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INVESTIGATION OF GENETIC AND PARAGENETIC PARAMETERS OF MILK PRODUCTION IN SHEEP

M.P. Petrović[1]; Dragana Ružić-Muslić[1], M.Zujovic[1], Violeta Caro Petrovic, P.Perišić, [2]

1Institute for Animal Husbandry, Belgrade-Zemun, 11080, Serbia
2Faculty of Agriculture, Belgrade
**Milan P. Petrovic, e-mail: milanppet@yahoo.com*

ABSTRACT

In this paper effects of major factors of genetic and paragenetic nature on milk yield of existing sheep populations are investigated. Mathematical procedures for evaluation of genetic and phenotypic parameters and anticipation of genetic values, today, are mainly based on different linear and non-linear concepts, therefore it is necessary to accept the reality that there is no absolute accuracy.

Results of the investigation have shown that there are positive and negative deviations in monitored traits depending on the population, season, order of lactation, type of birth and litter size. Considering that, sheep milk has decisive role in production of cheese. Results obtained in this research can be used as indicator for more efficient projection of improvement programmes in order to increase the production of milk and cheese.

Key words: *sheep, genetic parameters, paragenetic factors, milk production*

INTRODUCTION

Development of the improvement theory, improvement of the technological process of production, especially greater demand for high quality sheep milk cheeses (yellow hard cheese, white soft cheese), demands modernization of organizational forms of selection in sheep production (**Notter, 2001, Petrovic *et al.*, 2007**).

Activities and more attention in science are directed towards investigation of milk traits of sheep. Reason for this is increased demand for quality cheeses made from sheep milk, hard cheeses – kachkaval (**Petrović, 2000, Petrovic *et al.*, 2003**). Sheep milk cheese, due to its quality and tradition in production, represents significant factor in sheep production improvement in region of Mountain since it can be sold on world market. In order to achieve this goal, beside optimization and standardization of the production technology, it is necessary to point out improvement of sheep production and production of sheep milk in Serbia.

For achieving more efficiency in regard to genetic improvement of milk yield of sheep it is necessary to know several genetical and environmental parameters (**Marie,**

***et al.*, 1996 and Petrović *et al.*, 2000)**, as well as most adapted model for evaluation of breeding value of sheep **(Ugarte, 1996, 2007, Legarra and Ugarte, 2001).**

Objective of this paper was to investigate the effect of individual paragenetic factors on milk yield of sheep, as well as genetic parameters.

MATERIAL AND METHODS

Investigation was carried out in the regions of Eastern Serbia- Svrljig and Pirot, in population of: 1) Local Pirot breed and 2) Local Svrljig breed. Investigation included 20 herds consisting of 50-100 sheep, and monitoring of the milk yield was carried out once a month. Heritability and genetic correlations as genetic parameters and effect of season, order of lactation, type of birth and number of offspring as external factors were determined.

Data was processed using procedure of the next linear mixed model:

$$Y_{ijkl} = M + G_i + L_j + T_k + V_l + e_{ijk},$$ where is:

Y_{ijkl} - characteristic value of the individual which has realized the production
M- general population average
G_i- effect of season
L_j- effect of order of lactation
T_k- effect of type of birth
V_l- effect of number of offspring
e_{ij}- other undetermined influences

RESULTS AND DISCUSSION

Heritability of certain traits (h^2) was determined by method of intra class correlation according to sires, and results are presented in Table 1.

Table 1. Heritability of milk traits in sheep

Trait	Population of sheep	
	Pirot	Svrljig
Milk yield	0,38	0,39
Fat yield	0,32	0,33
Protein yield	0,29	0,28
Fat content	0,47	0,49
Protein content	0,50	0,49

Investigated traits have medium heritability values. Heritability for protein content was somewhat higher compared to other traits which is positive and desirable in

selection of sheep for improvement of milk yield. This result is in accordance with previous investigations carried out on different farms and sheep populations (**Petrović *et al.*, 2000 Petrovic *et al.*, 2003**) and with results of **Ugarte (2007)**.

Table 2. Genetic correlations of milk yield traits of sheep.

		Trait			
Trait	Population	Milk yield	Fat yield	Protein yield	Fat content
Fat yield	Pirot	0,86	-	-	-
	Svrljig	0,88	-	-	-
Protein yield	Pirot	0,92	0,88	-	-
	Svrljig	0,92	0,87	-	-
Fat content	Pirot	-0,32	0,31	-0,05	-
	Svrljig	-0,31	0,30	-0,07	-
Protein content	Pirot	-0,44	-0,04	-0,09	0,79
	Svrljig	-0,46	-0,03	-0,12	0,78

From data presented in Table 2 it could be seen that in the analysis of observed sheep populations no significant difference was established.. There is positive and negative correlation of investigated traits of milk yield for both sheep populations. Weak and negative correlation exists between fat content and other traits, as well as strong and positive correlation between milk yield and fat or protein yield. Results of this investigation are in accordance with research carried out by **Barillet and Boichard (1994), Petrović *et al.* (2000, 2003)**.

In order to evaluate effects of year and lactation on milk yield traits of observed sheep results presented in Table 3 will be considered.

We can see that milk yield of investigated sheep of both populations varied depending on the year. Namely, the highest negative deviation of milk was registered in first year and it was statistically significant ($P<0.01$). In second and third investigated year milk yield of sheep was similar in case of both genotypes and existed difference was irrelevant ($P>0.05$).

Table 3. Effect of year and lactation on milk yield.

Parametar	LSM		SE	
	Population		Population	
	Pirot	Svrljig	Pirot	Svrljig
Year				
1	74,12	69,85	2,22	2,31
2	78,11	78,50	2,31	2,24
3	79,06	78,16	1,94	2,01
Lactation				
1	69,22	67,18	1,65	1,71
2	78,12	74,18	1,85	1,84
3	80,21	80,12	2,11	2,20

The analysis regarding the effect of order of lactation,presented in Table 3 show the following:

The lowest value of milk yield was determined in first lactation and the highest in third lactation. Differences between first and second, first and third, and second and third lactation were statistically significant ($P<0.01$). No significant difference in regard to milk yield of sheep depending on population was established.

Such trend of lactation influence on milk yield of sheep is in accordance with already present thesis relating to mentioned issue (**Petrović, 2000**). At the same time it imposes obligation to include into improvement process data referring to environment correlation, variance components and co-variances, etc. (**Serrano *et al.*, 1997**).

Iinvestigation of effect of birth type and number of offspring on milk yield of sheep, are presented in Table 4.

Sheep born as twins had higher milk yield, but difference was not statistically significant ($P>0.01$). The present results is in accordance with investigation of Petrović et al. (2003). Data presented in the Table relating to litter size demonstrates different trend compared to type of birth. Namely, sheep bearing twins had milk yield of 79,22 kg and 79,16 kg depending on the population compared to sheep with single lambs with milk yield of 76,00 kg in case of first population and 76,42 kg in case of other population. Statistically significant differences in regard to this trait are registered ($P<0.05$).

Our investigation is in accordance with results obtained by **Marie *et al.* (1996) Vries *et al.* (2004)** and some other authors.

Table 4. Effect of type of birth and litter size on milk yield.

Parametar	LSM		SE	
	Population Pirot	Svrljig	Population Pirot	Svrljig
Type of birth				
single	79,15	78,10	1,10	1,16
twins	79,23	78,21	1,36	1,35
Litter size				
1 lamb	76,00	76,42	1,11	1,14
2 lambs	79,22	79,16	1,31	1,33

CONCLUSION

On the basis of the research made and the analysis of the results obtained, the following can be concluded:

- Milk yield traits of sheep shows medium values of heritability. No significant differences between Pirot and Svrljig local breeds.
- Genetic correlations vary from weak to strong in both directions. In the analysis of differences among observed sheep populations no significant difference.
- Effect of year as environmental factor on milk yield changed and varied from significant to insignificant.
- Order of lactation was of significant effect since the lowest registered milk yield was in first and the highest in third lactation in both breeds of sheep.
- Effect of type of birth showed no significant influence on milk yield of sheep.
- Litter size had significant effect on milk yield of both populations of sheep since sheep bearing twins had more milk compared to females with single lamb.
- This investigation provides the technical parameters for a discussion of the future of the Pirot and Svrljig breeding scheme and the possible incorporation of new selection criterion.

REFERENCES

Barillet F. and Boichard (1994). Use of first lactation test-day data for genetic evaluation of the Lacaune dairy sheep. Book of proceedings. 5th World Congress of Genetic Applied to Livestock Production, Canada. 1994, 18: 111-114.

Boylan W. J. (1989). The genetic basis of milk production in sheep. North American dairy sheep symposium. Minnesota, USA, 17: 1-8.

Legarra and E. Ugarte (2001). Genetic parameters of milk traits in Latxa dairy sheep. Animal Science, 73: 407-412.

Marie C., Bucquier F. and Banillet F. (1996). Influence du potential laitiez sur les composantes de l'efficacite alimentaire de brebis lacaune. In: Institute de l'Elevage (ed) 3eimes Rencontres Resherches Ruminants, Paris, 4-5 Decembre 1996, Paris, vol. 3: 297-300.

Notter, D.R. (2001). Genetic evaluation systems and the U.S. sheep industry. The Shepherd 2001, 46(12):18-19.

Serrano M. D., Perez G., Montoro V. and Jurado J. (1997). Changes in estimates of variance components and genetic progress due to the inclusion of genetic groups for several milk traits in Manchega sheep breed. EAAP. 48th Annual Meeting, Vienna, p 69.

Petrović P.M. (2000). Genetic and improvement of sheep. Book, Naučna, Beograd, 365 pp.

Petrović P.M., Skalicki Z., Dragana Ružić. and Žujović M. (2003). Investigation of genetic and paragenetic parameters of milk yield of sheep on Stara Planina mountain. Biotechnology in Animal Husbandry, 19(5-6): 113-117.

Petrović P.M., Dragana Ružić., Žujović M. and Mekić C. (2007). Genetic improvement of fertility in sheep by selection according to physiological parameters. 2nd International Congress, Belgrade, October 3-5. Biotechnology in Animal Husbandry 2007, 5-6,311-321.

Ugarte E. (1979). Genetic parameters and trends for milk production of Blond-faced Latxa sheep using Bayesian analysis. Journal of Dairy Science, 79: 2268-2277.

Ugarte E (2007). The Breeding program of Latxa Breed. 2nd International Congress, Belgrade, October 3-5, 2007. Biotechnology in Animal Husbandry 2007, 5-6, 97-111.

Vries, F. de, Hamann, H. and Distl, O. (2004). Estimation of genetic parameters in German meat and milk sheep breeds. Züchtungskunde, (Vol.76) (No.2): 117-126.