DETERMINING THE CURRENT STAGE OF IMPROVING CURL UNIFORMITY IN THE COLOR VARIETIES BELONGING TO THE KARAKUL OF BOTOŞANI BREED

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Abstract

Within the performance control activities of the skin production, for the analysis of the uniformity of the curls, we focus on the main characteristics that influence the expression and the externalization of a genotype with a certain type or form of curl with approximately equal values of the basic dimensions. To create conditions for genetic expression of the uniformity of the type of curls, it is necessary to follow the improvement of the following parameters: the length, the height, the width, the degree of closure, spiral direction, the contour and the distance of the curls on the skin surface. The method applied in the assessment of the specific characteristics of the research carried out was based on the technical norms specified in Section 1.4 and 1.5 of the MADR Order no. 22/20.01.2006, and the statistical processing of the data was based on the use of the computer program S.A.V.C. The obtained results show that between the average score determined for this character in the grayish variety and the black one, the difference is insignificant but the one between grayish and pink and grayish and grey is significant for P<0.01%, and the one between grayish and brown is significant for P<0.05. In the brown variety it is found that if at the first generation since the establishment of the breed register the proportion of those with maximum score was 46.33% at the generation evaluated in 2015, it is found that at almost 70% a good uniformity is obtained, resulting in a progress 2.35% genetically for each successive generation within that 10-year period.

Key words: curl uniformity, Karakul of Botoşani sheep, pelts.

INTRODUCTION

The uniformity of all the curls from the skin surface has always been an important objective of improving the Karakul of Botoşani sheep because it also influences the way of expressing other characters such as length, degree of closure, width and height and is expressed in an original way on the general appearance of the skin, influencing their aesthetic and commercial value.

This character is a special criteria and an important objective of improving the quality of skins. The trend and the desire of the breeder is to create the technical conditions for producing some types of skins, to meet the existence on their surface of curl's uniform as type, size, degree of closure, spiral direction, alignment mode etc. (Buzu, 2018; Hrincă et al., 2014; Iñiguez et al., 2008; Mochnacs et al., 1978,

Nechifor et al., 2016; Pascal, 2001; Schoeman, 1998).

Enumerating these requirements that ensure uniformity emphasizes the complex aspect and the high degree of correlation of this character with other reasons for which the effect of the improvement is quantified with a lower intensity. Regarding this last remark it can be said that "no matter how rigorous the selection, it is not possible that within the same skins, even being elite there are only one or two forms of curls" (Taftă et al., 1996; Nechifor et al., 2019).

Another drawback that can reduce the effect of selection is because the uniformity of the curls is difficult to obtain due, they depend on many other characters.

Studies conducted in this regard show that on the surface of the skin the most uniform curls are arranged in the upper-posterior part (croup, shafts, spine); it follows in order of uniformity -

the lateral parts (the upper part of the thighs, flanks and ribs to the back); on the third place in the top of the expression of the desired type are the curls located on the chest and neck; the most uneven curls are arranged on the head, sternum and middle part of the abdomen (Evtodienco et al., 2019; Nechifor et al., 2014; Pascal et al., 1995; Pascal, 2015).

MATERIALS AND METHODS

The number of sheep from which the lambs came from, based on which the current status of the improvement was evaluated for the main characters on which the skins quality depends, is found in over 95% in the particular sector in the counties breeding area, the difference was represented by lamb obtained from SCDCOC Popăuţi - Botoşani sheep. The biological material analyzed was represented by the purebred Karakul of Botoşani lambs belonging to all the varieties of color, obtained over the course of three successive generations, originating from breeding seasons that took place in 2013, 2014 and 2015.

Uniformity of curls is appreciated by observing the lamb from distance on both sides of the body, establishing if exist one or more types of curls, as well as the occupied surface and their distribution way on different corporal regions. Function of those characteristics curl's uniformity could be: good, medium or weak.

In order to increase the degree of evaluation and, implicitly, the accuracy of the data regarding the characters on which the quality of the skins depends, the following conditions were met:

- from each flock, all the lambs were evaluated in the same place and under the same conditions;
- all the assessments were made during the morning, until noon;
- from each flock, all the lambs were evaluated by a unique technical personnel so that there would be the same level of exigency;
- every day, the evaluation started with the lambs of a lighter color and continued with those belonging to the darker varieties.

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 the computer software S.A.V.C. (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

Curl's uniformity represents one of the features which had a direct influence on pelts value. As much as the totality of curls are more uniform as type and shape on its surface, with that much the pelt is more valuable. Existence of only one type of curl is impossible from biological point of view, but also the situations in which are founded over 4 curl types are not admissible.

On the pelt of Karakul of Botoşani lambs the quality of curls differs. So, the most valuable curls are disposed on the upper-posterior side (rump, loin, dorsum); followed in order of quality by lateral sides (upper part of thighs, flanks and ribs till back); on the third place in curl's quality top are situated the ones from chest and neck; the weakest curls are disposed on head, stern and middle part of abdomen (Nechifor et al., 2019; Pascal, 2015; Pascal, 2011).

Evaluation of this character is made in the first day of life and in relation to how the uniformity is perceived, 50 points are awarded when over 65% of the curls have relatively similar characters, only 25 points when the presence of similarities is identified at 40% and 65% of the total of the curls, another 20 points when maximum 30% of the curls have a uniformity easy to record.

Processing data shows that the average score of this character has values higher than 43 points for the black and grayish variety, lower for the grey (26.69 points) and intermediate for pink and brown (39.59 and 39.87 points) (Table 1).

In the black variety the statistical calculation of the data shows in the first place the existence of genetic progress and in the second a degree with a different rate of improvement from the

first generation entered in the Genealogical Register of the Karakul of Botoşani breed (the one from 2005) until the last generation of lambs analyzed in these researches (2015).

If in 2005 the population of lambs subjected to the productive evaluation found that at a proportion of only 9.40% the uniformity of the curling was good, due to the intensification of the selection it reached that in 2015 more than 65% of the analyzed individuals have a good uniformity.

Table 1. The average score and statistical parameters for the uniformity of the curl according to the color variety

Color variety	no.	$\overline{X} \pm s_{\overline{x}}$	s	V%
Black	1158	44.93±0.460	10.065	22.430
Grayish	1184	43.07±0.326	11.199	26.001
Brown	431	39.87±0.595	12.287	30.818
Grey	533	26.69±0.208	4.75	17.795
Pink	106	39.59±0.537	12.576	32.628

Also, compared to the same year, the cases in which the lambs presented an accepted modeling increased from 67.82% to almost 81% in 2013. Regarding this maximum level, reached in 2013, because the increased exigencies in appreciating this character there is a decrease of this lambs category by 7.98%.

By granting the maximum score to the lambs that present 75% of a high degree of uniformity it has the role of amplifying the externalization in genotype of this character, and the curls to have a higher degree of uniformity expression for length, width, height etc.

For the grayish variety, the average score calculated for this character was 43.07 ± 0.326, which indicates that the improvement is in real progress. The efficiency of selection and genetic progress is also supported by the fact that with each generation there is an increase in the proportion of individuals with good uniformity of curls. Compared to 2005, the proportion of those with a good uniformity increases from 68.79% to 86.89%, which indicates an improvement of this character by about 1.81% per generation (Table 2).

These data suggest that the process of breeding amelioration is performed in the desired sense and is easy to quantify, and is also supported by the fact that individuals who showed low uniformity were totally eliminated from the population.

To present the evolution of breeding degree for curl's uniformity function of season and color variety the obtained data for appreciation of the desired character are synthesized in Figure 1. Their analysis shows different situations for those five color varieties and implicit the fact that curl's breeding under the aspect of uniformity is situated on different levels.

At evaluation of the character represented by curl's uniformity was observed that in each of those three seasons from which lambs were gathered the highest score was obtained in the case of appreciation of black and grayish lambs.

In the case of both varieties the mean score for a good uniformity was higher than 72 points and the highest level of the score was recorded in the case of evaluation of grayish lambs obtained in the calving season from 2015. In this case, at effectuated evaluations was observed that a high rate of studied lambs, curl had an increased uniformity and in the case of majority of curls distributed on pelts surface those ones had almost the same shape and dimensions as length, height and width.

At pink and grey varieties due to the fact that those ones are composed colors, the white fibers located in curl's structure had a greater length face to the dark one, so curl is more irregular.

A diminishing of curl's uniformity could be observed at these varieties also regarding curl's shape, the ones with short, large and high tubes are dominant.

Generally, at brown, grey and pink variety the effectuated appreciations indicate a reduces degree of character breeding, aspect highlighted also by the fact that mean score was between 63.34 points at grey lambs appreciated in 2014 and 69.82 points at the brown ones evaluated in 2015.

Therefore, for increasing the uniformity degree of curls is imposed an intensification of breeding based on the increasing of selection degree and a better matching of mating.

Efficiency of color breeding in the case of homogenous mating is measurable when it is working with small batches or sub-populations, at which are assigned valuable breeders with features at least at the level of the animals from those batch (Pipernea, 1974, cited by Creangă, 2007).

Regarding the statistical significance of the differences, it is found that between the average score determined for the grayish variety and for other colored varieties (grey and pink) they are significant for the P<1 threshold and the one between the grayish and brown is significant for the 5% threshold, and between grayish and black no significance of the differences for the statistical thresholds taken into account is recorded (Table 3).

At the brown variety the process of improvement is in full development - an aspect that is easy to highlight from the analysis of the proportion of lambs from each generation that have met the minimum requirements for granting the maximum score. Thus, if at the first generation since the establishment of the breed register the proportion of those with the highest score was 46.33% at the evaluated generation in 2015, there is an increase of 23.49%, representing a genetic progress of 2.35% per generation newly obtained. Also, the lack of lambs with low uniformity shows the efficiency of selection and improvement of this character.

Continuing the selection, at least at this level of intensity, will cause the share of lambs with a phenotypic expression characteristic of an accepted uniformity to generate a constant increase in each generation, but also to increase the average score above the level of 39.87 ± 0.59 as it was obtained in 2015. Another argument of the good direction in which the improvement of this character takes place is represented by the lack of lambs whose uniformity is low.

In the pink and grey color varieties the process of improvement is slower because the current objective is to increase the size of the population. Therefore, only individuals who express in the genotype major deviations of the desired type are eliminated in the selection. This explains also that the average score has values less than 40 points in pink and less than 30 points in grey.

However, by the fact that for the pink variety the average score was 39.59 ± 0.53 and at the grey of 26.69 ± 0.20 it indicates a different level of improvement of the respective character in the two varieties of color. Keeping a minimum threshold for admission into the livestock and eliminating from the active population individuals who had a major deviation from the desired type has made the current generations subject to research, individuals whose uniformity type is undesirable to be greatly reduced or missing.

The improvement of this character in the grey variety is evidenced by the constant increase of the share of lambs with the desired type from 51.67% in the 2005 generation to 68.07% in 2015. In this case, the genetic progress achieved in the ten years was 1.64 which means that against the background of applied selection and breeding management, the number of their products will increase with a better expression for this character in phenotype.

Table 2. The frequency of individuals in relation to improving the curl's uniformity

| Color variety	Curl's uniformity	Frequency of the desired type per evaluation season (%)							
		2005		2013		2014		2015	
		n	%	n	%	n	%	n	%
Black	Good	107	67.82	380	79.50	450	80.79	343	72.98
	Medium	36	22.78	98	20.20	107	19.21	127	27.02
	Low	15	9.40	-	-	-	-	-	-
Grayish	Good	141	68.79	237	72.70	330	79.52	385	86.86
	Medium	36	17.56	89	27.30	85	20.48	59	13.14
	Low	28	13.65	-	-	-	-	-	-
Brown	Good	67	46.33	88	67.70	125	64.77	74	69.82
	Medium	54	37.70	42	32.30	68	35.23	32	30.18
	Low	23	15.97	-	-	-	-	-	-
Grey	Good	31	51.67	110	66.27	133	63.34	65	68.07
	Medium	18	30.00	56	33.73	77	36.66	90	31.93
	Low	11	18.33	-	-	-	-	-	-
Pink	Good	18	48.00	28	68.70	25	65.79	10	65.52
	Medium	9	26.47	13	31.30	13	34.21	19	34.48
	Low	8	25.53	-	-	-	-	-	-
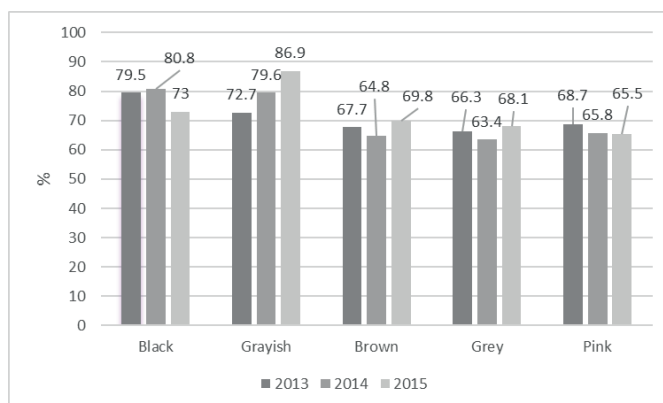
Figure 1. Evolution of the uniformity of the loop depending on the season and variety of color

Table 3. The difference and significance of difference for the uniformity of curl

Character 1	Character 2	Average difference	Difference meaning	Significance threshold
Grey	Grayish	3.48	significant	0.05
Grey	Brown	0.28	insignificant	-
Grey	Black	5.33	significant	0.01
Grey	Pink	1.05	insignificant	-
Pink	Grayish	4.53	significant	0.01
Pink	Brown	1.33	insignificant	-
Pink	Black	6.38	significant	0.01
Black	Grayish	1.85	insignificant	-
Black	Brown	5.06	significant	0.01
Brown	Grayish	3.20	significant	0.05

Statistical data processing shows that the difference between the mean scores was significant for the P<1 threshold between grey x grayish, pink x grayish, grey x black, pink x black and black x brown.

In lambs from the pink variety, the situation of the current level of improvement is in the same coordinates with that described at the grey, but the expression of this character is lower also on the background of the intensification of the selection and in the desire to increase the degree of similarity in the phenotypic expression of this character the proportion of lambs that had a uniformity that allowed the maximum score to be kept relatively at the same level, but with a tendency to reduce.

The data obtained highlight that the breeding program of the Karakul of Botoşani breed is efficient and allows a positive quantification of the way of expressing the specific characters of the skin production as a direct effect of the breeding. As a whole, all the data obtained converge in meaning with others found in the specialized literature determined for other populations of the Karakul of Botoşani breed (Cloete et al., 2014; Pascal, 2011; Pascal, 2001; Pascal et al., 1995) or for other breeds grown for fur production (Albertyn et al., 1993; Buzu, 2012; Buzu, 2014; Gligvashvili, 1998).

When the population will consolidate and the number of individuals within it will allow that by raising the selection criteria, the process of improvement will be accelerated and the proportion of lambs with uniform curls will have a progressive directional evolution.

CONCLUSIONS

For the uniformity of the curl, there is a different degree of improvement, being more advanced in the black variety and greyish (where more than 43 points were obtained), lower in the grey (26.69 points) and in an intermediate phase at pink and brown (39.59 and 39.87 points).

In the black variety the improvement of the uniformity of the curl registers higher quotas compared to other varieties of color and is at a

net level higher than in 2005 when the desired form was identified at only 9.40% and in 2015 at over 65% of the individuals analyzed.

For the greyish variety, compared to 2005 the proportion of lambs with the desired uniformity increases from 68.79 to 86.89% in 2015, indicating an improvement of this character by about 1.81% per generation and an improvement in progress.

Between the average score determined for this character in the greyish variety and the black one, the difference is insignificant but the one between greyish and pink and greyish and grey is significant for the threshold of 1%, and the one between the greyish and brown is significant for the threshold of 5%.

When assessing the uniformity of the curls in the brown lambs, it is found that if at the first generation since the establishment of the breed register the proportion of those with maximum score was 46.33% at the generation evaluated in 2015, it is found that at almost 70% a good uniformity is obtained, resulting in a 2.35% genetic progress for each successive generation over that 10-year period.

The evaluation of the uniformity of the curl for the grey variety allowed obtaining an average score of 39.59 ± 0.537 and at the grey of 26.69 ± 0.208, a level which indicates the existence of a different current threshold for improving the respective character in the two colour varieties.

The differences between the average score given to the evaluation of the uniformity of the curl were significant for 5% only between greyish - brown and greyish - grey.

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