

RESEARCH ON CURENT EVALUATION STAGE OF CURL TYPE IMPROVEMENT FOR KARAKUL OF BOTOȘANI

Ionică NECHIFOR¹, Alexandru Marian FLOREA¹, Andre CRÎȘMARU¹,
Constantin PASCAL^{2*}

¹Research and Development Station for Sheep and Goat Breeding Popăuți - Botoșani, Romania

²University of Life Sciences Iași, Romania

*Corresponding author email: pascalc61@yahoo.com

Abstract

The aim of this research was to perform an objective analysis of improvement process for the type of curls on the pelt surface. The research importance is special because in improving this character the desire of the breeder is different. The biological material belonged to the Karakul of Botoșani breed and the entire herd from which the evaluated lambs came is registered in the Genealogical Register of the respective breed. The method applied in assessing the quality of skins was based on the technical norms specified in Section 1.4 and 1.5 of the MADR Order no. 22/20.01.2006. Statistical processing of the data was based on the use of the computer program S.A.V.C. (Statistics Analysis of Variance and Covariance 2003). The assessment of the degree of improvement indicates that the desired curl represented by the shape of long and medium tubes is in an advanced stage as that type increased from 65.11% in 2005 to 66.66% in lambs' subject to assessments in in 2020. During this time, as a result of the improvement, the proportion of lambs with medium and long tube curls increased by more than 1.5% in the black and greyish variety, the difference being significant for $p < 0.01$.

Key words: curl, genetic improvement, Karakul of Botoșani, pelts.

INTRODUCTION

The main purpose of the planned research was to identify the degree of improvement for certain production characters specific to the Karakul de Botoșani breed.

In addition to the specific characteristics of the fibres that form the hair coat, the economic and aesthetic value of a skin is given by other features specific to the type of curl, namely: height, width, length and degree of closure. Some of these characters have a superior ameliorating role because, by expression, they define the form, shape and contour described by the curls on the surface of the skin.

In order to highlight the practical importance of these characters (Taftă, 1998) states that all these features have a great influence on the curls quality because "they affect in a certain way the commercial aspect of the curl". Therefore, in raising sheep for the production of skins, the shape or type of curl has a special connotation, being considered by many specialists and practitioners as the main objectives of improving breeds of sheep raised

for skins (Pipernea, 1979), sometimes this character being influenced by the age of the parents and their state of maintenance (Florea et al., 2020)

The importance of assessing the specific characteristics of the quality of the curls and especially their shape is particularly confirmed by the fact that the direct intervention in the process of breeding sheep from skins bred in South Africa and Namibia, based on the selection applied for this character has shaped a new genotype of Karakul sheep in which the curling is slightly unfolded, flattened, and which by arrangement generates sinuous designs and have a milled appearance, very low height and intense gloss (Schoeman et al., 1992).

MATERIALS AND METHODS

The analysed biological material was represented by purebred Karakul of Botoșani lambs belonging to all colour varieties, obtained over three successive generations. The entire herd is included in the Breed's

Genealogical Register and is in the program for improving the quality of skins.

The method applied in assessing the quality of the skins was based on the technical norms specified in Section 1.4 and 1.5 of the MADR Order no. 22/20.01.2006 and in which are specified the aspects on the basis of which the official control of the skin production and the evaluation of the corporal conformity and of the constitution at Karakul are carried out.

Statistical data processing was based on the use of the S.A.V.C. (Statistics Analysis of Variance and Covariance, 2003) to determine the arithmetic mean, the error of the arithmetic mean ($\pm s$) the standard deviation (s). To test the statistical significance of the differences between the averages of the values of the studied parameters as well as the correlations between them, the algorithms Variable Analysis (ANOVA Single Factor) and Pearson Correlation were used, both included in the software used in statistical data processing.

RESULTS AND DISCUSSIONS

The shape, size and type of curl are always important objectives for the improvement of Karakul of Botoşani sheep because they have a great influence on the general appearance of the skin, influencing their aesthetic and commercial value. In the performance control activities specific to the production of skins, the quality analysis emphasizes, in particular, the main features that influence the expression

and externalization of a genotype with a certain type or curl shape.

In order to create conditions for genetic expression of the desired shape and type of curls, it is necessary to increase the degree of improvement for the following parameters: length, height, width, degree of closure, direction of curl, contour and arrangement of curls on the skin surface.

When assessing the curl type character, more attention is paid to the length dimensions. The explanation for this situation is that the length is also a criterion for classifying the curls, those with a length greater than 12 mm are considered tube-shaped curls and if they are below this value the curls are bob-shaped.

Multiple evaluations were performed at each stage of assessing the degree of improvement of the character represented by the shape of the curls, so that the data processing provided objective values and highlighted the intensity and effect of the selection. The diagram described in the case of the graphical representation of the distribution by colour varieties of the average values obtained after evaluating the type of curl shows that the improvement process, although in progress, is at different levels at the five colour varieties consolidated within the Karakul of Botoşani breed (Table 1 and Figure 1). Only in the black breed the evaluation for this character allowed that for the over 1501 lambs that were subjected to the assessments the average score for the type of curl to be higher than 95 points.

Table 1. Statistical estimators obtained after evaluating the type of curl in relation to the variety of colour

Colour variety	No.	\bar{X}	$\pm s_x$	s	V%	Minimum	Maximum
Black	1501	99.26	0.831	18.166	18.302	78	135
Greyish	1181	84.45	0.468	16.073	19.031	59	135
Brown	428	81.67	0.762	15.774	19.315	63	128
Grey	103	84.40	1.831	18.588	22.024	40	128
Pink	530	87.27	0.784	18.051	20.684	63	128

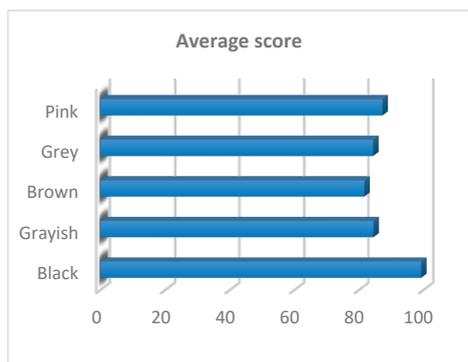


Figure 1. Average score obtained when assessing the degree of improvement of the type of curl in relation to the colour variety

In breeding programs applied to pelts breeds, high attention is paid to the uniformity of the basic characteristics of the curls, it is desirable that over 75% have approximately the same height, length and width. Regarding the uniformity of this parameter in many specialized publications it is shown that on the surface of a skin, usually the curls have different lengths, decreasing from croup to withers and from the upper line of the trunk to the abdomen (Pascal, 2001; Pascal, 2011; Taftă et al., 1998).

In black variety, the researches show that curls with tuber shape dominate, i.e. they have an average length of more than 12 mm (Table 2). In fact, this is also the main goal of improving the quality of black skin, i.e. to increase the uniformity of characters in terms of length, width and height. Improving these values influences the appearance of uniform types of curls, with a clear outline of the tubular curl.

In order to properly assess the genetic progress made, the data obtained in the three consecutive stages of evaluation of the three generations of lambs were compared with the performance recorded for the same character but in the lambs obtained in the lambing season of 2005, when it was established Genealogical Register of the Karakul of Botoșani breed. Starting from this specification we can observe that if in 2005 the proportion of lambs with predominantly tubular curl was 87.21% the average values recorded in 2018 indicate a reduction of their share to 82.25% and 79.20%

and 79.61% in the evaluation seasons applied in the 2019 and 2020 campaigns.

If we take into account the fact that the interest for this character increases only when the purpose of the skins is to be used in the manufacture of coats, we consider that keeping in the active population a herd that would produce skins with wider and looser curls justified and may respond to any requests to increase demand that may occur during certain periods of time. However, it is recommended, as in this case, that the improvement be aimed not only at a better expression of gloss but also at a standardization of the design and modelling of the curl.

The analysis of the current degree of expression of the desired type of curl in the black and greyish varieties is summarized in Figure 2, and for a good interpretation of the data obtained we must specify that the goal aimed at improving the character represented by the type of curl is different from one colour variety to another. Thus, if for the black and greyish variety it tends towards an increase of the degree of uniformity of the curls, in size and height and as a way of arrangement, for the other varieties of colour it is desired to consolidate and improve some characters that can be the basis for obtaining skins to have the curl arranged in the form of low waves, associated with an intense luster.

The statistical values obtained indicate that for the character represented by the type of curl the improvement process is different. Thus, in the black variety, the proportion of lambs with a long tube-shaped curl type was significantly increased in lambs of the three generations subject to evaluations compared to the expression of the same character in lambs evaluated in 2005.

Performing the same analysis based on statistical data obtained from the evaluation of greyish lambs indicates lower average values than in the reference year, except for the average score resulting from the assessment of this character in lambs obtained in the lambing campaign 2020. The performance for this character was 23.66 points higher than the assessments made for the 2005 generation of lambs.

Table 2. Frequency type of curls for the varieties of Karakul of Botoşani breed

Colour variety	Curl type	Frequency on evaluation season							
		2005		2018		2019		2020	
		n	%	n	%	n	%	n	%
Black	Long tube	295	39.28	214	44.67	213	38.17	221	46.92
	Medium tube	188	25.03	131	27.35	145	25.98	93	19.74
	Short tube	105	22.29	49	10.23	84	15.05	61	12.95
	Intense gloss wave	98	13.04	63	13.15	110	19.71	62	13.16
	Flattened	65	8.65	22	4.60	6	1.09	34	7.23
Greyish	Long tube	152	30.52	73	18.25	85	20.48	160	36.98
	Medium tube	135	27.15	94	23.50	78	18.80	145	32.19
	Short tube	98	19.67	118	29.50	122	29.40	65	14.73
	Intense gloss wave	85	17.06	115	28.75	130	31.32	71	16.10
	Flattened	28	11.86	-	-	-	-	-	-
Brown	Long tube	12	6.43	6	4.61	7	3.62	4	3.74
	Medium tube	38	20.32	20	15.38	13	6.70	9	8.41
	Short tube	35	18.71	25	19.23	45	23.19	34	31.77
	Intense gloss wave	88	47.06	79	60.78	119	61.34	60	56.08
	Flattened	14	7.48	-	-	10	5.15	-	-
Grey	Long tube	-	-	12	6.70	8	5.97	12	6.21
	Medium tube	-	-	64	35.75	37	27.63	28	14.50
	Short tube	-	-	34	18.99	38	28.35	57	29.53
	Intense gloss wave	-	-	55	30.72	38	28.35	85	44.07
	Bob	-	-	14	7.84	13	9.70	11	5.69
Pink	Long tube	-	-	3	7.14	-	-	-	-
	Medium tube	-	-	6	14.28	6	15.78	-	-
	Short tube	-	-	9	21.42	5	13.15	6	23.08
	Intense gloss wave	-	-	24	57.16	27	71.07	20	76.92

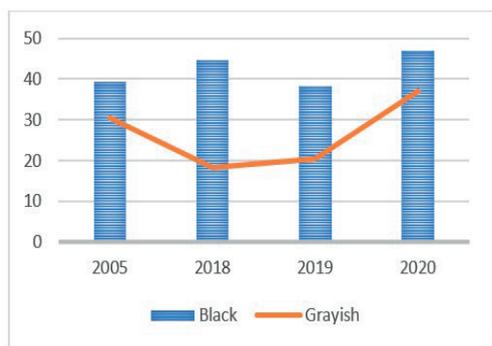


Figure 2. Rate of lambs at which was recorded the desired loop type under the shape of long tube (%)

The non-uniformity of the gloss and the modelling led to the change of the selection criteria, insisting on those characters that are associated with a better uniformity for some dimensions and shapes of the curls. Compared to the trend in 2005, when the selection insisted on obtaining skins with a flattened and a wave with a special luster curl, against the background of increasing attention for tubular curl, the proportion of lambs that had in 2015 predominant curl arranged in the form of long

and medium tubes increased by 3.5%, the difference being very significant for $p < 0.01$.

For the obvious improvement of the skin mist, it is desired that the selection be based on evaluations of the modelling and the better uniformity of the colour. At least for the last aspect, the selection is difficult because the colour and its shade depend a batch on the numerical ratio and the length ratio between the fibres coloured in black and white.

Compared to other values cited in the literature, those obtained converge in meaning and intensity of expression. Thus, a study conducted on the population of lambs of the black variety, within the Karakul of Botoşani breed, shows that the proportion of those who had a different curl of the desired shape was 14.5% for the biological material of line 5 and respectively 11.8% for those in line 1557 (Marin et al., 1974). Other studies performed on the population of Karakul of Botoşani lambs show that “in terms of the shape of the curl, the most common are those whose curls are tube-shaped (34.69%)” and other forms of curl have a relatively equal proportion placed between 17% and 21% (Hrincă et al., 1991). Also, for

the black variety, in 1977, in some studies carried out by Marin it was found that in the herd of black lambs the proportion of those who had curls of tube, medium and large bob type was 70.20%, and of short bob and wave type only 20.8%.

In the case of coloured varieties, the desire of the breeder is to increase the proportion of individuals in whom the skin has wavy and very shiny curls. For these varieties of colour, the criteria used in the selection of the curl type are mainly focused on the characters that facilitate a genotype expression of undefined curls, with low height, with the longitudinal axis arranged parallel to the skin surface, slightly scattered but very shiny fibres. The presence of these characteristics determines the appearance of skins with curled and arranged curls.

In the brown variety, the evaluation shows a progressive increase in the individuals dominated by the wavy and extremely shiny curl from 47.06% to 65.42% in the lamb generation from 2015. This was possible because after the approval of this variety it was possible to pass to an intensification of the criteria that improve the curling of brown lambs. Basically, the fact that the selection difference has high values and a high degree of statistical significance, being very significant for $p < 0.05$, confirms the efficiency of the selection and implicitly the fact that the improvement of this character has a degree of confidence of over 95%.

The grey variety is in the process of genetic consolidation after meeting the criteria for approval in 2018. Compared to the desired type of grey, it is intended that based on evaluations that take place in the first neonatal period to promote as breeders those individuals who allow to dominate in the genotype small curls, with silky fibres, with well-defined associated curls and with an intense luster.

Based on the research, it was found that the defined curling, represented by the tubular one, has the largest share in the lambs analysed. The exception is the type of long tube-shaped curl that holds, in each generation, less than 7%. From this perspective, the improvement must be intensified so that, in each generation, the proportion of those with a uniform curl in size, thickness and uniformity increases.

If we consider that the objective of improvement is to promote the low-height curling, with an intense luster wave arrangement, we can say that the improvement process is based on favourable coordinates because the proportion of lambs with these characteristics increases from 30.72% in 2018 to 44.07% in 2020. The difference of almost 14% indicates that the method applied in the selection is efficient and contributes to consolidating the desired type of curling for the new generations.

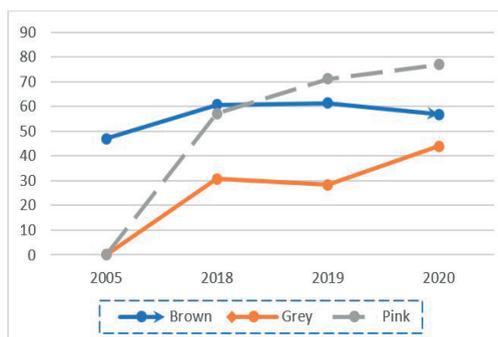


Figure 3. Proportion of lambs with the desired type of curly flattened and shiny wave (%)

Based on the research carried out, it was found that the pink variety has a small number of active population that is part of the category of those registered in the Genealogical Register of the breed. This variety is in the process of formation, and due to the beauty of the skins, it enjoys a special attention from the breeders. Being a composite colour, the uniformity of the colour shade is very difficult to obtain. The type of curl also shows increased variability. From these considerations, the main objective of the fundamental improvement is to promote the types of flattened curls, i.e. wave with special gloss.

During the analysed period, the lambs with this type of curling increase from a proportion of 57.16% in 2013 to over 75% in the case of evaluations carried out in 2015. These results confirm not only the efficiency of the selection but also the fact that the improvement is on favourable coordinates. Determining the differences and their significance indicates that for the values obtained in the curl type assessment there are significant differences for $p < 0.01$ (Table 3).

Table 3. The difference and significance of difference for the score obtained in the assessing of the curl type

Genotype 1	Genotype 2	Average difference	The meaning difference	Significance threshold
Grey	Greyish	2.82	insignificant	-
Grey	Brown	5.6	significantly	0.01
Grey	Black	11.99	significantly	0.01
Grey	Pink	2.87	insignificant	-
Pink	Greyish	0.06	insignificant	-
Pink	Brown	2.73	insignificant	-
Pink	Black	14.86	significantly	0.01
Black	Greyish	14.8	significantly	0.01
Black	Brown	17.59	significantly	0.01
Brown	Greyish	2.79	insignificant	-

CONCLUSIONS

The assessment of the degree of improvement for the curl type indicates that the desired curl in the form of long and medium tubes is at an advanced stage as that type increased from 65.11% in 2005 to 66.66%. to lambs subject to appreciation in the year 2020.

Over the time period, as a result of the improvement, the proportion of lambs with medium and long tube curls increased by more than 1.5% in the black and greyish variety, the difference being significant for $p < 0.01$.

The proportion of lambs in which the curling was predominantly flattened and with a low degree of closure, respectively wave and flattened, was kept within relatively constant limits placed around 20%, with relatively small variations from one generation to another.

The expression of the tubular type curl was present at approx. 50% of the lambs belong to the brown, grey and pink varieties, while in the black ones the respective type was identified in a proportion of less than 50%.

In the variety of greyish it is found that compared to 2005 the proportion of lambs that had in 2018 predominant curling arranged in the form of long and medium tubes increased by 3.5%, the difference being very significant for $p < 0.01$.

The brown variety shows a progressive increase of the individuals dominated by the curl arranged in waves associated with a very good and intense luster from 47.06% to 65.42%; the fact that the selection difference has high values and a high degree of statistical significance for $p < 0.05$ confirms the efficiency of the selection for this character, with a direct and positive effect on the improvement of this character.

In the grey variety because the goal of breeding is to promote individuals with low-height, wave-like curling and intense luster, we can say that breeding is on favourable coordinates as the proportion of lambs found in this form increases from 30.72% in 2018 to 44.07% in 2020.

In the pink variety, the desired type, represented by flattened curl, increased from 57.16% in 2018 to over 75% in the case of evaluations performed in 2020, results that confirm not only the efficiency of the selection but also the fact that the improvement is on coordinates favourable.

REFERENCES

- Albertyn, L.R., Schoeman, S., & Groeneveld, H.T. (1993). Factors influencing the quality of Karakul pelts, with emphasis on discrete characteristics. *S. Afr. J. Anim. Sci.*, 23, 183.
- Florea, A.M., Nechifor, I., Crișmaru, A., & Pascal, C. (2020). Researches regarding weight evolution considering the young female mating's age. *Scientific Papers. Series D. Animal Science*, 63 (2), 281-286.
- Hrincă, G., Ursu, E., Vicovan, G., & Fibatche, E. (1991). The association of hemoglobin types with the main properties of the skins of Karakul de Botoșani lambs. *Lucrări Științifice ICDCOC Palas*, VII, 49-57.
- Îñiguez, L., & Mueller, J. (2008). Characterization of Small Ruminant Breeds in Central Asia and the Caucasus. *International Center for Agricultural Research in the Dry Areas (ICARDA)*, Aleppo, Syria.
- Marin, I., & Niga, V. (1974). The main characteristics of skin cells in the lines created in the Karakul sheep population from SCZ Popăuți. *Lucrări Științifice ale Stațiunii Centrale de Cercetări pentru Creșterea Ovinelor*, Palas – Constanța, II, 99-108.
- Pascal, C., Gilcă, I., Creangă, Ș., & Vintilă, V. (1994). Comparative research on some characteristics that influence the quality of skins in lambs of the Karakul and hybrids breeds. *Lucrări Științifice*, vol. 37/38. *Seria Zootehnie*, 216-221.

- Pascal, C. (2001). The quality of skins obtained from Karakul sheep bred and exploited in Andrieseni farm, Iași county. *Lucrări Științifice, Seria Zootehnie*, 43/44, 327-330.
- Pascal, C. (2011). Researches regarding quality of sheep skin obtained from Karakul Botoșani sheep, *Biotechnology in Animal Husbandry*, 27, 1123-1131.
- Pipernea, N. (1979). *Improving the genetic structure of animal populations*. Bucharest, RO: Ceres Publishing House.
- Popa, R. (2009). *Improvement programs*. Bucharest, RO: Printech Publishing House.
- Taftă, V. (1983). *Breeding and intensive exploitation of sheep*. Bucharest, RO: Ceres Publishing House.
- Taftă, V. (1998). *The technique of evaluating productive performance in sheep*. Bucharest, RO: Ceres Publishing House.
- Taftă, V., Vintilă, I., Zamfirescu, S. (1998). *Production, improvement and reproduction of sheep*. Bucharest, RO: Ceres Publishing House.
- Thompson, A.D. (1938). *Karakul sheep - Government flock and the industry in South West Africa*. Windhoek, USA: John Meinert Publishing House.
- Schoeman, S.J., & Albertyn, J.R. (1992). Estimates of genetic parameters and genetic trend for fur traits in a Karakul stud flock. *S. Afr. J., Anim. Sci.*, 22, 75.
- Schoeman, S.J. (1998). Genetic and environmental factors influencing the quality of pelt traits in Karakul sheep. *S. Afr. J., Anim. Sci.*, 28 (3/4), 125-139.