Scientific Papers. Series D. Animal Science. Vol. LVII, 2014
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN-L 2285-5750

ANALYSIS CONCERNING THE INFLUENCE OF COLOUR GENES IN KARAKUL SHEEP ON MILK PRODUCTION

Mihail GROZA, Gheorghe HRINCĂ, Gheorghe BRĂDĂŢAN, Ionică NECHIFOR, Marian FLOREA

Research and Development Station for Sheep and Goat Breeding, Popauti, Răchiţi Village, Botosani County, 717310, Romania, Phone/Fax: + 40 231 51 29 68, E-mail: popauti@yahoo.com

Corresponding author email: mihail.groza@yahoo.com

Abstract

The purpose of this paper is to verify if the genes that determine the colour of lamb pelts of Karakul type influences the milk production. In other words, we have seen if the lamb pelt colours are associated with characters related to milk production. The biological material was composed of sheep population belonging to the Botosani Karakul breed. Sheep of the six colour varieties of this breed were taken in the experiment. The experimental conditions were assured equally for all sheep varieties. The first mathematical processing is a statistical description of the data depending on colour groups. The statistical description refers to the calculation of statistical parameters (average, standard deviation etc.). The average variation of colour groups was graphically represented. The representation was made also as a histogram depicting the standard deviation, too. The variance analysis was performed. Two homogeneity tests of variance are used to see the legitimacy of the analysis of variance: Leaven and Brown- Forsthe; the relation between average and standard deviation was graphically represented to see if it is linear. Comparative analysis of averages was done with different test: LSD, Sheff, Newman-Keuls, Duncan, Tukey. Data processing was performed with a statistical program. Analysis of variance shows that, in general, the colour of hair fibre does not significantly influence the milk production.

Keywords*: sheep, Karakul, lamb pelts, colour variety.*

INTRODUCTION

Currently, in the world, the sheep breeding is generally made trough the specialization on a certain production type: meat, wool, milk and lamb pelts. Rarely, the focus is on mixed production types even if between the segments of production metabolism were not found antagonistic relations (Taftă et al., 1997, Buzu, 2012).

The Botosani Karakul breed is specialized for lamb pelt production, which, besides the physical and morphological of their curling (shape and size of curls, quality and lustre of hair fibres) it is appreciated for the colours of the hairy coating of lamb pelts, too (black, greyish, brown, gray, pink and white) (Filote et al., 1966; Niga et.al., 1989). But this breed is exploited also for the milk production. Originating in Asia, Karakul sheep is considered a breed with a lower milk production (especially in black variety) compared to other sheep breeds. At the Research and Development Station for Sheep and Goat Breeding Popauti-Botosani several experiments were carried out on creating a mixed production line (milk – lamb pelts), in particular in coloured varieties showing promising results. The specialty literature presents an association between milk production and colour (milk production of greyish sheep is superior to the other colour varieties). (Filote and Filote, 2002)

In the context of these statements, the purpose of this paper is to verify if the genes that determine the colour of lamb pelt in Karakul lambs can influence the milk production. The hypothesis is to be verified. In other words, we want to see if the hair fibre colours of lamb pelts are associated statistically with milk production in order to use this association in making decisions regarding the sheep selection for increasing the milk production in this breed.

MATERIALS AND METHODS

The biologic material is composed of Botosani Karakul sheep belonging to the population from Research and Development Station for

Sheep and Goat Breeding Popauti. Sheep of all colour varieties of this breed were taken in experiment. Experimental conditions were ensured equally to all varieties within this investigational approach.
The statistical parameters used in experiments were taken from common mathematical statistics (average, standard deviation, variance, standard error etc.) (van Vleck, 1987; Sandu, 1995).
Statistical processing was performed according to the calculation methodology of the software *STATISTICA 8.0* (developed by the manufacturer StatSoft, 1984-2002).

Database description. The data were systematized in a file: File *MilkProd.*
The file contains a database with the following fields:
- Colour;
- Lactation period (days);
- Milk production (liters).

Data: MilkProd* (3v by 183c)

	1 Colour	2 LactPer	3 MilkProd
1	KN	121	73.290
2	KN	125	53.787
3	KN	169	71.844
4	KN	181	94.066
5	KN	181	63.085
6	KN	123	20.006
7	KN	160	21[illegible]78
8	KN	110	58.497
9	KN	108	25.902
10	KN	117	19.001
11	KN	143	57.820
12	KN	108	39.885
13	KN	142	111.468
14	KN	81	7.490
15	KN	112	12.151
16	KN	136	41.747
17	KN	177	79.619
18	KN	186	24.574

Figure 1. File *MilkProd*

Data processing
The first statistical processing is statistical description of the data on colour groups. The statistical description refers to the calculation of statistical parameters: average (mean), standard deviation, variance, standard error and so on.
The variation of averages in colour varieties is plotted. In addition the representation is made in histogram form depicting the standard deviation, too.
The variance analysis is carried out. To see the legitimacy of variance analysis two tests of variance homogeneity are performed: Leavene and Brown-Forsthe. The relationship between average and standard deviation is represented graphically to see if this relationship is linear.
The comparative analysis of averages is made by the tests:
- LSD;
- Sheff;
- Newman-Keuls;
- Duncan;
- Tukey.

Data processing was performed with STATISTICA software.

Abbreviations used in the Data Base File:
- Colour – colour variety;
- LactPer – lactation period;
- Milkprod – milk production;
- KN - Black Karakul;
- KA - White Karakul;
- KM - Brown Karakul;
- KR - Pink Karakul;
- KS - Gray Karakul;
- KB - Greyish Karakul.

RESULTS AND DISCUSSIONS

The statistic parameters for the character *Milk production* in colour varieties of Karakul sheep are shown in Table 1. This file contains the following fields: colour variety, milk production average, individual number, standard error. Last article includes statistical indicators on the entire population.

Table 1. Descriptive statistics

Breakdown Table of Descriptive Statistic
N=183 (No missing data in dep. var. list)

Colour	MilkProd Means	MilkProd	MilkProd Std.Dev.
KN	53.96561	41	29.68602
KB	63.58850	32	33.44977
KM	43.86815	26	30.93618
KS	50.29254	28	29.08239
KR	46.99253	15	25.03952
KA	56.35441	41	29.51363
All Grps	53.61532	183	30.31437

The table 2 presents the variance analysis for the character *Milk production* in colour varieties of Karakul sheep breed. ANOVA shows no significant differences in milk production among the colour varieties

To validate the ANOVA test it is necessary that the populations to be homogeneous. This validation was done by homogeneity tests (Leaven, Brown-Forsythe).

The table 3 illustrates the homogeneity of dispersions by the Leaven test. They are homogeneous, so that the variance analysis is legitimate.

The table 4 illustrates the homogeneity of dispersions by the Brown-Forsythe test. They are homogeneous, so that the variance analysis is legitimate.

Table 2. Variance analysis

Variable	Analysis of Variance (MilkProd) Marked effects are significant at p < .05000							
	SS Effect	df Effect	MS Effect	SS Error	df Error	MS Error	F	p
MilkProd	6932.750	5	1386.550	160318.2	177	905.7523	1.530827	0.182442

Table 3 The Levene test for variance homogeneity

Variable	Levene Test of Homogeneity of Variances MilkProd Marked effects are significant at p < ,05000							
	SS Effect	df Effect	MS Effect	SS Error	df Error	MS Error	F	p
MilkProd	258.0010	5	51.60020	55736.81	177	314.8972	0.163864	0.975456

Table 4. The Brown-Forsythe test for variance homogeneity

Variable	Brown-Forsythe Test of Homog. of Variances (MilkProd) Marked effects are significant at p < ,05000							
	SS Effect	df Effect	MS Effect	SS Error	df Error	MS Error	F	p
MilkProd	190.2227	5	38.04454	62246.59	177	351.6756	0.108181	0.990397

The figure 2 is a graphical representation of the statistical parameters of milk production in the colour varieties of Karakul breed. The chart shows that the highest milk production is obtained from sheep of greyish variety (KB) and the lowest from sheep of brown variety.

The chart below shows that the average and standard deviation are not correlated and therefore the variance analysis is legitimate (fig. 3). Because the points on the chart mean-dispersion do not align to regression line, it results that the variance analysis carried out is valid.

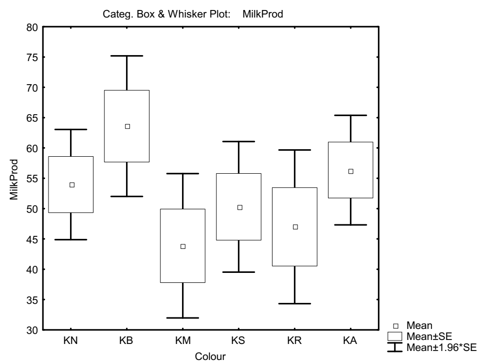

Figure 2. Histogram regarding variation of average depending on colour varieties

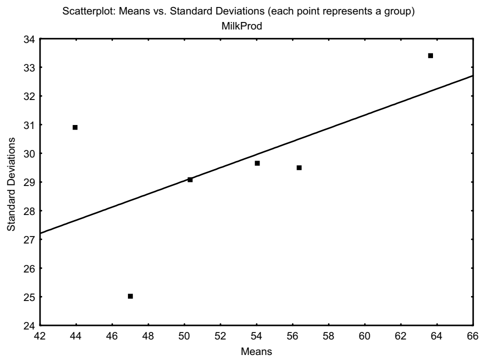

Figure 3. The relationship between average and standard deviation

The figure 4 configures averages and standard deviations for milk production in colour varieties of Karakul sheep.

The following analysis of the paper compares the milk productions among all colour varieties.

The table 5 presents the analysis of differences between averages concerning lactation period in colour varieties of Karakul sheep (according to LSD test).

The table 6 presents the analysis of differences between averages concerning lactation period in colour varieties of Karakul sheep (according to Scheffe test).

The table 7 presents the analysis of differences between averages concerning lactation period in colour varieties of Karakul sheep (according to Newman Keuls test).

The table 8 presents the analysis of differences between averages concerning lactation period in colour varieties of Karakul sheep (according to Duncan test).

The table 9 presents the analysis of differences between averages concerning lactation period in colour varieties of Karakul sheep, according to Tukey test for unequal groups.

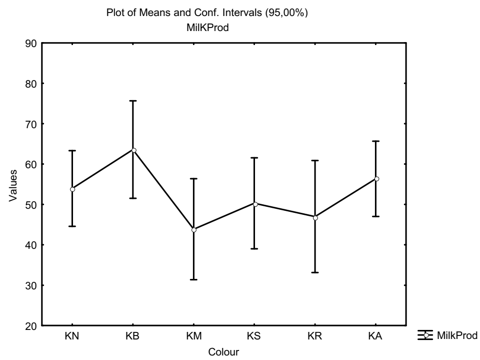

Figure 4. Average variation of milk production in colour varieties

Table 5. The LSD test for significance of difference between averages

Colour		LSD Test; Variable:MilkProd (MilkProd) Marked differences are significant at p < ,05000 **{1}** **M=53,966**	{2} M=63,589	{3} M=43,868	{4} M=50,293	{5} M=46,993	{6} M=56,354
KN	**{1}**		0.176979	0.182520	0.619230	0.443613	0.719740
KB	{2}	0.176979		**0.014007**	0.089532	0.079752	0.309582
KM	{3}	0.182520	**0.014007**		0.434215	0.749207	0.099719
KS	{4}	0.619230	0.089532	0.434215		0.732239	0.412422
KR	{5}	0.443613	0.079752	0.749207	0.732239		0.304011
KA	{6}	0.719740	0.309582	0.099719	0.412422	0.304011	

Table 6. The Scheffe test for significance of difference between averages

Colour		Scheffe Test; Variable: MilkProd (MilkProd) Marked differences are significant at p < ,05000 {1} M=53,966	{2} M=63,589	{3} M=43,868	{4} M=50,293	{5} M=46,993	{6} M=56,354
KN	{1}		0.870362	0.876454	0.998483	0.988297	0.999689
KB	{2}	0.870362		0.296105	0.713042	0.683865	0.958930
KM	{3}	0.876454	0.296105		0.987144	0.999824	0.739900
KS	{4}	0.998483	0.713042	0.987144		0.999754	0.984080
KR	{5}	0.988297	0.683865	0.999824	0.999754		0.956858
KA	{6}	0.999689	0.958930	0.739900	0.984080	0.956858	

Table 7. The Scheffe test for significance of difference between averages

Colour		Newman-Keuls test; Variable: MilkProd(MilkProd) Marked differences are significant at p < ,05000					
		{1} M=53,966	{2} M=63,589	{3} M=43,868	{4} M=50,293	{5} M=46,993	{6} M=56,354
KN	**{1}**		0.466096	0.603551	0.652861	0.669396	0.769893
KB	{2}	0.466096		0.150962	0.362651	0.250453	0.375701
KM	{3}	0.603551	0.150962		0.711218	0.702028	0.543470
KS	{4}	0.652861	0.362651	0.711218		0.686135	0.738269
KR	{5}	0.669396	0.250453	0.702028	0.686135		0.660677
KA	{6}	0.769893	0.375701	0.543470	0.738269	0.660677	

Table 8. The Duncan test for significance of difference between averages

Colour		Duncan test; Variable: MilkProd (MilkProd) Marked differences are significant at p < ,05000					
		{1} M=53,966	{2} M=63,589	{3} M=43,868	{4} M=50,293	{5} M=46,993	{6} M=56,354
KN	**{1}**		0.269313	0.265380	0.652861	0.425018	0.769893
KB	{2}	0.269313		**0.032201**	0.139418	0.069536	0.375701
KM	{3}	0.265380	**0.032201**		0.462615	0.702028	0.178008
KS	{4}	0.652861	0.139418	0.462615		0.686135	0.488403
KR	{5}	0.425018	0.069536	0.702028	0.686135		0.302510
KA	{6}	0.769893	0.375701	0.178008	0.488403	0.302510	

Table 9. The Tukey test for significance of difference between averages

Colour		Unequal N HSD; Variable:MilkProd (MilkProd) Marked differences are significant at p < ,05000					
		{1} M=53,966	{2} M=63,589	{3} M=43,868	{4} M=50,293	{5} M=46,993	{6} M=56,354
KN	{1}		0.796686	0.832351	0.997522	0.988449	0.999219
KB	{2}	0.796686		0.169575	0.563130	0.657711	0.930018
KM	{3}	0.832351	0.169575		0.972605	0.999751	0.666955
KS	{4}	0.997522	0.563130	0.972605		0.999675	0.975016
KR	{5}	0.988449	0.657711	0.999751	0.999675		0.957594
KA	{6}	0.999219	0.930018	0.666955	0.975016	0.957594	

The test results show that, in general, the milk production differences among the sheep groups composed by their affiliation to the colour varieties are not significant. However, some tests (LSD and Duncan) shows that the differences between greyish (KB) and brown (KM) varieties on milk production present statistical assurance.

CONCLUSIONS

The analysis of variance in Karakul sheep breed shows that the determinant genes of wool fibre colour does not significantly influence the milk production.

Statistically, the difference relevance among the milk productions in Karakul sheep classified by colour varieties is certified by significance tests.

Generally, the milk production differences among the colour varieties are not significant. Only significant difference is found between greyish and brown varieties.

REFERENCES

Buzu I., 2012. Tip de ovine Karakul Moldovenesc Corpolent: Teoria şi practica creării şi perfecţionării. Edit. Acad. Şt. a Moldovei, Chişinău.

Filote E., Groza M., Bosânciuc S., Filote M., 1996. Rezultate privind ameliorarea producţiei de lapte şi pielicele la ovinele din rasa Karakul de Botoşani. Rez. ale Simp. Şt. Internaţ. de Zooteh., USAMV Iaşi, p. 128.

Filote E., Filote M., 2009. Cercetări privind posibilităţile ameliorării producţiei de lapte la rasa Karakul. Abstr. of the 31th Ann. Sess. of Sc. Communi. Univ. of Agr. and Med. Vet. Sci" Bucharest, p. 23.
Niga V., Marin L., Ursu E., Filote E., 1989. Contribuţii privind crearea unor noi varietăţi de culoare la ovinele Karakul crescute în România. Lucr. şt. ale ICPCOC Palas-Constanţa, VI, p. 5-14.
Sandu Gh., 1995. Modele experimentale în zootehnie. Edit. CORAL SANIVET, Bucureşti.
Statsoft Inc., 1984-2007. STATISTICA 8.0. http://www.statsoft.com.
Taftă V., Vintilă I., Zamfirecu S., 1997. Producţia, ameliorarea şi reproducţia ovinelor. Edit. Ceres, Bucureşti.
Van Vleck D., 1987. Summary of methods for estimating genetic parameters using simple statistical models, Ed. Cornell University.