Scientific Papers. Series D. Animal Science. Vol. LXIV, No. 1, 2021
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

DETERMINING THE CURRENT STATE OF CURL'S IMPROVEMENT IN STRENGTH AND ELASTICITY

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Abstract:

The purpose of the research was to determine the level of improvement in skin production and how to express the strength and elasticity of curls. The importance of these characters is essential because both participate in shaping a certain type of curl that will have the quality of keeping the main shape and characteristics for a longer time. The biological material subject to appreciation belongs to the Karakul of Botoșani breed located in the Principal Class of the Genealogical Register. The experimental protocol was based on the assessment of the characters in three consecutive seasons and aimed at determining the degree of improvement of the curl for several selected characters. Based on the results, it can be concluded that the black variety average score is close to the maximum, thus indicating that the improvement of these characters is in a more advanced phase. Determining the degree of significance between the average scores for the gray and pink varieties are significant for P<0.01 and still significant for P<0.05 between pink and grayish.

Key words*: curl, Karakul sheep, loop, pelts.*

INTRODUCTION

Strength and elasticity are selection characters because they participate in expressing the quality of the curl in the skins of Karakul of Botoșani lambs. Both characters are influenced by the height, degree of closure of the curls, the density and quality of the fibers. Also, both the elasticity and the resistance of the curl can be influenced by the density of the curls as well as the surface of the skin.

Being characters that are evaluated in lambs in the first neonatal period, especially by subjective methods, their improvement will be strongly influenced by the technique and degree of training and objectivity of the staff involved in establishing productive performance in the Karakul of Botoșani breed.

So, in the production of skins, the great shortcoming that could make it difficult to obtain the expected effect of the selection is due to the fact that many of the characters followed in the selection are evaluated in practice using mainly subjective methods (Anonymous, 1982; Pascal, 2007; Pascal et al., 2010). For this reason, the results of evaluations are often inaccurate and inconsistent (Schoeman, 1968; 1969; Albertyn et al., 1990, quoted by Schoeman, 1998 and Pascal, 2011) and the clear determination of the effect due to a character evaluated in this way is very difficult to quantify.

Both strength and elasticity depend largely on the quality of the component fibers. The inclusion among the selection criteria and the properties on which the quality of the fibers depends is justified by the fact that all these influence the durability and resistance. The quality of the fibers is determined by the diameter of the fibers and the shape and arrangement of the cells at the level of the cuticular layer. Based on these findings, most researchers in the country and abroad (Taftă et. al., 1998; Pascal, 2007) state that a good quality of the hair coat is associated with a fiber length

between 9 and 12 mm and an average thickness of 30-33 μm.

MATERIALS AND METHODS

The biological material analyzed was represented by Karakul of Botoșani lambs of several color varieties, obtained over three consecutive generations at the herd located at the Research and Development Unit for Breeding Sheep and Goats Popăuți - Botoșani.
In each season of assessment of the characters that represented the main objective of the research performed, the working method used was based on the technical norms specified in Section 1.4 and 1.5 of the MADR Order no. 22/ 20.01.2006, published in the Official Gazette of Romania no. 146 of 15.02.2006 and in which are specified the aspects based on which the official Control for the skin production obtained from Karakul is performed.
All lambs obtained were subjected to skin quality assessments in the first two days after lambing, regardless of variety or condition of the curl at 24 hours after birth.
In this sense, the experimental protocol established the development of several activities and objectives, different in terms of implementation, for the analysis of the practical and technical impact on the reproductive activity applied to the Karakul of Botoșani breed.
All lambs obtained were subjected to skin quality assessments in the first two days after lambing, regardless of variety or condition of the curl, and took place in three consecutive campaigns, corresponding to the lambing season 2018, 2019 and 2020.
The working method used in the evaluation was based on the use of subjective methods for immeasurable characters and laboratory determinations for quantitative characters.
The data obtained were compared with those obtained in the performance control of the first generation of lambs obtained from the establishment of the Genealogical Register, respectively the generation of lambs from 2005.
The statistical processing of the data was based on the use of computer software SAVC (Statistical Analysis of Variance and Covariance 2003). To test the statistical significance of the differences between the averages parameters values studied and the correlations between them, the variables analysis (ANOVA Single Factor) and the Pearson Correlation algorithms were used, both included in the computer program used.

RESULTS AND DISCUSSIONS

Improving the quality of the skin is neither a simple nor an easy activity. The complexity of this process lies in the way of expression and the diversity of the characters that participate in obtaining quality skins. In view of the fact that many of them are subject to subjective assessments, a situation in which the selection is dependent on the skill and the way a property is perceived by the breeder, the process of skin improvement can be quite long and with very varied results, such as meaning and mode of expression.
This effect is a consequence of the fact that the promotion between the selection criteria of a certain character often determines a simultaneous answer and for another character with which it is in direct correlation. For example, van Niekerk (quoted by Taftă et al., 1997) demonstrate that the improvement of the skins for the uniformity of the curl and the arrangement of the curls on the skin surface, but also of the predominant pattern, entails not only a reduction in the length of the fibers but also an increase in the number of curls with reduced height. However, the effect is totally different when the selection insists on promoting the characters on which the quality of the coating fibers as a whole depends.
By evaluating the characters that were the subject of research, the aim was to find out what is the real effect of the applied selection and what are the progresses made in improving the quality of the skins in the Karakul of Botoșani breed. Following the data processing, the proportion of individuals that have been identified as having good strength and elasticity is recorded to be inconsistent (Table 1).
Analyzing the data resulting from centralization and statistical processing, we find differences between the average values resulting from the assessment of the resistance and elasticity of the curl to the color varieties found in the Karakul of Botoșani breed.

The highest average value was obtained from the evaluation performed on lambs belonging to the black variety. In this case the average score was 45.19 ± 0.45, being less than five points compared to the maximum accepted level for these characters, the maximum accepted score being 50.

The analysis of the evolution of the proportion of lambs that received a high average score highlights the fact that the improvement is certain, being supported by the genetic progress currently registered. Thus, if in 2005 the proportion of lambs that had a good expression for strength and elasticity was 68.12%, their share increased to over 80% in 2020 indicating an improvement for these characters in progress but also the fact that under the effect of selection and the pairing management in each generation increases by approximately 1.25% the number of those who obtained a maximum score in the evaluation.

Table 1. Statistical parameters for the resistance and elasticity of the curl (time to return to the original form)

Color variety	n	$\overline{X} \pm s_{\bar{x}}$	V%	% with a desired strength and elasticity				The difference ± 2005/2020	
				2005	2018	2019	2020	Total (points)	Generation (%)
Black	1501	45.19±0.45	21.83	68.12	80.55	84.56	80.63	12.51	1.251
Grayish	1181	42.73±0.33	26.58	57.36	61.59	72.08	69.47	12.11	1.211
Brown	428	41.24±0.57	28.95	60.88	75.57	73.05	70.25	9.37	0.937
Grey	103	37.86±1.23	33.16	57.13	67.46	64.76	64.29	7.14	0.714
Pink	530	39.65±0.53	31.14	38.19	40.73	45.94	46.12	7.93	0.793

Table 2. The difference and significance of difference for the resistance and elasticity of the curl

Character 1	Character 2	Mean difference	Signification of difference	Level of signification
Gray	Grayish	3.08	insignificant	-
Gray	Brown	1.59	insignificant	-
Gray	Black	1.79	insignificant	-
Gray	Pink	4.87	significant	0.01
Pink	Grayish	3.37	significant	0.05
Pink	Brown	7.32	significant	0.01
Pink	Black	2.45	insignificant	-
Black	Brown	1.50	insignificant	-
Brown	Grayish	3.08	insignificant	-
Black	Grayish	2.46	insignificant	

When evaluating the average score obtained by the lambs of the five color varieties that were included in the experimental protocol, there are differences in the mean values (Figure 1).

In lambs belonging to the grayish color variety, the tendency and evolution of the improvement of the degree of resistance and elasticity follow, in general, the same tendency as in black lambs. The difference is that the average value of the score is only 42.73 ± 0.33 points, being 2.46 points lower than that obtained for black lambs. However, the difference is not significant for P<0.01 (Table 2).

Also, the fact that the proportion of lambs that were evaluated with the maximum points was 57.36% in the 2005 generation and reached only 69.47% in 2015 shows that the improvement of the strength and elasticity of the curl is slower at grayish variety (Figure 2).

However, the selection applied shows that in each generation the proportion represented by individuals who obtained the maximum score in the evaluation of these characters' increases by 1.2%.

However, we can say that in the variety of grayish the improvement process is slow. The relatively slow pace of the genetic improvement process is largely due to the differences found between the traits on which the quality of black and white colored fibers depends. Usually the fibers are longer and are associated with a lower elasticity and strength and the black fibers being shorter are associated with a better expression of that character.

Therefore, it can be specified that when it will be possible to promote through the applied selection only breeders that have fibers in the curl with close length and thickness, and the chances that the improvement will register higher levels will increase.
Between grayish and the pink and black varieties, there are significant differences for P≤1 and insignificant for gray and brown (Table 2).

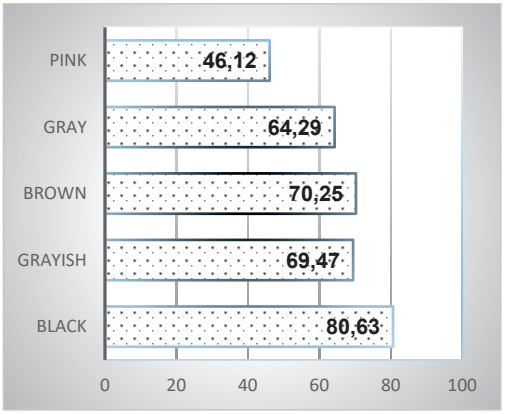

Figure 1. Graphic representation of the average values of the score obtained when evaluating the characters in the lambs obtained in 2020

In order to obtain a curl with more valuable characters, it is necessary to put a greater emphasis in the future selection on the improvement of the dermal layers as they represent the main organ in which the process of morphogenesis of the fibers that constitute the curl takes place. The quality of the skin is extremely important because in the dermal layers the processes specific to the morphogenesis of wool fibers are initiated and carried out. Many studies and research highlight the role and importance of dermal layers, and Karakul has shown that the type of curl, the size of the curl and the quality of the fibers in the curl largely depend on the quality of the skin (Nel, 1966; Schoeman, 1998; Nel, 1969; Van Niekerk et al., 1972; Gouws, 1974).
A larger study conducted in the African Karakul concludes that the expression of some characters followed in the amelioration process is directly influenced by the thickness of the skin and the quality of the covering fibers (Thompson, 1938; Ursu et al., 1997; Wahl et al., 1920; Schoeman, 1998).
In the brown variety, the average score of 41.24 ± 0.577 shows a very good proportion of those who had a good degree of evaluation for the strength and elasticity of the curls. The fact that the proportion of lambs with the desired type of character increases in each generation by about 9.37% shows a good efficiency of selection and an obvious genetic progress, but also a higher degree of improvement.

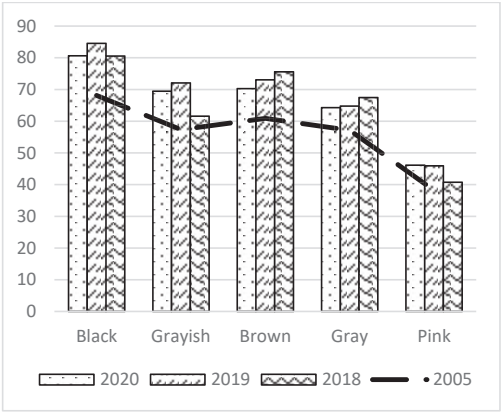

Figure 2. Frequency of character represented by resistance and elasticity (%)

The difference between the average score obtained for brown with brown, brown with gray and brown with black is insignificant for P<0.01.
In the grey variety the improvement of this character is at a lower level compared to the authorized varieties. The mean score of 37.86 ± 1.237 is 24.28% lower than the maximum permitted by the quality certification instructions for purebred animals.
The determination of a progressive increase of the lambs that received the maximum points in the evaluation of these characters indicates that the improvement is on favorable coordinates, even if the genetic progress was identified in only 0.7% of the individuals obtained from the herd of females registered in the breed register.
The pink variety, although obtained a better average score (39.65 ± 0.536), the fact that, so far, the proportion of lambs with a maximum score is below 50% shows a difficult improvement for these characters.

The slow rate of improvement is due primarily to the small size of the active population, with effects on the intensity of selection and, secondly, to the fact that red and white fibers with different lengths and thicknesses are found in the curl structure, influencing the expression of these traits in the genotype.
Determining the degree of significance between the average scores for the grey and pink varieties are significant for P<0.01 and still significant for P<0.05 between pink and grayish.

CONCLUSIONS

The researches values and also the evaluation of the degree of improvement for the specific characters of the skins is supported by the fact that the biological material was represented by the lambs from the sheep registered in the Genealogical Register (Principal and Secondary Section) representing, in fact, the most valuable nucleus of Karakul of Botoșani sheep breed.
Assessing the degree of improvement for the strength and elasticity of the curl in lambs that belong to the black variety, the improvement of this character is in a more advanced process because the average score is about 91% of the maximum value that can be attributed to evaluation.
The fact that the proportion of lambs that received the maximum score in 2005 was only 57.36% and reached as of 2020 only 69.47% shows that the improvement of the strength and elasticity of the curl is slower in the grayish variety.
Between the average scores for resistance and the elasticity of the fibers from grayish with pink, but also from grayish with black, there are significant differences for P<0.01 and insignificant between grayish with gray and brown.
In the brown variety, the average score obtained when evaluating the strength and elasticity of the curs was 41.24 points, which indicates that a very good proportion of individuals found the desired shape.
In the grey variety, the improvement of the resistance of the curl is at a lower level (reduced by 24.28%) than the maximum accepted by the instructions for certification of the quality of biological material in purebred animals.
In the pink variety, the average score obtained was 39.65 points and the fact that, so far, the proportion of lambs with a maximum score is below 50% shows a difficult improvement for these characters.
The slow pace of improvement of these characters in pink lambs is due primarily to the small size of the active population, with effects on the intensity of selection and, secondly, to the fact that in the curl structure are found brown and white fibers that have a length and a different thickness, influencing the expression of these qualities in the genotype.

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