.tr, (Date of Access:06.09.2018)

Yigit, E., 2007. Investigating of multidimensional analysis methods an application. Master Thesis, Ondokuz Mayis University, Institute of Science.

EXAMINING OF WORLD HONEY EXPORTS BY SOCIAL NETWORK ANALYSIS

Necda CANKAYA[1], Selim BIYIK[2], Nur Ilkay ABACI[3], Mehmet AYDOGAN[1], Kursat DEMIRYUREK[3]

[1]Black Sea Agricultural Research Institute, TR55300, Tekkeköy, Samsun, TURKEY
[2]Ondokuz Mayis University, Faculty of Agriculture, Department of Animal Science, TR55139, Atakum, Samsun, TURKEY
[3]Ondokuz Mayis University, Faculty of Agriculture, Department of Agriculture Economics, TR55139, Atakum, Samsun, TURKEY

Corresponding author e-mail: selim.biyik@omu.edu.tr

Abstract

Honey is an important nutrient in terms of human health and its contribution to the country's income is increasing. Thanks to the knowledge of the trade network in the honey industry, it helps countries to determine their strategic and positional characteristics and their relationships with other countries in the network in the interests of their own interests. For this reason, it is aimed to determine export network of honey trade. In the study, detailed export values of the year 2016 taken from FAOSTAT were used. NodeXL statistical package program has been used to create export network analysis. The research included 73 countries exporting honey over a hundred thousand dollars annually and the countries they exported were included. Social networks of honey exporting countries have been established and the data related to these have been interpreted. According to this, there are 122 countries in world honey trade, and these countries trade on average 6 countries. The density of world honey exports was determined as 0.053 (5.3%). The major exporter countries of the world honey export network are China, New Zealand, Argentina, Germany and Spain. By 2016, Turkey imported honey has been ignored to the extent that about 6,000 dollars, has made a total of 14.928 million dollars in exports to 33 countries. Also, Turkey has exported to 11 countries over one hundred thousand dollars. The highest exported country was Germany (40.09%) and the second was the United States of America (USA-30.67%). The countries with the highest imports in the world were USA, Germany, Japan, France and China. The creation of new markets from large-scale importing countries outside of Germany and the USA will contribute to the country's economy.

Key words: *export, honey, import, social network*

EFFECTS OF CAPSICUM OLEORESIN, CARVACROL, CINNAMALDEHYDE AND THEIR MIXTURES SUPPLEMENTATION TO BROILER DIETS ON GROWTH PERFORMANCE, IGF-1 GENE EXPRESSION LEVELS AND MECHANISMS

Hasan Huseyin IPCAK[1], Ahmet ALCICEK[1]

[1] Department of Animal Science, Faculty of Agricultural, Ege University, TR35100 Bornova-Izmir, TURKEY

Corresponding author e-mail: huseyinipcak@gmail.com

Abstract

Nowadays, antibiotic-free production in the poultry sector is becoming increasingly popular and consumers are paying more attention to animal applications, placing greater emphasis on food safety and production systems. Indeed, the aim of this study was to evaluate the effects of dietary capsicum oleoresin (CAP, 150 mg/kg), carvacrol (CAR, 150 mg/kg), cinnamaldehyde (CIN, 150 mg/kg) and equal amount of mixtures (CAP+CAR+CIN, 50 mg/kg each, capsicum oleoresin + carvacrol + cinnamaldehyde) supplements on growth performance and IGF1 gene expression levels and mechanisms in broiler chickens. In the experiment, four hundred Ross-308 day-old, both sexs broiler chicks were randomly distributed to five dietary treatments, each with five replicates. Among these five dietary treatment groups formed for the experiment, the control group was fed without feed additives (control), the second group with 150 mg capsicum oleoresin for each kg of feed, the third group with 150 mg carvacrol for each kg of feed, the fourth group with 150 mg cinnamaldehyde for each kg of feed, and the last group with 150 mg mixtures for each kg of feed. The experiment was maintained to six weeks. According to the research results, the effects of dietary treatments on the body weight and the body weight gain were found to be significant ($P<0.05$). Especially in the group fed on diet added CAP+CAR+CIN, the treatments had a significant effect on feed intake and feed conversion ratio as well as body weight and body weight gain when compared to the control group on a periodic basis ($P<0.05$). However, the effect of the treatments on livability is insignificant ($P>0.05$). In addition, the changes in dietary content were not accompanied by changes in IGF-1 gene expression levels ($P>0.05$). And it can be concluded that the supplementation carvacrol, cinnamaldehyde, capsicum oleoresin and especially their mixtures at the level of 150 mg/kg to broiler diets affected positively growth performance in broiler chickens. So, these bioactive secondary plant metabolites can be used in feeding of broilers as natural feed additive.

Key words: *broiler, capsicum oleoresin, carvacrol, cinnamaldehyde, performance, gene expression*

POSTER PRESENTATIONS

TABLE OF CONTENT

POSTER PRESENTATIONS

STUDY OF THE INFLUENCE OF DIET ON BLOOD PARAMETERS AND THE COMPOSITION OF RAW CAMEL MILK RAISED IN THE SOUTH-EAST OF ALGERIA

Fadjeria YAACOUB[1], Rokia GUETTAF[1], Mohamed MAZOUZI[1]

[1] University of Biskra, Department of Sciences of Nature and Life, ALGERIA.

Corresponding author e-mail: yafadjr@yahoo.fr

Abstract

The main objective of this study is the characterization of the biochemical profile of camels and the effect of rearing mode (diet) on different blood parameters and milk composition (lactose, calcium, fat and total protein).The study was conducted on "Sahraoui" camels aged between 4 and 8 years old and from two dairy farms (extensive and semi-extensive).In this study samples of raw camel milk are collected from both farms in the period from February to May. The blood samples were used to determine certain blood parameters (glucose, triglycerides, cholesterol, total proteins, urea and calcium) using spectrophotometric methods. The fat and calcium levels determined by complex metric and spectrophotometric methods showed a significant variation in the calcium content of the raw camel milk of the two farms studied (1425 mg / l ± 152.6 against 1177 mg / l ± 47.1). As well as for the fat composition (27.5 g / l ± 3.32) for camel milk from extensive rearing against (34 g / l ± 5.50) for semi-extensive camel milk. Lactose and protein content did not show significant variation between the two farms. The determination of the blood parameters has shown that the effect of the breeding mode is highly significant for proteinemia with values ranging from 71.52 g / l ± 12.54 for camels from extensive rearing and 47.10 g / l ± 15.82 for those from the other breeding. On the other hand, the rest of the blood parameters showed no significant variation.

Key words: *camels, rearing mode, raw milk, blood parameters, biochemical characteristics*

RNA-SEQ DATA USAGE FOR IDENTIFICATION OF MICRORNAs ASSOCIATED WITH LAMBING RATE IN IRANIAN INDIGENOUS SHEEP

Parvin Shariati GAZGAZARE[1], Ali Akbar MASOUDI[1], Rasoul vaez TORSHIZI[1], Alireza EHSANI[1]

[1]Tarbiat Modares University, Faculty of Agriculture, Department of Animal Science, IRAN.

Corresponding author e-mail: masoudia@modares.ac.ir

Abstract

The main objective of animal breeding is maximizing the profit of the herd. This goal is achieved by improving the genetic value of the herd by appropriate selection methods. The profitability of sheep breeding is most influenced by the litter size. The number of offspring per parturition depends on many factors, among which the ovulation rate is so important. MicroRNAs are single-stranded RNA molecules with approximately 22 nucleotides length that have been produced from endogenous hairpin-shaped transcripts. The microRNAs act as guide molecules in post transcriptional gene regulation by binding to the target genes usually in 3´UTR area. MicroRNAs are almost involved in all biological processes of the ovary. In this study, the transcriptome data of ovarian tissue of Iranian Shall and Sangsari sheep, having a different lambing rate, were used to identify the microRNAs with differential expression associated with lambing rate. The results obtained from differential gene expression analysis by using RNA-seq data were identified in total 19 microRNAs with significant differential expression, that include 14 over expressed and 5 down expressed microRNAs. Mirbase database investigation revealed that none of these microRNAs were previously reported in sheep, but seven microRNAs in cattle (including bta-mir-2904-2, bta-mir-1281, bta-mir-1843, bta-mir-2887-2, bta-mir-1842, bta-mir-1247 and bta-mir-4657) and three microRNAs in both cattle and goat (including chi-mir-324, bta-mir-324, chi-mir-186, bta-mir-186, chi-mir-197, bta-mir-197) were previously identified. The results of this study suggest that using RNA-seq data analysis, in addition to identifying the differential expressed protein coding genes; it is possible to examine the expression of a number of other non -coding regulatory RNAs in specific microRNAs.

Key words: *ovarian tissue, RNA-seq data, lambing rate, microRNA*

THE EFFECT OF INCUBATION TEMPERATURE AND OOCYTE QUALITY ON IN VITRO MATURATION

Ugur SEN[1]

[1]Ondokuz Mayis University, Faculty of Agricultural, Department of Agricultural Biotechnology, TR55139, Samsun, TURKEY

Corresponding author e-mail: ugur.sen@omu.edu.tr

Abstract

The aim of the present study was to investigate the effect of incubationtemperature and oocyte quality on in vitro maturation of bovinecumulus-oocyte complexes (COCs). COCs were classified as very good (n=179) and good (n=198) quality based on their homogeneity of the cytoplasm and the compactness of the cumulus investment. Very good and good quality COCs were separately cultured in tissue culture medium-199 (TCM-199) supplemented with 10% FCS for 22 hours filled with a humidified 5% CO_2 in air at either 36.5°C or 38.5 °C. Cumulus cell expansion of all COCs was evaluated at the end of the maturation period under a stereomicroscope (x10). Nuclear status of bovine oocytes in both groups was determined by nuclear staining and evaluated with interference phase contrast microscopy (x400). The data were analyzed by chi-square. There were no significant differences between very good quality COCs matured at 36.5°C or 38.5°C with regard to percentage of cumulus expansion and oocytes reached to metaphase II (M II) and other stages (GV, GVBD, MI). However, the percentage of oocytes reached to M II stage decreased (58.3 v.s 81.7%; P<0.05) when the incubation temperature was decreased in good quality COCs. In conclusion decreasing the IVM temperature (36.5 °C) did not have dramatic effects on cumulus expansion and nuclear maturation.

Key words: *incubation temperature, oocyte, quality, maturation, bovine*

THE EFFECT OF MATERNAL AGE ON SOME BODY MEASUREMENTS IN ANATOLİAN BLACK CALVES

Ilker UNAL[1], H. Ilknur TUNCER[1], C. Meliksah SAKAR[1], Engin UNAY[1]

[1] International Center for Livestock Research and Training, Lalahan, Ankara, TURKEY

Corresponding author e-mail: ilker.unal@tarimorman.gov.tr

Abstract

Birth weight is one of the most important parameters affecting the growth, improvement and yield of the calves in cattle breeding. The aim of this study is to research the effect of maternal age, sex of calfand birth year on some body measurements such as rump height, body length, chest girth, frontwrist girth, rump breadth, chest breadth, chesth depth and birth weight of calves of Anatolian Black Cattle which is one of the domestic cattle breeds with the widestliving range in Turkey. In this tudy, some body measurements of 58 Anatolian Black calves borned between the year 2015-2017 in the herd of protection of genetic resources at Lalahan International Center for Livestock Research And Training were evaluated. When the effect of maternal age was found statistically significant (P<0.05) only on chest girth, the effect of gender was found significant on chest girth, front wristgirt hand birth weight. The effect of birth year was found statistically nonsignificant on all body measurements examined in this study. However, when maternal age is divided into two groups as group one (under 5 year age) and group two (over and equal 5 yea rage) the effect of maternal age was found significant (P<0.05) on chest girth, front wrist girthand birth weight in female calves and significant (P<0.05) on body length, chest girth and birth weight in male calves.

Key words: *Anatolian black cattle, birth weight, maternal age, body measurements.*

INTRODUCTION

Anatolian Black Cattlebreed is thedomestic cattle breed which has widest living range in Turkey. They are grown extensively on mountainous regions, terrestrial climate, primitive maintenance, feed in gandhosting conditions, especially at Central Anatolia. It is a cattle breed that is highly resistanttoin sufficient care and feding conditions, has a high resistance against diseases and has a developed maternal instinct. The Anatolian Black Cattle has been conserved as live at outside of the in natural habitat (exsitu in vivo) since 1995 at the Directorate of Lalahan International Center for Livestock Research and Training via the Project for the Conservation of Domestic Genetic Resources conducted by the General Directorate of Agricultural Research and Policies (TAGEM). In addition, since 2005, it also has been conserving at the irnatural habitat (in situ).

In cattle breeding, as a measure of growthand development, various body measurements are taken as basis. The most important of these parameters is birth weight. Birth weight is an important factor affecting postnatal growthand development and progeny, milk and meat yield in laterages. Therefore, it is also of great importance in economic terms. Withers height and chest girth areal so factors that ar eeffective except BirthWeight (Akbulut et al., 2001, Bilgic and Alıc 2004).

There are several factors that have effect on the birth weight and body measurements of a calf. These are discussed in two main groups as genetic and environmental factors. While Genetic factors can be listed as race and gender, environmental factors can be listed as maternal age, births eason, gestation, maternal weight, number of off spring in the birth, and care-nutrition. Maternal age is one of the important factors that has effect on growth in the calves (Arpacık 1982, Souza et all 1994, Kaygısız 1998).

In several researches conducted in Brown Swiss cattle, it was reported that the effect of maternal age on birth weight was statistically significant (P<0.05) (Villalba et al. 2000, Kaygısız 1998, Akbulut and Ark.

2001). Demirhan (2008) found it statistically significant that the effect of lactation rank on birth weight (P<0,05) and cidago height (P<0.01) in the study of Anatolian Black Cattle.

In this study, the effects of maternal age on birth weight, withers height and chest girth of calves were evaluated in Anatolian Black Cattle in the herd of conservation of genetic resources at the Lalahan International Center for Livestock Research and Training.

MATERIALS AND METHODS

In this study, the data belonging to the herd of Anatolian Black Cattle created within the scope of Genetic Resources Conservation Project at the Directorate of Lalahan International Center for Livestock Research and Training were used. A total of 58 Anatolian black calves born during the period of 2015-2017 were evaluated in the study.

Body measurements such as rump height, body length, chest girth, front wrist girth, rump breadth, chest breadth, chesth depth and birth weight of Anatolian Black calves and the datas of maternal age were examined. Parameters belonging to calves were taken within 24 hours after birth. For datas of the maternal age, the Herd Registration Book at the Cattle Breeding Department was utilized. The birth weights of the calves were measured by anelectronic scales sensitive to 200 g, other body measurements were measured by measuring stick and tape measure. They were all measured by the same technical personnel.

Measurements obtained in the study and basic statistical values of the maternal age were determined. Variance analysis of the measurement parameters was done. The relationship between birth weight, withers height and chest girth measures and maternal age was determined by "Pearson Correlation". Statistical calculations were done with "Minitab 16" package program.

RESULTS AND DISCUSSION

The mean values of body measurements of calves according to the gender are given in Table 1. The significance ratings according to the least squares method of maternal age, birth year and gender factors of body measurements in Anatolian Black calves are given in Table 2. In the results of variance analysis performed on these data, it was determined that the effect of maternal age was found statistically significant (P<0.05) only on chest girth but the effect of gender was found significant on chest girth, front wrist girth and birth weight.

Table 1. The mean values of body measurements of calves according to the birth years (Mean±SEM)

Birth Year	Gender	n (head)	Withers Height (Cm)	RumpHeight (Cm)	Body Length (Cm)	Chest Girth (Cm)	Front Wrist Girth (Cm)	Rump Breadth (Cm)	Chest Breadth (Cm)	Chesth Depth (Cm)	Birth Weigth (Kg)
2015	Female	8	57.00±1.161	60.69±1.470	55.19±1.727	60.81±1.395	8.63±0.183	9.94±0.240	13.88±0.363	20.06±1.230	17.88±1.010
2015	Male	9	58.39±1.394	63.28±1.648	54.72±2.597	63.22±1.489	9.28±0.252	9.50±0.236	13.83±0.464	20.78±1.007	20.38±1.445
2016	Female	8	58.81±0.940	62.06±0.918	52.63±1.945	60.63±1.899	8.13±0.206	9.56±0.175	13.63±0.460	20.44±0.664	18.13±1.246
2016	Male	15	60.40±0.814	65.40±0.827	54.03±1.313	60.57±1.011	8.83±0.093	10.00±0.162	14.33±0.252	20.03±0.404	19.87±0.810
2017	Female	9	57.39±1.184	61.67±1.047	48.72±0.878	56.89±1.139	7.83±0.186	9.22±0.121	13.44±0.549	18.94±0.779	15.89±0.716
2017	Male	9	59.50±1.190	63.11±1.130	52.00±2.297	60.11±1.736	8.80±0.210	10.00±0.250	13.39±0.380	19.94±0.598	19.44±1.260

Table 2. The significance ratings (P Value) according to the least squares method of maternal age, birth year and gender factors of body measurements.

Factor	Withers Height (*P value*)	Rump Height (*P value*)	Body Length (*P value*)	ChestGirth (*P value*)	Front WristGirth (*P value*)	Rump Breadth (*P value*)	Chest Breadth (*P value*)	Chesth Depth (*P value*)	Birth Weigth (*P value*)
Maternal Age	*0.286*	*0.390*	*0.341*	***0.034***	*0.880*	*0.553*	*0.224*	*0.512*	*0.074*
Birth Year	*0.500*	*0.388*	*0.113*	*0.478*	*0.100*	*0.994*	*0.066*	*0.540*	*0.965*
Gender	*0.217*	*0.120*	*0.256*	***0.045***	***0.000***	*0.622*	*0.992*	*0.620*	***0.004***

In studies conducted with the same race, Demirhan and Tekerli (2008) found that the effect of parity on Withers Height and Front Wrist Girth was very significant (P<0.01), on birth weight was significant (P<0.05) and on body lenght and chest girth was nonsignificant. Kılıçel and Tepeli (2014) reported that the effect of maternal age on birth weight, chest girth and Withers Height was statistically significant (P<0.05) in cows

that gave two or more birth. When compared with studies conducted in the same race Kılıçeland Tepeli (2014) found that the gender effect on birth weight, chest girth, body lenght and withersh eight was statistically nonsignificant (P>0.05). On the otherhand Demirhan and Tekerli (2008) found that the gender effect on birth weight and front wristgirth was statistically significant (P<0.05) while on chestgirth, body lenght and withers height was nonsignificant (P>0.05). Also it is reported that the birth weight of Anatolian black calves is higher than that of female calves (Anonim 2004).

The effect of birth year was found statistically nonsignificant (P>0.05) on all body measurements examined in this study. This is thought to be due to the fact that animals are standardized in terms of maintenance and feding conditions in the Institute. However Demirhan and Tekerli (2008) reported that the birth year effect on birth weight and front wristgirth was statistically significant (P<0.05). In Table 3, the maternal age was assessed as a group of 4 years and under and a group of 5 years and over. According to the maternal age group, variance analysis was performed in terms of calf body measurements and birth weight parameters and for parameters where the difference between groups is important the significance level of differences was compared with Tukey multiple comparison test. As a result of analysis, it was determined that chest girth, front wrist girth and birth weight of female calves changed according to the maternal age(P<0.05). Similarly it was determined that body length, chest girth and birth weight values of male calves were affected by maternal age (P<0.05). As a result of the evaluation, it was determined that anatolian black cattle aged 5 years and over gave birth to bigger calves in terms of birth weight and chest girth features.

Table 3. Variance analysis of some body measurements according to maternal age groups

Gender	Maternal Age (year)	N (head)	Withers Height (Cm)	RumpHeight (Cm)	Body Length (Cm)	Chest Girth (Cm)	Front Wrist Girth (Cm)	Rump Breadth (Cm)	Chest Breadth (Cm)	Chesth Depth (Cm)	Birth Weigth (Kg)
Female	≤4	10	56.90±0.966	60.60±0.816	50.20±1.446	56.45±1.165^{b}	7.85±0.224^{b}	9.60±0.233	13.35±0.460	18.90±0.722	15.20±0.485^{b}
Female	≥5	15	58.27±0.832	62.07±0.932	53.27±1.329	61.27±1.041^{a}	8.40±0.121^{a}	9.53±0.124	13.83±0.319	20.37±0.703	18.60±0.744^{a}
P value			0.300	0.280	0.141	***0.006***	***0.028***	0.786	0.381	0.174	***0.002***
Male	≤4	17	58.71±0.629	63.32±0.707	51.44±1.258^{b}	58.97±0.902^{b}	8.79±0.149	9.65±0.205	13.59±0.258	19.74±0.489	18.18±0.617^{b}
Male	≥5	16	60.56±1.057	65.13±1.133	56.03±1.659^{a}	63.50±1.029^{a}	9.11±0.131	10.09±0.104	14.31±0.302	20.72±0.516	21.71±0.912^{a}
P value			0.136	0.182	***0.034***	***0.002***	0.127	0.066	0.077	0.176	***0.003***

*The relationship between the meanings shown in the same column with different letters is significant (P<0.05)

CONCLUSIONS

As a result of the evaluation, it is thought that Anatolian Black Cattle have reached the threshold after 5 years of age and therefore give birth to bigger calves after reaching the threshold.

REFERENCES

Wu G, Bazer FW, Cudd TA, Meininger CJ, Spencer TE. 2004. Maternal nutrition and fetal development. J Nutr, 134: 2169–2172.

Akbulut Ö, Bayram B, Yanar N. 2001. Yarı entansif şartlarda yetiştirilen esmer ve siyah alaca buzağıların doğum ağırlığına ait fenotipik ve genetik parametre tahminleri. Journal of LalahanLivestockResearchInstitute, 41(2): 11-20.

Altınel A. 1985. Esmer ırk sığırların büyüme ve süt verimi özelliklerini etkileyen bazı çevresel faktörler üzerinde araştırmalar. J FacVetMedUniv, 11 (1): 43-68.

Arpacık R. 1982. Sığır Yetiştiriciliği. Uludağ Univ Printing House, Bursa; p. 20-59.

Bilgiç N, Alıç D. 2004. Siyah alaca buzağıların doğum ağırlıklarına ait genetik ve fenotipik parametre tahminleri. Tarım Bilimleri Dergisi, 10 (1): 72-75.

Guaragna GP, Carneiro GG, Torres JR, Gambini LB. 1990. Effect of environmental and genetic factors on birth weight of Holstein cattle. Boletim de Industria Anim, 47 (1): 19-30.

Karabulut O, Mundan D, Sehar Ö. 2012. Siyah alaca buzağılarda doğum ağırlığının varyans unsurları ve damızlık değerleri. Harran Univ J FacVetMed, 1(1): 28-34.

Kaygısız A. 1198. Altındere Tarım İşletmesi'nde yetiştirilen esmer ve sarı alaca buzağıların doğum ağırlıklarına ilişkin genetik ve fenotipik parametre tahminleri. Turk J Anim Sci, 22 (6): 527-535.

Souza JC de, Brule AO, Ferraz PB, Oliveira J de AL, AlencarMmde, BahienseFerrazPJr, AnchietaLeiteOliveira J

de, Mello de Alencar M. 1994. Repeatability of body weightandgainfrombirthtoweaning in NeloreCattle. SBZ, 23: 133–139.

Tilki M, İnal Ş, Tekin ME, Çolak M. 2003. Bahri Dağdaş Uluslararası Tarımsal Araştırma Enstitüsü'nde yetiştirilen esmer ineklerin gebelik süresi ve buzağı doğum ağırlığına ait fenotipik ve genetik parametre tahminleri. Turk J Vet Anim Sci, 27: 1343–1348.

Villalba D, Casasus I, Sanz A, Estany J, Revilla R. 2000. Preweaning growth curves in Brown bwiss and pirenaicacalves with emphasis on individual variability. J Anim Sci, 78: 1132-1140.

THE IMPROVEMENT OF AKKARAMAN LAMBS BETWEEN BIRTH AND DAY 120 REARING AT CANKIRI PROVINCE

C. Meliksah SAKAR[1], Abdulkadir ERISEK[1], Ugur ZULKADIR[1]

[1] International Center for Livestock Research and Training, Lalahan, Ankara, TURKEY

Corresponding author e-mail: melikksahi@gmail.com

Abstract

Growth curve is defined as the alteration that any feature examined shows in a particular period. This alteration shows differences in species, race and line, especially in the feature being examined. The aim of this study is to determine the development of the Akkaraman lambs grown in the Cankırı province until the age of four months by weighing them at different periods and prepare the growth curve. The animal material of this study was formed of Akkaraman breed lambs born in 2018, grown in "Cankırı Province Akkaraman Breed Sub-Project 1" within the scope of "Animal Improvement National Project in Public" conducted by TAGEM. A total of 281 pieces of lambs were received from 7 farms. In the study, weights of lambsat birth, 60, 90 and 120. days were determined. In this study, average birth, 60, 90 and 120 days weight average were found 4.264 kg, 22.114 kg, 30.147 kg, and 34.950 kg, respectively. In the study, the gender effect on birth weight was not statistically significant (P>0.05), while the effect of type of birth was found statistically significant (P<0.001). The effect of birth type was significant (P<0.05) on 2., 3. and 4. month weights; the effect of farm conditions on birth weight was statistically significant (P<0.001). The determination coefficient (R^2) in the improvement of the lambs from birth to 4 month age was found 0.918.

Key words: *Akkaraman, lamb weight, growth curve*

EFFECT OF HATCHABILITY AND SEX ON GROWTH PARAMETERS IN A CROSSBREED POPULATION OF ARIAN AND URMIA NATIVE

Reihane Seifi MOROUDI[1], Saeed Ansari MAHYARI[1], Rsoul Vaez TORSHIZI[2]

[1]Department of Animal Science, Faculty of Agriculture, Isfahan University of Technology, IRAN
[2]Department of Animal Science, Faculty of Agriculture, Tarbiat Modares University, IRAN

Corresponding author e-mail: s.ansari@cc.iut.ac.ir

Abstract

There is a good correlation between growth parameters and production of the birds in the field and it is important to manage the herd production. In this study 2nd generation of a crossbreed population of Arian and Urmia native chicks constructed and growth data at birth to 12 weeks of age collected on 312 birds. The information of all birds categorized in 5 groups of 5 hatchability in 2 sex. The Gompertz model was determined as the best model of growth parameters prediction in previous study, therefore the growth parameters of each bird estimated by this model. The results showed that sex and hatchability have different effect on growth parameters of the model. In all groups, initial weight, final weight and growth rate were high in males as it could have been indicated. Values of maturity rate in males were equal or higher than females. Weight and age at inflection point in all groups were higher in males. The data indicated that the growth trend was different between males and females. Initial weights of the birds of group 1 was higher than other groups, in opposite, initial weight of the birds of group 4 was lower than other groups. Growth rate of male birds of the group 1 and females of the group 3 were more than other groups. Subsequently growth at inflection point of males of the group 1 in contrast to other males, and in females of the group 3 in contrast to other females displayed lower values. In order to confirm the signification of these results (sex and hatchability effect on Gompertz and growth parameters) GLM was carried out in SAS software. The final results showed that sex and hatchability have significant effect on growth parameters.

Key words: *Gompertz model, growth parameter, chick, hatchability, sex*

APPLICATION OF MULTIVARIATE LINEAR REGRESSION ANALYSIS ON NUTRIENT CONTENT OF SUGAR BEET

Lutfi BAYYURT[1], Hasan ONDER[1]

[1]Ondokuz Mayis University, Faculty of Agricultural, Department of Animal Science, TR55139, Atakum, Samsun, TURKEY

Corresponding author e-mail: bayyurt_25@hotmail.com

Abstract

The aim of this study was to develope a model for nutrient content of sugar beet by multivariate linear regression analysis. For this aim, as independent variables crude protein, crude ash, crude oil, crude cellulose, hemicellulose, cellulose, organic matter and nitrogen-free extract; as dependent variables dry matter consumption and dry matter digestibility values were used in model. The effect of the independent variables was fixed and the partial correlation between the dependent variables and the variables was found to be low. According to the chi-square result obtained from the model, at least one of the explanatory variables explained the dependent variable and the multivariate linear regression analysis was statistically significant.

Key words: *sugar beet, , nutrient content, partial correlation, multivariate linear regression analysis.*

HONEY BEE BREEDING IN IN VITRO CONDITIONS

Dilek KABAKCI[1], Gokhan AKDENIZ[1]

[1]Ministry of Food, Agriculture and Livestock, Apiculture Research Station Department, Ordu, TURKEY

Corresponding author e-mail: dilek_kabakci@hotmail.com

Abstract

The natural nutrients of honey are nectar, honey and pollen. After the nectar is collected by the honey bee, it is converted into honey by physical-chemical changes in the body and in the honeycomb eyes in the hive, and the honeycomb is stored in the eyes. Nectar and honey are used by bees to meet your energy needs. Bees can only survive by eating honey. Pollen is a unique nutrient that provides the protein, lipid, sterol, vitamins and minerals necessary for the development of the puppies of the honey bees and the development of their tissues, muscles, secretory glands and other organs during their youth. Pollen is the main source of the so-called bee's milk, which the young workers secrete from their hypopharyngeal glands. If young adult worker bees can not fully meet their protein needs, the hypopharyngeal and mandibular glands secreted by the bees used in the feeding of the larvae and the main bee will not develop enough and not secrete bee milk. Due to this, malnutrition occurs and the larvae in the brood can not develop and the spawning rate of the mother bee decreases. Many details of bee biology have emerged by examining the dark observation hives. Over the past 20 years, The bees have produced under controlled conditions by simulating colony conditions in natural conditions. Bees growing in the laboratory environment has had difficulties in production due to the complex and sensitive nutrition programs of workers and men bees. The main bees, which are fed only with bee milk during their whole life, can be produced easier. In vitro cultivation, controlled environmental conditions and feeding programs as well as hygienic environment and sterilization of the tools to be used in production are the most important factors affecting success. In vitro cultivation, enables the explanations of many other issues such as the research of collective bee losses seen in the world in recent years, the determination of the effects of various environmental conditions on bees, the effects of chemicals used in plant production on the life cycle of bees, nutrition physiology of bees and bee biology.

Key words: *in vitro, in vivo, honey bee, temperature, humidity*

COMMON MISTAKES IN MICROSCOPIC SOMATIC CELL COUNTING IN BOVINE MILK

Savas ATASEVER[1], Edit Mikóné JÓNÁS[2]

[1]Ondokuz Mayis University, Faculty of Agricultural, Department of Animal Science, TR55139, Atakum, Samsun, TURKEY
[2]Department of Animal Husbandry, Faculty of Agriculture, University of Szeged, 6800, Szeged, HUNGARY

Corresponding author e-mail: satasev@omu.edu.tr

Abstract

Somatic cell count (SCC) is used as the most reliable marker to determine udder health status or raw milk quality. A level of cells higher than 400x10^3 cells per millilitre has not been accepted for human consumption of bovine milk in many countries. Actually, SCC is composed of leukocytes that are generated by the immune system to combat an inflammation in the udder gland, or mastitis. Because of leukocytes in the udder increase during the inflammation, SCC provides an indication of the degree of abnormality. To calculate, microscopic evaluation is accepted to be standard method in the field. At this point, obtaining actual data is compulsory for true decision. The main mistakes in microscopic counting may be classified as less or exceed counting per slide, suboptimal sample preparing, washing extra dye solution with power water, inappropriate milk sampling with pipette, insufficient experience in knowing cell type. In this paper, mistakes commonly performed in bovine milk somatic cell counting with microscope has been discussed.

Key words: *cow milk, direct microscopy, milk quality, somatic cell count*

EVALUATION OF THE EFFECTS OF MYCOTOXIN BINDERS IN ANIMAL NUTRITION

Hasan Huseyin IPCAK[1], Ahmet ALCICEK[1]

[1] Department of Animal Science, Faculty of Agricultural, Ege University, 35100, Izmir, TURKEY

Corresponding author e-mail: huseyinipcak@gmail.com

Abstract

Mycotoxins are small and quite stable molecules which are extremely difficult to remove or eradicate, and which are considered to be a great threat both for human and animal health in global terms. Espicially in farm animals, mycotoxins can cause decreased performance, reducing in feed consumption, weakening of immunity system, reproductive disorders, diminished body weight gain and residues on food products of animal origin. The mycotoxins of major concern as feed contaminants that are potentially removable from feed, are mainly aflatoxins, ochratoxin A, zearalenone, deoxynivalenol, T-2 and fumonisins. One of the methods for reducing the exposure to mycotoxins is to reduce their absorption and bioavailability by using various mycotoxin binders. The most widely known of these are aluminosilicates like clay, bentonite, montmorillonite, zeolite, aqueus sodium calcium aluminosilicate (HSCAS) and active carbons. Another method is the degradation of mycotoxins into non-toxic metabolites by using indigestable complex carbonhydrates (bacterium and yeast cell walls), enzyme, vitamin, amino-acid and synthetic polymers like cholestralamine, polivinil-polipirrolidon polymers (PVPP).
The purpose of this review points out the benefits and risks of the most commonly used toxin binders as feed additives in poultry and ruminants.

Key words: *mycotoxins, toxin binders, feed, feed additives, poultry and ruminants*

INTRODUCTION

Mycotoxins are toxic secondary metabolites specially produced by Aspergillus, Fusarium, Penicillium, Claviceps and Alternaria spp. It has been estimated that at least 300 mycotoxins are potentially toxic to animals and humans. The most investigated mycotoxins are mainly aflatoxins, ochratoxin A, Zearalenone, deoxynivalenol, T-2 and Fumonisins (Kolosova et al., 2009). The FAO has estimated that worldwide approximately 25% of agricultural commodities are affected by mycotoxins (Jelinek et al., 1989). Mycotoxins that have generated a major risk factor for humans and widely public health. Mycotoxins have diferrent biological effects such as carcinogenic, mutagenic, teratogenic, oestrogenic, neurotoxic, immunotoxic, etc. (Alçiçek, 2012). Especially in farm animals, mycotoxins can cause decreased performance, reducing in feed consumption, weakening of immunity system, reproductive disorders, diminished body weight gain and residues on food products of animal origin (Kolosova and Stroka, 2012). Due to the frequent occurence of mycotoxins and toxicities, methods to prevent or reduce exposure to these and others are in demand (Bursian et al., 2004). For this, various physical, chemical and biological methods applied. But used of these avaliable methods for the detoxification of feed contaminated with mycotoxins is restricted because of the problems associated with health and safety issues, possible losses in the nutritional quality of treated feeds coupled with limited efficacy and cost implications. An alternative and popular approach to decreasing mycotoxin toxicity in animals is the use of toxin binders as feed additives that can reduction the contamination of feed by mycotoxins and suppress or reduce the absorption, promote the excretion of mycotoxins or modify their mode of action (Kolosova and Stroka, 2012). Depending on their mode of action, these feed additives act either by reducing the bioavailability of the mycotoxins or degrading or transforming them into less toxic

metabolites (biotransformation) (EFSA, 2009). According to this toxin binders can be gathered under two grubs.

One of the strategies for reducing the exposure to mycotoxins is to decrease bioavailability of mycotoxins in order to absorption from gastrointestinal tract by including several mycotoxin absorbing agents in the diet, which inhibit mycotoxins uptake as well as distribution to the blood and target organs (EFSA, 2009). The most mainly known of these are aliminosilicates (bentonites, montmorillonites, zeolite, HSCAS (Hydrated sodium calcium aluminosilicate), etc.), indigestible complex carbohydrates (cellulose, polysaccharides in the cell walls of yeast and bacteria such as glukomannans and peptidoglycans), actived carbon or charcoal, synthetic polymers such as cholestryamine and polyvinylpyrrolidone (Whitlow, 2006).

Another strategy is the degradation or transformation of them into less toxic metabolites by using biotransforming agents such as bacteria (gram-pozitive anaerobic bacteria, gram-pozitive aerobic bacteria, gram-negative earobic bacteria), fungi (Aspergillus spp., Eurotium herbariorum, Rhizopus spp., Penicillium raistricki, Rhinocladiella atrovirens), yeast (Trichosporon mycotoxinivorans, Phaffia rhodozyma and Xanthophyllomyces dendrorhous isolates), enzymes (protease A, pancreatin, carboxypeptidase A, epoxidase, lactonohydrolase) (EFSA, 2009). Mycotoxin binders are supposed to detoxify the contaminated feedstuffs during passage through the digestive tract by adsorbing or degrading the mycotoxins under the pH, temperature and moisture conditions of the digestive tract (Döll and Danicke, 2004). On account of this the effects of specific mycotoxins and mycotoxin binders differ for each animal species. In summary the evaluation of the efficacy of toxin binders against the different mycotoxins presents in feeds is undertaken separately for poultry and ruminants (EFSA, 2009).

SOME MYCOTOXIN BINDERS USED IN OUR COUNTRY AND THE WORLD

To be used some of mycotoxin binders (absorbing or biotransforming agents) in poultry and ruminants given in the Table 1, Table 2 and Table 3. Accordingly In these tables mentioned about studied mycotoxin, mycotoxin levels, used mycotoxin binders, number and details on animals, duration, parameters evaluated and effect of used product.

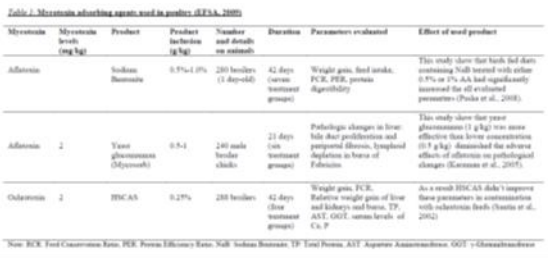


Table 1: Mycotoxin adsorbing agents used in poultry (EFSA, 2009)

Mycotoxin	Mycotoxin levels (mg/kg)	Product	Product inclusion (g/kg)	Number and details on animals	Duration	Parameters evaluated	Effect of used product
Aflatoxin		Sodium Bentonite	0.5%-1.0%	280 broilers (1 day-old)	42 days (seven treatment groups)	Weight gain, feed intake, FCR, PER, protein digestibility	This study show that birds fed diets containing NaB treated with either 0.5% or 1% AA had significantly increased the all evaluated parameters (Pasha et al., 2008).
Aflatoxin	2	Yeast glucomannan (Mycosorb)	0.5-1	240 male broiler chicks	21 days (six treatment groups)	Pathologic changes in liver; bile duct proliferation and periportal fibrosis, lymphoid depletion in bursa of Fabricius	This study show that yeast glucomannan (1 g/kg) was more effective than lower concentration (0.5 g/kg) diminished the adverse effects of aflatoxin on pathological changes (Kassaify et al., 2005).
Ochratoxin	2	HSCAS	0.25%	288 broilers	42 days (four treatment groups)	Weight gain, FCR, Relative weight gain of liver and kidneys and bursa, TP, AST, GGT, serum levels of Ca, P	As a result HSCAS didn't improve these parameters in contamination with ochratoxin feeds (Sarıca et al., 2002)

Note: RCR, Feed Conservation Ratio; PER, Protein Efficiency Ratio; NaB, Sodium Bentonite; TP, Total Protein; AST, Aspartate Aminotransferase; GGT, γ-Glutamyltransferase

Table 1: Mycotoxin adsorbing agents used in poultry (EFSA, 2009)

Mycotoxin	Mycotoxin levels (mg/kg)	Product	Product inclusion (g/kg)	Number and details on animals	Duration	Parameters evaluated	Effect of used product
Aflatoxin (AF)	2-5	Polyvinylpoly-pyrolidone (PVPP)	3	60 broiler chicks (1 days-old)	21 days	Immunological parameters: splenic plasma cell counts, peripheral blood T-lymphocyte proportions	The addition of PVPP to an AF containing diet significantly increased T-lymphocyte count, splenic plasma cell counts were numerically intermediate between control and AF groups (Çelik et al., 2000).
Ochratoxin (OA)	50	Activated charcoal	2	1 day-old growing chicks	7 days	Feed consumption, body weight	Addition of charcoal to OA contaminated diets appeared to be an ineffective method for reducing OA (Rotter, 1989).
T-2 toxin	3	Esterified glucomannans from *Saccharomyces cerevisiae*		960 broiler chicks	35 days	Body weight, feed intake, morphology of liver and adrenals, cholesterol, serum protein	Esterified glucomannan increased body weight, feed intake, serum protein and cholesterol, decreased weight of liver (Raju, 2000).

Table 2: Mycotoxin biotransforming agents used in poultry (EFSA, 2009)

Mycotoxin	Mycotoxin levels (mg/kg)	Product	Product inclusion (g/kg)	Number and details on animals	Duration	Parameters evaluated	Effect of used product
Aflatoxin (AF)	5	*Saccharomyces cerevisiae*	2	40 adult female Japanese quail from 40 days to 84 days of age	35 days	Body weight gain, food consumption, egg production and egg weight	The addition of SC to the AF containing diet significantly reduced these deleterious effects of AF on body weight gain, food consumption, egg production, egg weight (Yıldız et al., 2004).
Deoxynivalenol (DON)	0.1-3.97	NSP-ENZYME (Xylanase)	0.2	384 male turkeys (1 day old)	35 days	Body weight gain, food consumption, weight o liver, heart and spleen	This study showed that viscosity in the small intestine was significantly reduced by supplementing the diets with the NSP enzyme. Heart and live weights decreased by NSP enzyme (Danicke, 2007).
Deoxynivalenol (DON)	10	*Eubacterium*	$2.5.10^8$ CFU/kg	277 broiler chicks (1 day old)	42 days	Measurement of villus height and width, intestinal lesions, weights of gizzard, heart, liver, small intestine	This indicates that the addition of *Eubacterium* would be a proper way to counteract the possible effects caused by this mycotoxin (Awad, 2006).

Table 3: Mycotoxin binders used in ruminants (EFSA, 2009)

Mycotoxin	Mycotoxin levels (mg/kg)	Product	Product inclusion (g/kg)	Number and details on animals	Duration	Parameters evaluated	Effect of used product
Aflatoxin B_1	55	Sodium Bentonite	1.2 %	16 Lactating cows	11days	Measure of aflatoxin M_1 level in milk	Using of sodium bentonite in contaminated feeds with aflatoxin B_1 diminished residue of aflatoxin M_1 in milk (Diaz, 2004).
Aflatoxin B_1	0.2	HSCAS	4%	Lactating dairy goats	8 days	Milk production, determination of milk composition and aflatoxin M1 in milk	This study show that no treatment-related differences in the feed intake, milk production, or milk component analyses were observed with 200 ppb of aflatoxin and 4% HSCAS. In addition residue of aflatoksin M_1 in milk decreased by HSCAS (Smith, 1994).
Aflatoksin B_1	0.021	AflaDetox	1%	25 Lactating holstein cows	18 days	Milk production, determination of milk composition and aflatoxin M1 in milk, somatic cell counts	In this research there were no differences milk production, composition and feed intake. To be added 1% AflaDetox In the diet reduced aflatoxin M1(Deeli et al., 2003).

BENEFIT AND RISK ASSESSMENT OF MYCOTOXIN BINDERS

Absorbing agents, can be categorized in two groups as organic and inorganic

absorbing agents. Clays are a common example for inorganic agents which have a long history of being used in both human and animal nutritional products because they are capable of retrenching the adverse effects of toxic agents efficiently. They can prevent the negative impacts of environmental substances and living organisms. Nevertheless, yeasts are organic absorbing agents and they have stimulating effects on the immune system. As a result of the stimulation of the immune system, it is considerable to tell that a better immunity against structural diseases is possible. Benefit of the detoxifying agents are beyond reasonable doubt. But as per the toxicokinetic principle, they may also help the improvement of the safety of animal products and enhance animal helath thus indirectly help the enhancement of the human health too. Because they are able to reduce the gastro-intestinal absorption of the mycotoxins, they can reduce the toxin distribution and metabolism in organs and tissues as a consequence (EFSA, 2009).

By any measure, this is not risk free or freed from adverse effects and awareness for unawaited consequences is essential as;

▪ These agents which are able to absorbe mycotoxins can interfere with nutrients and feed compounds including vitamins and minerals too. This situation might reduce the beneficial effects of these nutriments as the biological availability.

▪ Some additives as nutritional supplements or feed elements, are in position of their own properties to absorb mycotoxins. Some antioxidant substances are examples for this. This is not the consequence of possible side effects of the mycotoxin binders. This is just another possible new way for using feed additives and nutrients.

▪ Biotransforming agents modify the mycotoxin so that it has minimized or non toxicity. This can be re-modified before its excretion causing a reversibility of the toxicity which leads a reversibility again, for animals and consumers. This reversibility of risks can be a threat via the consumption of some organs (liver, kidney) and other animal products such as dairy products (milk, eggs, blood). Despite this risk is viable, there are no data recorded on this possinility yet to confirm.

▪ Heavy metals and dioxins along with other toxic bound agents are released. This kind of environmental contaminants ocur in animal products in such ways. It possesses a little risk for animals though the possible contaminant release is a more serious matter for consumers.

▪ Pathogenic mycobacteria is a threat for animal due to contamination of kaolin.

These presences show us that a benefit/risk assessment is not easy to trade off because it requires a case by case basis. A scaling should take place as per mycotoxin by mycotoxin and detoxifying agent by detoxifying agent. Another challenge for a benefit/risk comparison is that it requires a dissertation for each of the species in project. When all of these possibilities are taken into account, there seems to be too many possible cases (EFSA, 2009).

CONCLUSIONS

Over the world, the contamination of food and feeds with mycotoxins comprises a significant issue. They created a major risk factor for human and animal health. Due to the frequently occurance of mycotoxins and toxicity, these needs to be detoxified with diverse methods. There are used several methods (physical, chemical and biological) for detoxification of mycotoxins. An alternative also approach to reduce to mycotoxin is the use of adsorbing and biotransforming agents. A mycotoxin binders added to the diet should effectively sequester mycotoxins to prevent toxicity in animals and to prevent absorption by gastrointestinal tract. However this toxin binders have some pozitif effects aside from have lots of risks. Because of this, the adverse effects of many mycotoxin binders must be prevented and increased their activity.

Mycotoxin adsorbing agents should effectively absorb mycotoxins, reduce mycotoxin availability, reduce animal toxicity and tissue residues, not be destructive effects, have veriable positive results and inclusion in diets, resistant to physical, chemical and biological effects of feed manufacturing and not be expensive. Besides, there is not enough published information on the use of mycotoxin

biotransforming agents epecially in ruminants. For this reason, more research needs to be done about them.

REFERENCES

Awad, W.A., Bohm, J., Razzazi-Fazeli, E., Ghareeb, K., Zentek, J. 2006. Effect of Addition of a Probiotic Microorganism to Broiler Diets Contaminated With Deoxynivalenol on Performance and Histological Alterations of Intestinal Villi of Broiler Chickens. Poultry Science, 85, 974-979.

Alçiçek, A. 2012. Yemlerde Aflatoksin Oluşumu ve Süte Geçme Durumu. Tarım Gündem, 1(6):82-84.

Bursian, SJ., Mitchell, RR., Yamini, B., Fitgerald, SD., Murphy, PA., Fernadez, G., Rottinghaus, GE., Moran, L., Leefers, K., Choi, I. 2004. Efficacy of a Commerical Mycotoxin Binder in Alleviating Effects of Ochratoxin A., Fumonisin B1, Moniliformin and Zearalenone in Adult Milk. Veterinary and Human Toxicology, Vol. 46, No. 3, p:122-129.

Celik, I., Oguz, H., Demet, O., Donmez, H.H., Boydak, M., Sur, E. 2000. Efficacy of Polyvinylpolypyrrolidone in Reducing the İmmunotoxicity of Aflatoxin in Growing Broilers. British Poultry Science, 41, 430-439.

Danicke, S., Valenta, H., Ueberschar, K.H., Matthes, S. 2007. On tThe Interactions Between Fusarium Toxin-Contaminated Wheat and nNon-Starch-Polysaccharide Hydrolysing Enzymes in Turkey Diets on Performance, Health and Carry-over of Deoxynivalenol and Zearalenone. British Poultry Science, 48, 39-48.

Denli, M., Blandon, J.C., Salado, S., Perez, J.F., Calsamiglia, S. 2003. Effects of Dietary AflaDetox on Aflatoxin M1 Residue in Milk of Dairy Cows.

Diaz, D.E., Hagler, W.M., Blackwelder, J.T., Eve, J.A., Hopkins, B.A., Anderson, K.L., Jones, F.T., Whitlow, L.W. 2004. Aflatoxin Binders II: Reduction of Aflatoxin M1 in Milk by Sequestering Agents of Cows Consuming Aflatoxin in Feed. Mycopathologia, p:1-8.

Döll, S., Danicke, S., 2004. In Vivo Detoxification of Fusarium Toxins. Archives of Animal Nutrition, 58, 419-441.

EFSA, 2009. Review of Mycotoxin-Detoxifyying Agents Used as Feed Additives: Mode of Action, Efficacy and Feed/Food Safety. AFSSA, CODA-CERVA, INRA Clermont-Ferrand, INRA Toulouse, IRTA, ISPA

Jelinek, C.F., Pohland, A.E., Wood, G.E. 1989. Worldwide Occurrence of Mycotoxins in Foods and Feeds. J. Assoc. Off. Anal. Chem. 72:223-230.

Karaman, M., Basmacioglu, H., Ortatatli, M., Oguz, H., 2005. Evaluation of the Detoxifying Effect of Yeast Glucomannan on Aflatoxicosis in Broilers as Assessed by Gross Examination and Histopathology. British Poultry Science, 46, 394-400.

DETERMINATION OF *IN VITRO* GAS PRODUCTION KINETICS AND CHEMICAL COMPOSITIONS OF LIGUSTRUM AND JASMINE TREE LEAVES

Abdulkadir ERISEK[1], Unal KILIC[2], Mustafa BOGA[3]

[1] International Center for Livestock Research and Training, TR06100, Ankara, TURKEY
[2] Ondokuz Mayis University, Faculty of Agricultural, Department of Animal Science, TR55139, Atakum, Samsun, TURKEY
[3]University of Omer Halisdemir Bor Vocational School, TR51700, Nigde, TURKEY

Corresponding author e-mail: abdulkadirerisek@gmail.com

Abstract

This study was carried out to determine the feed values and in vitro gas production (IVGP) kinetics of Ligustrum vulgare L. (Oleaceae) and Jasminum officinale L. tree leaves. In vitro (Hohenheim) gas test was used to determine the in vitro gas productions of the leaves for 3, 6, 9, 12, 24, 48, 72 and 96 h after incubation. General Linear Modal was used to compare gas production, and gas production kinetics of samples. The findings of the present study suggested that there were differences between the tree leaves in terms of crude protein, ash, ADF, in vitro gas productions, OMD, ME and NEL values (P<0.01). Ligustrum and Jasmine leaves had similar condensed tannin and NDF contents (P>0.05), but ligustrum leaves showed more IVGP, organic matter digestibilities and energy values than jasmine leaves (P<0.01). In conclusion, it was determined that the leaves used in the study have low in vitro gas production and can be utilized as additives for alternative roughage feed in ruminant nutrition. However, it is recommended that the results obtained from this research should be combine with other forages and tested in in vivo studies.

Key words: *ligustrum, jasmine, leaves, in vitro gas production, energy values*

INTRODUCTION

Leaves of tree are important to ruminant (goats, sheep, cattle etc.) nutrition and tree leaves can be used as an alternative forages or additives [Boga, 2014; Olfaz et al., 2018]. It is also known that the leaves of some trees are meeting the requirements of ruminant in semi-arid areas like as Mediterranean region [Kamalak et al. 2005; Atalay et al, 2017]. Jasmine and Ligustrum leaves are abundantly found in Turkey. It is known that these leaves can be used as a low quality roughage feed or additives in ruminant nutrition. The aim of this study was to determine chemical compositions, relative feed value, in vitro gas productions, energy values (metabolizable energy and net energy lactation) and organic matter digestibility of the leaves of ligustrum and jasmine trees growing in Southern Turkey (Adana Province).

MATERIALS AND METHODS

Collection of leaves and chemical analysis: The leaves of tree were harvested in mid-August from Adana province in the south of Turkey. In this study, three different tree leaves (Ligustrum vulgare L. (Oleaceae) and Jasminum officinale L) were used. Dry matter (DM) was determined by drying samples at 105 ºC for 24 hours. Ash content was determined by ashing in a muffle furnace at 550 ºC for 8 hours. Nitrogen (N) contents were analysed using the Kjeldahl method according to AOAC [1998] procedure. Crude protein was calculated as N × 6.25. The ether extracts (EE) content was determined by using Ankom XT15 analyser [AOCS, 2005]. The analyses of neutral detergent fibre (NDF) and acid detergent fibre (ADF) contents of the leaves were based on the method of Van Soest et al. [1991] using Ankom fibre analyser. Condensed tannin contents of the

leaves were determined according to Makkar et al. [1995].

In vitro gas (Hohenheim) production technique: Approximately 200 mg dry weight of samples were weighed in triplicate into 100 ml calibrated glass syringes following the procedures of Menke and Steingass [1988]. Gas volumes were recorded at 0, 3, 6, 9, 12, 24, 48, 72 and 96 hours of incubations. Five replications of each leaf were used for in vitro study. The data were fitted to the model of Ørskov and McDonald [1979] by NEWAY computer package programme. Organic matter digestibility (OMD), metabolizable energy (ME) and net energy lactation (NEL) contents of the leaves were estimated according to the equations given at below used for forages.

OMD, % = 14.88+ 0.8893GP + 0.448CP + 0.651 ash [Menke et al., 1979]

ME, MJ/kg DM = 2.20+0.136GP + 0.057CP + 0.002859 EE2 [Menke et al., 1979]

NEL, MJ/kg DM = 0.101GP + 0.051CP + 0.11EE [Menke and Steingass, 1988]

Where; GP: 24 h net gas production (ml/200mg DM), CP: Crude protein (%), EE: Ether extract (%)

General Linear Modal was used to compare gas production, and gas production kinetics of samples.

RESULTS AND DISCUSSION

Chemical compositions of the tree leaves were given in Table 1. Besides, In vitro gas productions and gas production kinetics of the leaves were given in Table 2, Table 3 and Figure 1.

Table 1. Chemical compositions and condensed tannin contents of the leaves (as DM%)

Leaves	DM	NDF	ADF	EE	Ash	CP	CT
Jasmine	35.610	37.914	29.487	2.983	8.220	10.798	0.692
Ligustrum	35.072	38.185	39.486	1.667	7.679	8.919	0.849
SEM	1.615	0.457	1.492	0.318	0.027	0.172	0.084
Significant	0.825	0.696	0.009	0.043	0.000	0.002	0.255

DM: Dry matter, NDF: Neutral detergent fibre, ADF: Acid detergent fibre, EE: Ether extracts, CP: Crude protein, CT: condensed tannin, SEM: Standard error of mean

Table 2. *In vitro* gas production of the leaves (ml/200 mg DM)

Leaves	3.h	6.h	9.h	12.h	24.h	48.h	72.h	96.h
Jasmine	3.46	6.20	9.19	10.90	19.02	21.74	27.72	28.08
Ligustrum	3.56	9.08	13.16	16.18	30.06	36.39	41.25	43.90
SEM	0.14	0.31	0.39	0.32	0.40	0.82	0.40	0.47
Significant	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SEM: Standard error of means, h: hour as incubation period

Table 3. *In vitro* gas production kinetics and pH values after 96.h incubation of the tree leaves

	pH*	b	c	a+b	OMD	ME	NE_L
Jasmine	6.59	27.83	.04	28.46	37.17	5.43	2.80
Ligustrum	6.58	45.50	.05	43.34	46.13	6.80	3.67
SEM	0.01	0.45	0.00	0.41	0.35	0.05	0.04
Significant	0.47	0.00	0.05	0.00	0.00	0.00	0.00

b: potential gas production (ml), c: the gas production rate constant for the insoluble fraction (ml/h), a+b: total gas production (ml), OMD: organic matter digestibility (%), ME: metabolisable energy (MJ/kg DM), NEL: net energy lactation (MJ/kg DM), *: pH values after 96.h incubation

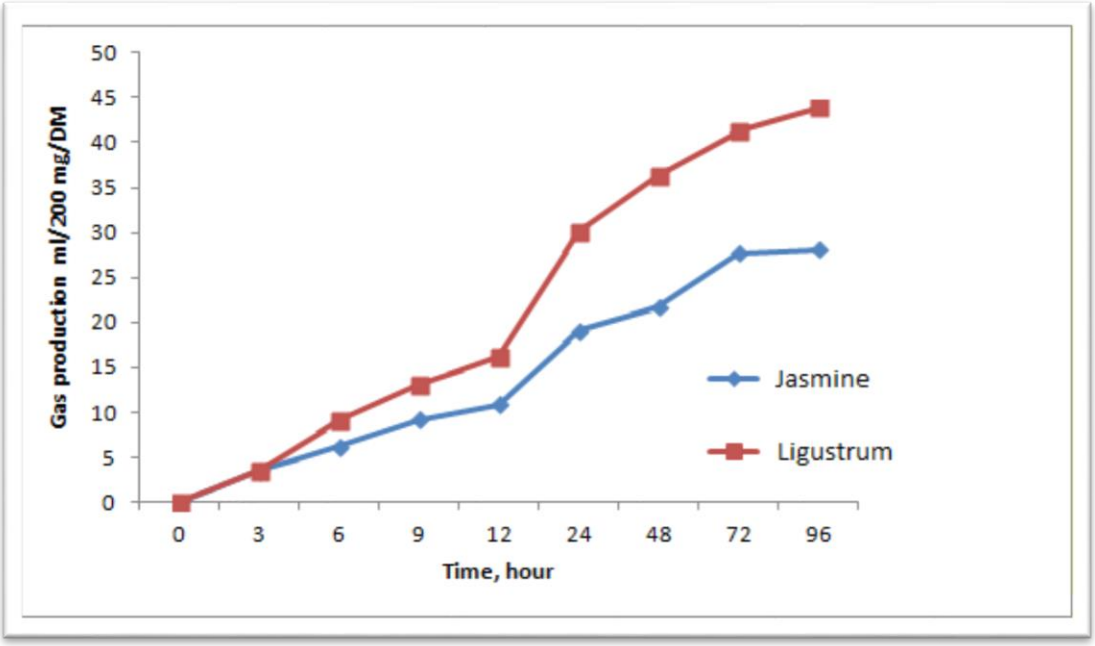


Figure 1. Gas productions of ligustrum and jasmine leaves.

CONCLUSIONS

It is concluded that there were significant differences between these leaves in terms of chemical composition and potential gas production. In conclusion, it was determined that the leaves used in the study have low in vitro gas production and can be utilized as additives for alternative roughage feed in ruminant nutrition. it is recommended that the results obtained from this research should be combine with other forages. However, these results need to be confirmed further with in vivo studying, before these products can be advanced further in goats nutrition.

REFERENCES

AOAC. Officinal Methods of Analysis. 16th Edition, AOAC International, Gaithersburg, MD. 1998

AOCS. Official procedure, approved procedure Am 5-04, Rapid determination of oil/fat utilizing high temperature solvent extraction. J Am Oil Chem Soc. 2005; Urbana, IL

Atalay A.I., Ozkan C.O., Kaya E., Kurt O., Kamalak A. Effect of maturity on chemical composition and nutritive value of leaves of Arbutus andrachne shrub and rumen in vitro methane production. Livestock Research for Rural Development. 2017; 29: 138. Available from http://www.lrrd.org/lrrd29/7/akam29138.html (Accessed date: 02.12.2017)

Boga M. Chemical Composition and in Vitro Gas Production Kinetics of Some Tree Leaves Obtained in The Mediterranean Region of Turkey. Anadolu Tarim Bilimleri Dergisi, 2014; 29(2): 143-146.

Kamalak A., Canbolat O., Gurbuz, Y., Ozay O., Ozkose E. Chemical composition and its relationship to in vitro gas production of several tannin containing trees and shrub leaves. Asian Austral. J. Anim. Sci. 2005; 18: 203-208.

Makkar H.P.S., Blummel M., Becker K. Formation of complexes between polyvinyl pyrrolidones or polyethylene glycols and their implication in gas production and true digestibility in vitro techniques. British Journal of Nutrition, 1995; 73, 897-913.

Menke K.H., Raab L, Salewski A, Steingass H, Fritz D, Schneider W. The estimation of the digestibility and metabolizable energy content of ruminant feedingstuffs from the gas production when they are incubated with rumen liquor in vitro". J. Agric. Sci. Camb. 1979; 93:217–222.

Menke K.H., Steingass H. Estimation of the Energetic Feed Value Obtained from Chemical Analysis and in vitro Gas Production Using Rumen Fluid. Anim. Res. Devel, 1988; 28: 7-55.

Olfaz M., Kılıc U., Boga M., Abdi A.M. Determination of the in vitro gas production and potential feed value of olive, mulberry and sour orange tree leaves. Open Life Sci. 2018; 13: 269–278

Ørskov E.R., McDonald, I. The estimation of protein degradability in the rumen from incubation measurements weighted according to rate of passage. J Agr Sci., 1979; 92: 499-503.

Van Soest P.V., Robertson J. B., Lewis B.A., Methods for dietary fiber, neutral detergent fiber, and nonstarch polysaccharides in relation to animal nutrition. Journal of Dairy Science. 1991; 74 (10): 3583-3597.

FEED ADDITIVES USED FOR REDUCTION OF ENTERIC METHANE PRODUCTION

Abdiwali MOHAMOUD ABDI[1], Unal KILIC[1], Abdulkadir ERISEK[2]

[1]University of Ondokuz Mayis, Faculty of Agriculture, Department of Animal Science, TR55139 Samsun, TURKEY
[2]International Center For Livestock Research and Training,TR06100, Ankara, TURKEY

Corresponding author e-mail: abdulkadirerisek@gmail.com

Abstract

Animal products are very important in the feeding and whole life of people in world. For this reason, the animals must be fed adequately and balanced and this activity should be carried out within the economy principles. Approximately 10% of the energy in the feed of ruminants lost through enteric methane emission. The energy lost through methane gas production causes significant economic loss and adverse environmental effects such as global warming and climate change. The methane produced by ruminants in the world was estimated between 80-115 million tons per year, which accounts 25-30% of human induced gases and the global warming effect of methane is 21-25 times higher than that of CO2. The percentage rates of carbon dioxide, methane, nitrogen oxides and other gases in total greenhouse gas emissions of human-induced greenhouse gases are 76%, 16%, 6% and 2% respectively. In last three decades, it was developed many additives and strategies to reduce enteric methane production, these strategies including use of organic acids, ionophores, plant extracts, fats, sulphate, nitrate, probiotics, and biotechnological methods and feed related strategies. In conclusion, the doses of additives used to reduce methane production should be determined, otherwise it may cause undesired effects and consequences.

Key words: *Methane, ruminants, organic acid, ionophore, greenhouse gas*

INTRODUCTION

Animal products are very important in the feeding and whole life of people. For this reason, the animals must be fed adequately and balanced and this activity should be carried out within the principle of economy. The rations used in the feeding of ruminants should be prepared with minimum expenditure and converted to animal production with the least loss. When the feed energy lost through methane gas production in ruminants is taken into account, it is known that the lost energy causes significant economic cost and has adverse effects on the environment. Significant increases have been recorded in the amount of greenhouse gases in the atmosphere as animal production has become a large industry. The percentage rates of carbon dioxide, methane, nitrogen oxides and other gases in total greenhouse gas emissions of human-induced greenhouse gases are 76%, 16%, 6% and 2% respectively (FAO 2016). The methane produced by ruminants in the world was estimated between 80-115 million tons per year, which accounts 25-30% of human induced gases and the global warming effect of methane is 21-25 times higher than that of CO_2(IPCC, 2007).The reduction of methane is likely to have a comparatively greater effect on the coming future of global warming than other gases because of the shorter lifespan of methane in the atmosphere.Methane emission is one of the challenging factors that participate global warming and climate change. Climate change and global warming are the biggest environmental issues. IPCC (2007) reported that methane, which is one of the main greenhouse gases in the atmosphere was increased by 40% from 1970 to 2004. Ruminant nutritional experts were struggling interventions to reduce enteric methane production and increasing feed

efficiency for many years (Junior et al., 2017). Enteric methane emission can be reduced by supplementing the diet of ruminants with different additives and certain elements. There are many trials and techniques for mitigating greenhouse gas emission from ruminants.

The purpose of this study was to collect and summarize the results of previous researches about feeding additives which have the ability to reduce methane production. In this study, different additives which can abate enteric methane emission from ruminant animals were assessed. Moreover, the effect and extent of additives on methane production and their adverse impact on rumen fermentation and animal production performance were also determined.

FEED ADDITIVES USED FOR METHANE REDUCTION

A different feed additives used for the reduction methane produced by ruminants when they are fed with low quality forages. These additives including organic acids and their salts, Ionophores, plant extracted compounds, lipids, sulphur and nitrates. In addition, the other strategies used in the mitigation of methanogenesis contain ration-based feeding strategies, biotechnology approaches and probiotics.

Organic Acids and Their Salts

Methane formation in the rumen can be reduced by using organic acids (Table 1) such as fumaric acid, malic acid and their salts as alternative hydrogen ion receptors and by directing the hydrogen from methanogens to propionic acid synthesis. Numerous researchers have reported that the addition of fumaric acid, malic acid and their salts in ruminant rations reduced methane production in the rumen, a proportional increase in the amount of propionic acid, and a decrease in the total acetic / propionic acid ratio in the total volatile fatty acids (Wallace ve ark. 2006, Foley ve ark. 2009, Yang ve ark. 2012, Li ve ark. 2018).

Table 1. Organic acids

Additive	Dose	Study	Result	Reference
Fumaric acid	10% of the diet	Lambs	• Reduced methane by 50% • Increased feed efficiency • Reduced DMI	Wallace et al (2006)
Encapsulate fumaric acid			• Reduced methane by 75% • Increased feed efficiency • Reduced DMI	
Fumaric acid	24 g/day	Goats	• Methane reduced 32% in lower PS diet • Methane reduced 18% in higher PS diet • Increased propionate • Acetate/propionate ration decreased	Li et al (2018)
Fumaric acid	175 g/day	Beef	• Methane was reduced significantly • Total VFAs and propionate increased • Acetate/ propionate ration decreased	BeaucheminandMcGinn (2006)
Fumaric acid	80 g/day	Beef	• Methane was reduced significantly • Total VFAs increased	McGinn et al (2004)
Malic Acid	3.75% and 7.5%	Beef	• Methane reduced 16% • Propionate increased • Acetate/ propionate ration decreased • DMI decreased	Foley et al. (2009)

DMI: Dry matter intake, PS: Particle size, VFA: Volatile fatty acid

Ionophores

Ionophores suppress the production of methane by converting rumen fauna into gram negative bacteria. Lactate, acetate, butyrate, formic acid and hydrogen-producing bacteria and protozoans are susceptible to ionophores while succinate and propionate producers are resistant to ionophores (Odongo et al., 2007). Thus, the addition of ionophores ration increases the amount of propionic acid in rumen fermentation end products, decreases acetate: propionate ratio and methane production is suppressed (Hart et al., 2013, Junior et al., 2017).

Condensed tannins

Tannin, which is present in high levels in plants grown especially in hot climates, suppresses the production of methane due to negative effects on hydrogen producing and methanogenic archaea and protozoa (Tan et al., 2011, Malik et al., 2017, Piñeiro-Vázquez et al., 2018). Some studies with cattle (Woodward et al. 2004) and sheep (Waghorn et al. 2002) reported that feeding ruminants with forage containing condensed tannins will reduce enteric methane emission. Grainger et al (2009) found that the condensed tannin extract supplemented with the diet of grazing dairy cattle reduced methane emission by 29%. When sheep fed ryegrass added with 2.5% of acacia mearnsii as a source of condensed tannin, methane emission was reduced by 13% and caused a slight drop of feed digestibility and milk production while N diverted from urine to faeces (Carulla et al. 2005). The Junior et al (2017) reported that condensed tannin extracted from acacia mearnsii decreased methane production by 8% and slightly increased propionate production and led improvement in the ruminal fermentation by 23.8%. Different levels of purified condensed tannin reduced total gas production and methane emission with increased dose of treatment, but total volatile fatty acids and dry matter digestibility were also reduced (Tan et al., 2011). A moderate level of condensed tannin can reduce methane production with minimal negative effect on dry matter digestibility and rumen fermentation. Malik et al (2017) found that methane production was reduced by 20-26% *in vivo* study on sheep fed straw based diet supplemented with the leaves of Ficusbenghalensis tree without adverse effect on rumen fermentation. Similarly, Piñeiro-Vázquez et al (2018) reported that tannin extracted from quebracho tree caused a tremendous effect on methane reduction. In this study, it was determined that 2% and 3% of condensed tannin can decrease methane emission up to 29-41% without causing a significant effect on feed intake and digestibility.

Saponin

Use of different levels of grass saponin reduced total gas production and methane emission by 25.30% and 31.11% respectively, protozoal counts, ammonia-N concentration, acetate, butyrate and acetate: propionate ratio were significantly decreased, where propionate wad increased (Feng et al., 2012). The methane reduction and improvement of rumen fermentation parameters will place saponin in the forefront of additives used for methane emission mitigation. Holtshausen et al (2009) reported that different doses of saponin decreased methane, the concentration of ammonia-N, acetate, acetate:propionate ration and dry matter digestibility and increased propionate production *in vitro* study, but when lower saponin was examined in *in vivo* there were not observed any reduction in methane emission. *In vitro* study, saponin reduced methane production by 8.5%, combining with nitrate or sulfate further reduction occurred, but the best result was observed when all the three additives were used together (Patra and Yu 2014). The lambs fed diet treated with tea extracted saponin, the daily methane emission was decreased by 27.7%, but the reduction was not good when combined with soybean oil (Mao et al., 2010).

Lipids and Oils

Fat addition to ruminant rations is a nutrition strategy that has been used for many years to increase the energy concentration in the ration (Table 2). The addition of oil to ruminant ratios also suppresses the production of methane.

Especially long-chain fatty acids found in vegetable oils suppress ruminal methane production. It is thought that increased fat content in the diet inhibit protozoa, increase propionic acid production and reduce methanogenesis by biohdrogenation of unsaturated fatty acids (Hook et al., 2011). In ruminant rations, the presence of excessive amounts of unprotected fat (> 5-6%) in rumen fermentation affects the digestion of structural carbohydrates, negatively affecting feed consumption and animal performance (Odongo et al., 2007).

Table 2. Lipids and Oil

Additive	Dose	Study	Result	Reference
Stearidonic acid	1, 5, 20 and 50 mg/L	*In vitro* TMR	• 20 mg dose reduced methane %20 • Propionate increased	Amaro et al (2012)
Sunflower oil	400 mg/day	Beef cattle	• Reduce methane by % 22 • Propionate increased, total VFAs and acetate/propionate ration decreased • DMD, NDFD and ADFD are decreased	McGinn et al (2004)
Canola oil	%4.6 DMI	Beef cattle	• Methane decreased 32% • DMI, DMD, CFD and A/P decreased • Propionate increased	Beauchemin and McGinn (2006)
Japanese horseradish oil	0.17, 0.85 & 1.70 g/L	*In vitro*	• Methane decreased 19-90% • H_2 accumulated in the rumen	Mohammed et al (2004)
	%2 DM	Beef cattle	• Methane decreased 19% • DMD, NDFD, CPD and propionate increased • DMI and A/P decreased	
Linseed plus nitrate	Linseed:%1.9 NO_3 : %1.0	Beef cattle	• Methane decreased 9% • DMI and weight gain decreased	Dorea et al (2018)
Linoleic, Linolenic, Stearic and Oleic acid	35 & 70 g/kg	*In vitro*	• Methane decreased 21-62% • Methanogens, protozoa, fibrolytics and A/P decreased • Total gas decreased 12-27%	Zhang et al (2008)
Linseed oil	%1.8, 3.6 & 5.4	Dairy cattle	• Methane decreased 7-38% • Protozoa and A/P secreased	Martin et al., (2016)

TMR: Total mixed ration, DM: Dry matter, DMI: Dry matter intake, DMD: Dry matter digestibility, NDFD: Neutral detergent fiber digestibility, ADFD: Acid detergent fiber digestibility, CFD: Crude fiber digestibility, CPD: Crude protein digestibility, A/P: Acetate propionate ration

Nitrate and Sulfate

Nitrate ($NO3^-$) acts as an alternative hydrogen sink and thereby lowers enteric methane production. In the rumen, nitrate is first reduced to nitrite and is then further reduced to ammonium. Thus, nitrate reduction is highly competitive compared with metanogenesiz with respect to available hydrogen and therefore lowers methane production. Recent studies have established the effects of feeding high nitrate diets on lowering enteric methane production in dairy cattle (Klop et al., 2016). These studies quantified lower methane production of 16 to 25% as grams per kilogram of DMI or liters per kilogram of DMI at a

nitrate inclusion level of 21 g of NO3−/kg of DM.VanZijderveld et al (2010) reported that 2.6% of nitrate reduced methane production in sheep by 32% without causing any poisoning (Table 3), but when used nitrate and sulfate together further methane reduction (47%) resulted. An *in vitro* study revealed that total gas production and methane emission were reduced and this methane suppression further increased when combined with sulfate and saponin (by 46%) with no adverse effect on fermentation and digestibility (Patra and Yu 2014). Therefore,

combination of Nitrate, sulfate and saponin can be an efficient methane mitigation strategy. Enteric methane emission from fatting cattle was reduced by 9% when moderate nitrate and linseed were supplemented in their feed, but this treatment affected the dry matter intake and daily weight gain, (Dorea et al., 2018). Similarly, nitrate containing diets lower daily methane output and resulted in poor weight gain in beef cattle, but the feed conversion ratio was increased (Duthie et al., 2018). Sulfate decreased enteric methane emission in sheep by 16%, but this reduction reached to 47% as combined with nitrate Van Zijderveldet al (2010). Both of nitrate and sulfate compete methanogenic archaea with hydrogen ions in the rumen. In similar study (Table 6), sulfate resulted a slight reduction of methane production (5.3%), but when combined with nitrate and saponin futher more reduction (46%) occurred (Patra and Yu 2014). This can be a good methane emission mitigation strategy which can participate reduction of greenhouse gas and improve efficient utilization of feed by ruminants.

Table 3. Nitrate and Sulphate

Additive	Dose	Study	Result	Reference
Nitrate and Sulphate	NO_3: 2.6% SO_4: 2.6% DM	Sheep	• NO_3, SO_4 and NO_3+SO_4 reduced methane by 32, 16 and 47% respectively • Nitrate reduced methanogens • Sulphate increased total rumen bacteria	Van Zijderveld et al (2010)
Nitrate	5.3, 13.6 and 21.1 g/ Kg DM	Dairy cattle	• Methane decreased 6-23% • There was negative effect on digestibility	Olijhoek et al (2016)
Nitrate, Saponin and Sulphate	5 mM, 0.6 g/L ve 5 mM sırayla	*In vitro*	• NO_3, SO_4 and NO_3+SO_4+ Saponin reduced methane %30.3, 5.3 and %45.7 respectively • Protozoa population decreased	Patra and Yu (2014)
Nitrate, Saponin & Propanoic acid	NO_3:5-10 mM Sp:0.6-1.2 g/L, Pro:4-8 mM		• NO_3 and NO_3+Propanoic acid+Saponin reduced methane 23-43% and 85% respectively • Protozoa and methanogens reduced	Patra and Yu (2013)
Nitrate	12, 24, 36, and 48 µmol/ml	*In vitro*	• 12 µmol reduced methane 70% where higher doses inhibited totally • All doses reduced methanogens 97% • Higher doses reduce cellulolytics	Zhou et al (2012)
Nitrate	21 g/ kg DM	Dairy cattle	• Reduced methane 27.5% • Milk protein concentration decreased • DMI and milk protein decreased	Klop et al (2016)

DM: Dry matter, Sp: Saponin, Pro: Propanoic acid, DMI: Dry matter intake

Other Methane Reducing Strategies

In many studies, it has been reported that the reduction of roughage/concentrates feed ratio and feeding animals with a pelleted forage resultant increase in ruminal propionic acid production and decrease methane production (McGinn et al., 2004). Similarly, animal fed with diets containing high sugar and starch, the concentration of propionic acid and the total VFAs formed during fermentation are higher, while feeds based on roughage the production of acetic acid is higher. For this reason, methane emissions are reduced in animals fed with concentrate diets. Processing roughage feed such as copping, grinding, pelleting and treating with chemicals will reduce structural carbohydrate digestion time by increase rumen emptying rate, result decrease of methane production by 20-40%.Defaunation is a namegiven to the elimination process of protozoa found in the rumen. Methane production can be suppressed by 9-25% with the defaunation treatment.However, it is not a practical process that can be used to reduce

methane production as it is both possible to negatively affect digestibility and to be applied in field conditions (Hegarty et al., 2008, Bird et al., 2010). Other methods used to mitigate methane production in ruminants include immunization. Austrian researchers reported that they vaccinated sheep with experimental vaccine mixtures and that antibodies against methanogenic archaea developed in metabolism after vaccination and that methane production decreased by 7-20% (Wright et al., 2004, Williams et al., 2009).

According to the results of the previous studies, yeast (Saccharomyces cerevisae and Aspergillus oryzae) suppress methane production. Studies conducted *in vivo* and *in vitro* have reported that yeast suppresses methane production (Thota et al., 2017). Another group of probiotics that are used to suppress methane production are bacteria that have a reductive acetogenesis effect. These bacteria produce acetic acid, especially in the digestive tract, by reducing the hydrogen and carbon dioxide that accumulates in the rumen (Meral and Unique 2013).

CONCLUSION

In conclusion, in order to reduce methane production in ruminants, it should be decreased number of animals and increased productivity, manipulate rations by using most appropriate additives that regulate rumen environment. Finally, selection of feed plants that provide low CH_4 production for animals, manipulation of the rumen ecosystem, and breeding of low CH_4 producing animals were recommended.

REFERENCE

Amaro, P., Maia, M. R. G., Dewhurst, R. J., Fonseca, A. J. M., &Cabrita, A. R. J. (2012). Effects of increasing levels of stearidonic acid on methane production in a rumen *in vitro* system. Animal feed science and technology, 173(3-4), 252-260.

Duthie, C. A., Troy, S. M., Hyslop, J. J., Ross, D. W., Roehe, R., & Rooke, J. A. (2018). The effect of dietary addition of nitrate or increase in lipid concentrations, alone or in combination, on performance and methane emissions of beef cattle. animal, 12(2), 280-287.

Feng, Z. H., Cao, Y. F., Gao, Y. X., Li, Q. F., & Li, J. G. (2012). Effect of gross saponin of Tribulus terrestris on ruminal fermentation and methane production *in vitro*. J Anim Vet Adv, 11(11), 2121-2125.

Foley, P. A., Kenny, D. A., Callan, J. J., Boland, T. M., &O'mara, F. P. (2009). Effect of DL-malic acid supplementation on feed intake, methane emission, and rumen fermentation in beef cattle. Journal of animal science, 87(3), 1048-1057.

Grainger, C., Clarke, T., Auldist, M. J., Beauchemin, K. A., McGinn, S. M., Waghorn, G. C., & Eckard, R. J. (2009). Potential use of Acacia mearnsii condensed tannins to reduce methane emissions and nitrogen excretion from grazing dairy cows. Canadian Journal of Animal Science, 89(2), 241-251.

Hart, K.J., Kilic,U., Faulkener, C., Newbold, C.J., 2013. The Effect of Monensin on Fermentation Parameters, Methane Production and Microbial Numbers in The Rumen Simulator RUSITEC. 5. Greenhouse Gases & Animal Agriculture Conference. 23-26 June, p.473. Dublin – Ireland. Poster presentations (Tuesday). Advances in Animal Biosciences. Cambridge University Press; 2013;4(2):457–556.

Holtshausen, L., Chaves, A. V., Beauchemin, K. A., McGinn, S. M., McAllister, T. A., Odongo, N. E., ... &Benchaar, C. (2009). Feeding saponin-containing Yucca schidigera and Quillajasaponaria to decrease enteric methane production in dairy cows1. Journal of Dairy Science, 92(6), 2809-2821.

Junior, F. P., Cassiano, E. C. O., Martins, M. F., Romero, L. A., Zapata, D. C. V., Pinedo, L. A., ... & Rodrigues, P. H. M. (2017). Effect of tannins-rich extract from Acacia mearnsii or monensin as feed additives on ruminal fermentation efficiency in cattle. Livestock Science, 203, 21-29.

Li, Z., Liu, N., Cao, Y., Jin, C., Li, F., Cai, C., & Yao, J. (2018). Effects of fumaric acid supplementation on methane production and rumen fermentation in goats fed diets varying in forage and concentrate particle size. Journal of animal science and biotechnology, 9(1), 21.

Malik, P. K., Kolte, A. P., Baruah, L., Saravanan, M., Bakshi, B., & Bhatta, R. (2017). Enteric methane mitigation in sheep through leaves of selected tanniniferous tropical tree species. Livestock Science, 200, 29-34.

Mao, H. L., Wang, J. K., Zhou, Y. Y., & Liu, J. X. (2010). Effects of addition of tea saponins and soybean oil on methane production, fermentation and microbial population in the rumen of growing lambs. Livestock Science, 129(1), 56-62.

Martin, C., Ferlay, A., Mosoni, P., Rochette, Y., Chilliard, Y., &Doreau, M. (2016). Increasing linseed supply in dairy cow diets based on hay or corn silage: Effect on enteric methane emission, rumen microbial fermentation, and digestion. Journal of dairy science, 99(5), 3445-3456.

McGinn, S. M., Beauchemin, K. A., Coates, T., &Colombatto, D. (2004). Methane emissions from beef cattle: Effects of monensin, sunflower oil, enzymes, yeast, and fumaric acid 1. Journal of animal science, 82(11), 3346-3356.

Odongo, N. E., Bagg, R., Vessie, G., Dick, P., Or-Rashid, M. M., Hook, S. E. & McBride, B. W. (2007). Long-term effects of feeding monensin on methane production in lactating dairy cows. Journal of Dairy Science, 90(4), 1781-1788.

Patra, A. K., & Yu, Z. (2014). Combinations of nitrate, saponin, and sulfate additively reduce methane production by rumen cultures *in vitro* while not adversely affecting feed digestion, fermentation or microbial communities. Bioresource technology, 155, 129-135.

Tan, H. Y., Sieo, C. C., Abdullah, N., Liang, J. B., Huang, X. D., & Ho, Y. W. (2011). Effects of condensed tannins from Leucaena on methane production, rumen fermentation and populations of methanogens and protozoa *in vitro*. Animal Feed Science and Technology, 169(3-4), 185-193.

Wallace, R. J., Wood, T. A., Rowe, A., Price, J., Yanez, D. R., Williams, S. P., & Newbold, C. J. (2006, July). Encapsulated fumaric acid as a means of decreasing ruminal methane emissions. In International Congress Series (Vol. 1293, pp. 148-151). Elsevier.

Yang, C. J., Mao, S. Y., Long, L. M., & Zhu, W. Y. (2012). Effect of disodium fumarate on microbial abundance, ruminal fermentation and methane emission in goats under different forage: concentrate ratios. Animal, 6(11), 1788-1794.

Zhang, C. M., Guo, Y. Q., Yuan, Z. P., Wu, Y. M., Wang, J. K., Liu, J. X., & Zhu, W. Y. (2008). Effect of octadeca carbon fatty acids on microbial fermentation, methanogenesis and microbial flora *in vitro*. Animal Feed Science and Technology, 146(3-4), 259-269.

Guan, H., Wittenberg, K. M., Ominski, K. H., & Krause, D. O. (2006). Efficacy of ionophores in cattle diets for mitigation of enteric methane 1. Journal of Animal Science, 84(7), 1896-1906.

Piñeiro-Vázquez, A. T., Jiménez-Ferrer, G., Alayon-Gamboa, J. A., Chay-Canul, A. J., Ayala-Burgos, A. J., Aguilar-Pérez, C. F., & Ku-Vera, J. C. (2018). Effects of quebracho tannin extract on intake, digestibility, rumen fermentation, and methane production in crossbred heifers fed low-quality tropical grass. Tropical animal health and production, 50(1), 29-36.

Author Index

Nationality of Participants

Country	Number of Authors
Algeria	3
Cameroon	2
Denmark	3
Germany	1
Hungary	1
Iran	6
Mozambique	3
Nigeria	2
North Cyprus	2
Pakistan	4
South Africa	3
Turkey	108
United kindom	1