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RESEARCH ARTICLE

INVESTIGATION MILK YIELD IN SMALL RUMINANTS BY REGION IN TURKEY

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ABSTRACT

The aim of the research, goat and sheep milk yield reveal differences and to develop recommendations by 7 geographical regions in Turkey. Data of the study was obtained from Turkey Statistical Institute (TSI)'s internet address "in the Livestock Statistics" section. As of 2014 started with 81 goats and domestic sheep are milk yield were examined according to milked for the number of animals and milk production quantity. The highest average yield per animal is provided in goat hair in the Mediterranean Region (107 kg), the lowest average yield in the Black Sea Region (96,554 kg). In domestic sheep, the highest average yield per animal is provided in the Mediterranean Region (83,750 kg), the lowest average yield in Eastern Anatolia Region (75,642 kg). Multivariate Analysis of Variance (MANOVA) was applied to obtained data. As a result of analysis of domestic sheep and goat milk yield differences were found significant in the statistics by region ($P<0.01$). According to Bonferroni's multiple comparison test, goat milk yield Eastern Anatolia- Southeast Anatolia, Marmara, Aegean, Mediterranean, Southeast Anatolia-Marmara, Aegean and Mediterranean, Marmara and Aegean, Central Anatolia and Mediterranean, Aegean and the Mediterranean, Central Anatolia- the Mediterranean and the Mediterranean and Black Sea region differences between were significant. In domestic sheep milk yield, differences in Eastern- Southeast Anatolia, Marmara, Aegean, Central Anatolia, Mediterranean and Black Sea, Southeast Anatolia and Marmara, Aegean, Central Anatolia, Mediterranean and Black Sea, Marmara and Aegean, Central Anatolia, Mediterranean and Black Sea, Aegean and Central Anatolia and the Mediterranean-Black Sea and Central Anatolia and Black Sea region were significant. According to the results obtained, the Black Sea region determined maximum differences belong to milk yield of goats. Differences in domestic sheep belonging to the milk yield has determined the most Mediterranean region.

Key Words: Milk Yield, Goat, Domestic Sheep, Manova.

INTRODUCTION

Animal protein sources are extremely important in the balanced and adequate nutrition of people. Our country has many wide pastures even of insufficient quality due to its climatic features and geographic structure. Particularly sheep and goat breeding is the animal husbandry branch with the cheapest cost. Sheep are the animals that can make the best use of pasture and goats are the animals that can benefit from pasture during the year as pasture improver (Ceyhun *et al*., 2013).Sheep breeding is one of the most important branches that the farmers of the country deal with animal husbandry throughout history. Sheep breeding occupies an important place in the economy of the country in terms of meat, milk, wool and leather production. Sheep breeding is particularly an important source of income of the people living in East and South-east Anatolia regions. However, a significant decrease occurred in the number of sheep after 1980.

In the recent years, sheep breeding regained importance due to the governmental support provided to sheep breeding and the number of sheep increased (Anonymous, 2013a). Sheep breeding traditionally has a special significant place in the Economy of Turkey. This importance arises from the ability of the sheep to convert the short and unproductive pasture and the areas which are unsuitable for fallow, stubble and vegetable production into meat, milk, fleece wool and leather products. Annual milk yield in sheep varies according to race. The average annual milk yield of the sheep are as follows:

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Akkaraman 50-60 kg, Dağlıç 40-50 kg, Sakız 120-180 kg, Kıvırcık 60-90 kg, Karakaya 40-45 kg, İvesi 120-160 kg, Merino Sheep 50-55 kg, Konya Merino Sheep (Anatolia Merino Sheep) 40-50 kg, Gökçeada sheep 50-60 kg and Tuj sheep 50-55 kg. Goat breeding is a traditional animal husbandry branch usually performed in less developed or developing countries. This activity constitutes an important source of living and nutrition of low-income families in rural and forested areas. Another feature of this breeding branch is its use in breeding goats for the hilly, shrubbery and rocky land that cannot be benefited from in any way and the production of milk and meat (Kaymakçı ve Aşkın, 1997). The most significant problem of goat breeding is the insufficiency in the rehabilitation works aiming to increase the genetic capacity and efficiency of the goat population (Ceyhan *et al*., 2015).

After analysing the TurkStat data, the number of ovine animals (sheep and goat) in Turkey was at the peak amount in 1981 with 68,524,000 animals while the number of sheep was 31,115,190 and the number of goats was 10,347,159 with a total number of 41,462,349 in 2014. (TurkStat, 2015). According to FAO statistics, the total number of goats in the world is 1,005,600,000. Turkey is in the 22th rank with the production of 8,357,290 goats. The total number of ships in the world is 1,172,830,000. Turkey is in the 9th rank with the production of 27,425,200 sheep. The amount of sheep milk was 1,101,013 tonnes in 2013 and 1,113,130 tonnes in 2014. The amount of sheep milk has increased by 1,10% in 2014 compared to the previous year. The amount of goat milk was 415,743 tonnes in 2013 and 463,394 tonnes in 2014. The amount of goat milk has increased by 11,46% in 2014 compared to the previous year.

The aim of this study is to investigate the change in the annual average milk yield by analysing the existence and milk yield of local sheep and hair goats in the 7 geographic regions.

MATERIALS AND METHODS

The animal material of the study was formed by the number of local sheep and hair goats in 81 districts in 2014 obtained from the Turkish Statistical Institute website and the amount of milking from these ovine animals. The annual average milk yield was calculated by dividing the amount of milking with regard to the districts of 7 geographic regions. The calculated values were prepared for analysis by determining them separately for both hair goat and local sheep. Multivariate analysis of variance is applied in the event that 2 or more dependent variables exist in a group of 3 or more. It means, the mean vectors of a group of three or more (k number) are compared (Alpar, 2011).

Multivariate analysis of variance (MANOVA) model is in the form of $Y_{ijk} = m + a_{ij} + e_{ijk}$ (Johnson and Wichern, 2002). Here; Y_{ijk}: k. observation value j. of variable in i. the population, a_{ij}: j. the effect of variable in i. the population, ε_{ijk}: are the mistakes in the k. observation of j. the variable in i. the population. ε_{ijk}' are independent from each other, their average is zero, they have normal distribution with covariance matrix $\sum$ (Jeremy, 1974). $\bar{x}_i$:i. the mean vector of the group was $\bar{x}$: General mean vector was n_i :i. Data number in the group was S_i :i. the variance-covariance vector of the group was $B = \sum_{i=1}^{k} n_i(\bar{x}_i - \bar{x})(\bar{x}_i - \bar{x})'$, $W = \sum_{i=1}^{k}(n_i - 1)S_i$ and BW^{-1} the eigenvalues of matrix were λ_i , Roy's largest root test statistics, being the largest value of λ_i s, Lawley-Hotelling trace test $\sum_{i=1}^{s}\lambda_i$, Pillai's Trace statistics are calculated as $T = \sum_{i=1}^{s}\lambda_i/(1+\lambda_i)$ (Lehmann, 1997). Here, s is the number of eigenvalues. Wilks Lambda statistics was delevoped by Rao (1973) and stated as $\Lambda = \prod_{i=1}^{s} 1/(1+\lambda_i)$.

One of the most important assumption to be made in order for Multivariate Analysis of Variance (MANOVA) to be applied is the homogeneity of the variance-covariance matrix determined by 'Box's M' test. As the Box's M test may be found significant in some research with a high number of participants (Tabachnick and Fidell, 2007), it is recommended to the significance measurement of 0.025, 0.01 (Mettler and the Vannat, 2010) or 0,001 (Pallant, 2005).

$$M = \sum_{i=1}^{k}(n_i - 1)\ln|S| - \sum_{i=1}^{k}(n_i - 1)\ln|S_i|$$

S common covariance matrix for the Box's M statistics and Si is the covariance matrix of each group (Özdamar., 2013).

Simultaneous confidence intervals that allow bilateral comparisons to be made concerning the Bonferroni approach for multiple comparison are formed (Everitt, 2001; Hsu, 1996).

RESULTS AND DISCUSSION

In the research, group covariance matrices were found to be homogeneous as the significance value of Box's M test calculated for the dependent value formed by hair goat and local sheep variables was Box's M=15.491, (P=0.720). Furthermore, it is appropriate to do MANOVA test to the data in the study as the value of chi-square test as a result of Bartlett sphericity test was 8.336 and (P=0.015). Introductory statistics are given in Table 1.

Table 1. Annual milk yield descriptive statistics belong to goats and local sheep by region

Region	N	Goats	Local sheep
		$\bar{X} \pm s_{\bar{x}}$	$\bar{X} \pm s_{\bar{x}}$
East Anatolia	14	103.79 ± 1.99	75.64 ± 1.45
Southeastern Anatolia	9	106.00 ± 2.48	79.33 ± 1.81
Marmara	11	102.55 ± 2.24	79.91 ± 1.64
Aegean	8	106.00 ± 2.63	79.63 ± 1.92
Central Anatolia	13	96.85 ± 2.06	77.08 ± 1.51
Mediterranean	8	107.00 ± 2.63	83.75 ± 1.92
Black Sea	18	96.55 ± 1.75	78.06 ± 1.28

N: number of observations, $\bar{X}$: The average milk yield (kg), $s_{\bar{x}}$: Standart error

Table 2. Multivariate tests

Effect	Value	F	P
Pillai's Trace	0.41	3.20	0.00
Wilks' Lambda	0.62	3.30	0.00
Hotelling'sTrace	0.57	3.40	0.00
Roy's Largest Root	0.46	5.66	0.00

Table 3. Bonferroni multiple comparison test

Regions	Goats	Local sheep
Eastern Anatolia - Southeastern Anatolia	-2.21**	-3.69**
Eastern Anatolia Marmara	1.24**	-4.27**
Eastern Anatolia - Aegean	-2.21**	-3.98**
Eastern Anatolia - Central Anatolia	6.94	-1.43**
Eastern Anatolia -Mediterranean	-3.21**	-8.11*
Eastern Anatolia - Black Sea	7.23	-2.41**
Southeastern Anatolia - Marmara	3.45**	-0.58**
Southeastern Anatolia - Aegean	0.00**	-0.29**
Southeastern Anatolia - Central Anatolia	9.15	2.26**
Southeastern Anatolia - Mediterranean	-1.00**	-4.42**
Southeastern Anatolia - Black Sea	9.45	1.28**
Marmara- Aegean	-3.45**	0.28**
Marmara- Central Anatolia	5.70**	2.83**
Marmara- Mediterranean	-4.45**	-3.84**
Marmara- Black Sea	6.00	1.85**
Aegean - Central Anatolia	9.15	2.55**
Aegean - Mediterranean	-1.00**	-4.13**
Aegean - Black Sea	9.45	1.57**
Central Anatolia - Mediterranean	-10.15	-6.67
Central Anatolia - Black Sea	0.29**	-0.98**
Mediterranean - Black Sea	10.45*	5.69

*(P<0.05), **(P<0.01): *, ** Significant at 5% and 1% level of probability, respectively

In Table 1, the highest milk yield for hair goat was found in Mediterranean, Aegean and Southern-east Anatolia regions respectively (107, 106 and 106 kg) and the lowest milk yield was found in Black Sea and Central Anatolia regions

respectively (96.554 and 96.847 kg). According to Şimşek *et al*. (2006), in 2006, the milk yield for hair goats was 40.95 kg. at the end of 45th day, 90.10 kg. at the end of 90th day and 130.92 kg. at the end of 135th day. In the study of Tölü *et al*. (2010), In the studies of 2010, the milk yield during lactation period was obtained as 245.8 kg. in Gökçeada genotype, 275.4 kg. in Malta genotype and 408.6 kg. in Turkish Saanen genotype. In local sheep, the highest milk yield was obtained in the Mediterranean Region (83.750 kg) and the lowest was obtained in Eastern Anatolia Region (75.643 kg).

The MANOVA results of milk yield og hair goats and local sheep based on regions are presented in Table 2. The milk yield in hair goats and local sheep has show significant difference depending on the regions. As Wilk's λ=0.619; $F_{(12,146)}$=3.299; (P=0.001), the mean vectors of milk yield are significantly different. Bonferroni multiple comparison test was performed in order to determine by which dependent variables caused the significant difference found out as a result of MANOVA results and the obtained results have been presented in Table 3. Therefore, it can be said that the annual milk yield in hair goats and local sheep shows difference depending on 7 geographic regions.

A statistical difference was found in the annual milk yield (kg) of the hair goats between Eastern Anatolia-South-eastern Anatolia, Eastern Anatolia-Marmara, Eastern Anatolia-Aegean, Eastern Anatolia-Mediterranean; South-eastern Anatolia-Marmara, South-eastern Anatolia-Aegean, South-eastern Anatolia-Mediterranean; Marmara-Aegean, Marmara-Central Anatolia, Marmara-Black Sea; Aegean-Mediterranean; Central Anatolia-Black Sea and Mediterranean-Black Sea regions (P<0.01 and (P<0.05).

A statistical difference was found in the annual milk yield (kg) of the local sheep between Eastern Anatolia and South-eastern Anatolia, Eastern Anatolia and Marmara, Eastern Anatolia and Aegean, Eastern Anatolia and Central Anatolia, Eastern Anatolia-Black Sea and Eastern Anatolia-Mediterranean, Southeastern Anatolia-Marmara, Southeastern Anatolia-Aegean, Southeastern Anatolia-Central Anatolia, Southeastern Anatolia-Mediterranean, Southeastern Anatolia-Black Sea; Marmara-Aegean, Marmara-Central Anatolia, Marmara-Mediterranean, Marmara-Black Sea; Aegean-Central Anatolia Aegean-Mediterranean, Aegean-Black Sea and Central Anatolia-Black Sea regions (P<0.01 and P<0.05). The milk yield only between Central Anatolia-Mediterranean and Mediterranean-Black Sea Regions was found to be insignificant (P>0.05).

Conclusion

Consequently, the annual milk yield of hair goats and local sheep depending on regions was found to be statistically significant. The annual milk yield difference in hair goats was found to be statistically significant between Eastern Anatolia Region and South-eastern Anatolia, between Marmara, Aegean and Mediterranean Regions, between Southeastern Anatolia Region and Marmara, between Central Anatolia-Black Sea (P<0.01) and between Mediterranean-Black Sea Regions (P<0.05). The annual milk yield difference in local sheep was found to be statistically significant between Eastern Anatolia Region and South-eastern Anatolia, between Marmara, Aegean, Central Anatolia, Black Sea Regions (P<0.01) and Mediterranean Region (P<0.05); between Southeastern Anatolia Region and Marmara, Aegean, Central Anatolia, Mediterranean and Black Sea Regions (P<0.01); between Marmara Region and Aegean, Central Anatolia, Mediterranean and Black Sea Regions (P<0.01); Aegean-Central Anatolia, between Aegean-Mediterranean (P<0.01) and Aegean-Black Sea Regions (P<0.05) and between Central Anatolia-Black Sea Regions (P<0.01). The highest milk yield was achieved in the Mediterranean region.

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