# ASSESSING THE CURRENT STATE OF IMPROVEMENT WHICH AFFECTS THE QUALITY OF FIBRES AT THE KARAKUL OF BOTOŞANI BREED

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**Abstract**

*The aim of the research was to assess the current state of improving some characters on which depends the quality of fibers of the loops from the Karakul of Botoşani breed. The importance and usefulness of these investigations is the fact those many of the characters on which the overall value of the pelts depend are influenced by length, thickness, gloss, resistance and elasticity of the fibers that make up the loop.*

*At the black variety through the improvements based on selection it has come that at the generations of lambs subjected to assessments, the average value was reduced gradually with 0.44% in 2013, with 1.94% in 2014 and in 2015 with 7.45%.*

*At the grey variety the constant of the selection for this character allowed the genetic progress to be even more obvious since in the same period that character has been reduced from 17.22±0.52 mm to only 15.98±0.23 mm, in which case the genetic progress obtained is represented by an improvement of this character with 7.2%.*

*Analysis of data related to the thickness of the fibers highlight the genetic progress and the varieties of black and grey color the current state of the average thickness of the fibers from the loop are sensitive smaller compared to the other color varieties, however, insignificant in terms of statistically for $p < 0.01$.*

*The frequency analysis of the lambs in relation to the mode of reflection of light, indicates an improvement of this character on the interval, by increasing the proportion from 47.03% at the generation evaluated in the 2013 season at nearly 52% in 2015, and the proportion of individuals presenting fibers with a good degree of smoothness, meaning the normal and silky type, was of 76.3%.*

*On the basis of the carried out research it can be said that the improvement of the Karakul of Botoşani breed is in progress, but to improve their respective characters is requiring the application of a progressive directional selection.*

**Key words:** Karakul of Botoşani, quality fibers, pelts

## INTRODUCTION

The usefulness and necessity of the present research is due to the fact that the Karakul of Botoşani breed, as a biological creation of recent date, is not fully known at national and international level.

The aim of the planned research is due to the fact that the breed Karakul of Botoşani has local and regional importance, as well as the complexity of the production characters and aims at assessing the current level of progress to improve the quality of pelts to identify new targets that, later on, to be included in a more efficiently program of improvement in order to improve the quality of the fibers from the loop, as well as the expression mode of the characters specific to pelt production.

Another aim of the research was to conduct a real assessment of the level of actual improvement specific to the entire population entered in the **Genealogical Register** of the breed, with the objective of determining the value of improvement of the rams used in breeding.

## MATERIAL AND METHODS

The analyzed biological material was represented by pure breed Karakul of Botoşani lambs belonging to all varieties of color, obtained on the interval of three successive generations, however, from

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lambing seasons that have taken place in 2013, 2014 and respectively 2015.

The work methods used were specific to the field of pelt production and statistical processing of the data and had the purpose to allow a real assessment of the current status of improvement of the quality of fibers from the loop in order to issue some technical and practical solutions which to support or enhance the improvement of the Karakul of Botoşani breed.

The method applied in the assessment of the quality of pelts has been based on the technical standards specified in Section 1.4. and 1.5. from the MADR Order No. 22/20.01.2006, published in the Official Gazette of Romania No. 146 from 15.02.2006 showing the aspects upon which it carries out **The official control of pelt production** and **Evaluation of body conformation and constitution at the Karakul**.

**Statistical processing of data** was based on using the computer program **S.A.V.C.** (Statistical Analysis of Variance and Covariance, 2003), and for testing the statistical significance of the differences between the averages of the values of the studied parameters and correlations between them, were used the algorithms *Analysis of the variables* (*ANOVA Single Factor*) and *Pirson Correlation*, both included in the computer program **S.A.V.C**.

## RESULTS AND DISCUSSION

All lambs obtained from herds included in the official control of production were subject to evaluations of the quality of pelts within two days of birth, regardless of variety or status of the looping and took three successive campaigns, corresponding to the calving season from the years 2013, 2014 and respectively 2015, and were compared with those obtained from the control performance from the first generation of lambs obtained since the establishment of the Genealogical Register, respectively the lamb generation from 2005.

**Length of fibers** constitute an important character on which depends the way of expression of the quality of the looping, following that through the work of selection to obtain specific dimensions situated between the limits deemed to be optimal for the formation of a particular type of looping. This is possible because the genotypes with different features can appear in every animal generation only by grouping together independent parental genes, transmitted through the gametes at the time of fertilization [5].

The effect of the selection applied to the quality of the fibers which form the looping is very well highlighted by studies and research carried out on the African Karakul sheep type, by Thompson [1938]. In the case of research carried out at Windhoek, Namibia, decided that among the objectives of the selection carried out at Karakul to be included and some characters which influence both skin quality and the coating fibers, especially those concerning the requisite flexibility and thickness of the dermal layers and length and gloss of coverage fibers and thereby helping to obtain Swakara type pelts.

Considering the importance of this character in the research was determined the length of the fibers in relation to the livestock and the variety of color (table 1) and from the data analysis is confirmed a genetic progress obvious as an effect of selection applied to these characters.

Table 1 The average length of the fibers from the loop in relation to the variety of color (mm)

| Genotype | n | Frequency per evaluation season | | | |
|---|---|---|---|---|---|
| | | Values quoted in literature | 2013 | 2014 | 2015 |
| | | $\overline{X} \pm s_{\overline{X}}$ | $\overline{X} \pm s_{\overline{X}}$ | $\overline{X} \pm s_{\overline{X}}$ | $\overline{X} \pm s_{\overline{X}}$ |
| Black Karakul | 75 | 13.41±0.71* | 13.35±0.70 | 13.15±0.14 | 12.41±0.26 |
| Grey Karakul | 75 | 17.22±0.52** | 16.48±0.23 | 16.59±0.62 | 15.98±0.23 |
| Brown Karakul | 50 | - | 16.88±0.32 | 16.33±0.38 | 16.08±0.43 |
| Grizzle Karakul | 50 | - | 15.24±0.83 | 15.84±0.16 | 15.08±0.44 |
| Pink Karakul | 25 | - | 16.05±0.37 | 15.85±0.37 | 15.25±0.20 |

*Pascal 2011; **Pascal et al. 1995

*The black color variety*, because the identified type is represented by long loops formed by short fibers, which generate loops with a reduced height, is found an obvious improvement of this character. Thus, if the research carried out in 2011 [6] show that the average length of the fibers was of 13.47 mm, through the improvement based on the selection has resulted that the generations of lambs subjected to assessments, the mean value of fiber length to be gradually reduced with 0.44% in 2013, with 1.94% in 2014 and with 7.45% in 2015. In these circumstances it can be said that by complying with the objectives set by the plan of improvement and under severe selection of breeders, it was able that on the interval of only four successive generations the average length of the fibers to be reduced by 1 mm.

*The grey variety* the constant of selection for this character allowed the genetic progress to be even more obvious. In the same period the average length of fibers decreased from 17.22 ± 0.52 mm to only 15.98±0.23 mm, in which case the genetic progress actually realized is represented by an improvement of this character with 7.2%. This is due to the fact that have been apprehended through the applied selection only individuals presenting the type of normal tint because they have a ratio between the black and the white fibers at a level close to the optimal one. Knowing that the white fibers are longer than the black ones, if desired type would have been represented by the increase in the phenotype on the tint where the dominates are white fibers, due to the fact that their proportion exceeds 75%, the effect of the selection would be set at a lower level.

Obvious improvements have been noted in the case of research of the same character and at brown, grey and pink varieties. In all cases, by reducing the dimensions of length is proven the effectiveness of selection, and by maintaining this character between the basic goals of improving it can be concluded that in every generation the average value will gradually reduce to a range of 13-14 mm, meaning the desired optimal because it facilitates a better expression of other characters at the level of quality of pelts.

The stabilization of this character at this level will facilitate the emergence of individuals at which the tubular looping and its uniformity will be very well expressed. If the market trends will change, being required pelts with a broad looping, incomplete, flattened and glossy, then the selection should be intensified in order to increase the genotypes at which the average length of the coverage fibers to be reduce under 11 mm.

**Smoothness of the fibers** represents an important objective of selection applied to the lambs of the Karakul of Botoşani breed. The thickness of the fibers is critical in defining the type of loop, and pursuing an indirect influence on the expression mode, but also upon the delineation of the looping type and of the glaze. Also the uniformity of thickness of fibers has a special influence in shaping the type of loop. Knowledge of these issues is extremely useful for improving the quality of pelts.

Studies carried out in our country [7, 8, 10] point out the fact that when is wished to obtain the tubular loops with a high closing degree the fibers from the loop should be thinner at the top, intermediate in the middle and thicker at the base.

Data analysis shows the genetic progress resulting from the selection applied by holding for breeding the genitors from the Karakul of Botoşani breed. At the varieties of black and grey color the current state of the average thickness of the fibers from the loop are sensitive smaller but insignificant statistically for $p < 0.01$.

Comparison of actual values determined for the grey variety is found that on the interval of ten successive generations the average thickness was reduced by only 1.8%. Even at this level, the average size of this character is more than 1 μm towards the optimal desired growth, respectively of growth in the structure of the loop of the fiber proportion where the average thickness is less than 33 μm.

Reducing the thickness of the fibers from the loop as a basic condition in order to increase the quality of pelts is supported by the results of other research carried out in the country and abroad [1, 9, 7] and indicating that a good quality of the sheathing is associated always with a length and thickness of fibers of 9-12 mm and respectively of 30-33 μm. All these characteristics are in a close correlation and participate directly in the definition of a particular type of looping, but

also in the expression of the gloss, resistance and elasticity.

At the brown variety during the three successive generations is found a stabilization of the thickness of the fibers from the loop around the average value of 34 µm. The other two varieties of color respectively grey and pink, it can notice a slight upward trend in the thickness of the fibers as effect of the weakening of the selection because, in both versions, the main objective of the selection for this phase was to increase the number of individuals. After this goal will be achieved will proceed to the intensification selection of individuals to improve all the characters on which depends the quality of fibers from loop.

Table 2 The average length of the fibers from the loop in relation to the variety of color (µm)

| Genotype | n | Frequency per evaluation season | | | |
|---|---|---|---|---|---|
| | | Values quoted in literature | 2013 | 2014 | 2015 |
| | | $\overline{X} \pm s_{\overline{X}}$ | $\overline{X} \pm s_{\overline{X}}$ | $\overline{X} \pm s_{\overline{X}}$ | $\overline{X} \pm s_{\overline{X}}$ |
| Black Karakul | 75 | 33.50±2.10* | 33.53±0.48 | 33.26±0.41 | 33.01±0.31 |
| Grey Karakul | 75 | 34.72±0.18** | 34.61±0.13 | 34.28±0.33 | 34.08±0.20 |
| Brown Karakul | 50 | - | 34.18±0.71 | 34.33±0.76 | 34.12±0.31 |
| Grizzle Karakul | 50 | - | 33.22±0.03 | 34.74±0.14 | 35.38±0.65 |
| Pink Karakul | 25 | - | 35.05±0.37 | 35.25±0.34 | 35.36±0.20 |

*Pascal 2011; **Pascal et al. 1995

The general conclusion that emerges from the research conducted concerns the fact that only at the black variety is found that this parameter is associated with values which entail a better expression of the quality of fibers. Also, according to the trend of the future, including among the objectives of improvement and some issues that could facilitate a more significant reduction, of the thickness of the fibers, entails a greater selection of animal breeders in order to improve consistency and a shifting of the weighting of the values considered to be optimal for this character.

**The gloss of fibers** represents the property of the fibers to reflect light with a different intensity. As a parameter of quality, gloss is dependent on several aspects such as: the number of fibers, bowing degree and last but not least the uniformity, but also the shape and the edges of the cells within the cuticle layer level.

The effect due to improvements for gloss and smoothness is hard to quantify and promote because both characters are evaluated through criteria purely subjective. The great practical advantage is represented by the fact that they are correlated positively and intense, which makes the improvement of one draw a moving of the average values, in the sense desired, and for the other character.

Frequency analysis of the lambs in relation to the mode of reflection of light indicates an improvement of this character on the respective interval, by increasing the proportion from 47.03% at the generation evaluated in the 2013 season at nearly 52% in 2015. It further notes that in relation to the level recorded in 1990, a regression occurs, with more than 10% (table 3). In 1974, a study conducted on sheep lines formed in the Karakul of Botoşani breed, Marin et al. [1974] shows that the proportion of lambs at which the gloss was intense and good exceeded 90%. The emergence of this situation represents a negative deviation from the direction of improvement of the breed Karakul of Botoşani and represent a direct consequence of the effect due to the abandonment of evaluation activities and control of the character and performance on which depends the quality of pelts, but also of deviations from the selection criteria of breeders that took place in the period immediately after year 1990.

Table 3 Fitting of lambs according to the gloss of fibers
The dynamics of evolution for the fibers gloss

| Fiber gloss | Frequency per evaluation season | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | | 2013 | | 2014 | | 2015 | |
| | **n=194** | **%** | **n=1163** | **%** | **n=1441** | **%** | **n=1213** | **%** |
| **Intense** | 128 | **65.97** | 547 | 47.03 | 702 | 48.71 | 627 | 51.69 |
| **Very good** | 56 | 28.86 | 418 | 35.94 | 572 | 39.69 | 426 | 35.12 |
| **Good** | 7 | 3.60 | 165 | 14.18 | 168 | 11.66 | 103 | 8.48 |
| **Weak** | 3 | 1.57 | 33 | 2.85 | 53 | 3.67 | 57 | 4.71 |

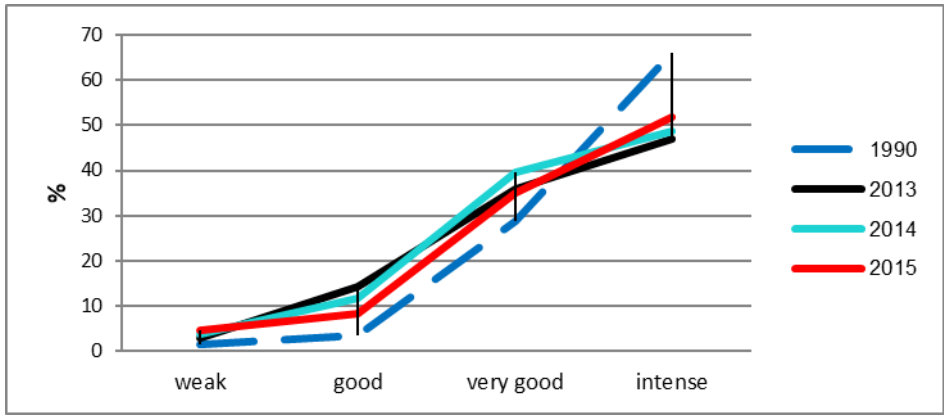


Fig. 1 The dynamics of evolution for the fibers gloss

The present state of improvement can be also established by comparing the results obtained with others included in various bibliographic sources. If in the year 1977, the luster of fibers, at the black variety, was very good at a ratio of 22.9% [3], at the assessment of the same character, Hrincă et al. (1991), indicates that at just 16.67% of the total number of individuals the luster was of intense type, and at the 77.51% was just very good.

**Silkiness and elasticity of fibers** are high-quality characters and represent the perception had when the hand goes over the sheathing present on the surface of pelts. From the data presented in table 4 it is found that the generation of lambs obtained after the campaign of mount/calving from 2012/2013 the proportion of those showing fibers with a good grade of silkiness, meaning the normal and silky type, was of 76.3%. Even at this level, it can be seen that this character is expressed well below the level determined at the lambs assessed in the evaluation mark season from year 1990, when the proportion of those with silky fibers was 71.65%.

Table 4 Classification of lambs according to the silkiness of fibers

| Silkiness of fibers | Frequency per evaluation season | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | | 2013 | | 2014 | | 2015 | |
| | n=194 | % | n=1163 | % | n=1441 | % | n=1213 | % |
| Silky | 139 | **71.65** | 514 | 44.20 | 718 | 49.82 | 614 | 50.61 |
| Normal | 47 | 24.23 | 373 | 32.08 | 502 | 34.83 | 435 | 35.86 |
| Rough | 5 | 2.58 | 216 | 18.57 | 168 | 11.66 | 143 | 11.78 |
| Soft | 3 | 1.54 | 60 | 5.15 | 53 | 3.67 | 21 | 1.75 |

In 2015, due to an accurate match of breeding pairs, an obvious improvement of these characters in observed, and as a directly affect the share of lambs that has a favorable

exteriority located at a desired level by the farmer was of 85%. The proportion of lambs with the desired type increased in 2015 relative to 2013 by more than 6%, the difference being significant for $p < 0.01$.

At the generations of lambs that were the subject of current research is found a significant reduction in lying around the value of 50% of the fibers with a high degree of silkiness. Basically, it can be said that the improvement for this character is far from being regarded as evident and positive. Furthermore, in some research conducted by Marin et al., 1974, is highlighted that the herd of lambs belonging to the lines 5 and 1557 the proportion of those which had elastic fiber and of good quality exceeded 55%, and this value is higher than the results obtain at the evaluation of all lambs from the three seasons, fact which entitles us to conclude that the improvement for this character should be reassessed and strengthened.

The evaluation of this character on the four generations of lambs show that there has been a drastic decrease of the silkiness of the fibers as a result of abandonment in the first period, after 1990, of making a productive control and the obligation to issue mating guiding lists. In these circumstances, if in 1990 the share of lambs with silky and elastic fibers exceed 70% of the evaluated generation, in 2013 decreases to 44.20%, and in 2014 has a slightly increase of 5.62% from the previous year's assessment.

From the data presented in table 5, it is established that the rough looping relates, always, in a higher proportion of fibers, with a vitreous luster and a low elasticity. In other researches, Zakirov [cited by Taftă, 1998], show that the rough looping, lacking in elasticity, is associated with, always, a glassy and mat luster at the rate of over 80% of cases.

Table 5 The relation between silkiness, gloss and elasticity of fibers (n=3817)

| Fibre luster (%) | Fiber quality characters | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Silkiness | | | | | Elasticity | | | |
| | Very silky | Silky | Weak | Rough | Dry | Very good | Good | Medium | Weak |
| Intense | **76.28** | 21.31 | 2.21 | - | - | **78.16** | 20.04 | 1.80 | - |
| Normal | 15.35 | **73.45** | 6.25 | 3.55 | 1.40 | 18.05 | **77.09** | 3.06 | 1.80 |
| Low | 4.73 | 2.19 | **93.08** | - | - | 2.46 | 10.13 | **82.98** | 4.53 |
| Glassy | 3.64 | 2.77 | 2.03 | **87.23** | 4.33 | - | 1.33 | 6.54 | **92.13** |
| Mat | - | 2.74 | 3.22 | 15.08 | **78.96** | - | 1.66 | 15.66 | **82.68** |

At the evaluated lambs is observed that the desired relation, respectively the presence of silky fibers, elastic and with intense luster, was identified at a ratio greater than 75% of the total, which suggests that the improvement of this character can register higher levels of expression in the period ahead.

## CONCLUSIONS

1. The value of the results of these investigations as well as the evaluation degree of improvement for specific characters of pelts is sustained by the fact that the biological material was represented by lambs proceeding from sheep entered in the Genealogical Register (Main and Secondary Section), representing, in fact, the most valuable nucleus of the sheep from the Karakul of Botoşani breed.

2. Evaluation of the degree of body development for adult categories highlighted some differences statistically insignificant for the approved varieties, indicating an obvious genetic stability for this character.

3. The analysis of the indicators on which depends the perpetuating of the species shows a high fecundity, but the prolificacy average has lower values than 110%, due to the fact that it is not desirable to obtain more lambs because it entails a reduction in the total area of pelts.

4. From the total of 5361 heads submitted in the Genealogical Register, 63.72% are located in holdings from Botoşani County.

4.1. The difference of 36.28% is recorded in four other counties, but in different proportions (Vaslui, Iaşi, Neamţ and Suceava).

4.2. Vaslui County, although has smaller numbers in comparison to Iaşi and Neamţ, is placed immediately after Botoşani County, having 16.04% individuals registered in the Genealogical Register, in the County of Iasi only 14.16% and 1% in Neamţ.

5. Evaluation of the length of the fibers at the generations of lambs subjected to assessments show a progress and a selection efficiency for this character because it establishes a gradual reduction with 0.44% in 2013, with 1.94% in 2014 and with 7.45% in 2015, approaching the average value of 12 mm which is associated with a more correct expression for the other characters of this production.

5.1. Due to the lengthy selection it is found that at the grey variety the average length of the fibers from the loop had a positive trend, dropping from 17.22±0.52 mm to only 15.98±0.23 mm very important aspect because the stabilization of this character, at this level, will facilitate the emergence of individuals at which the tubular looping and its uniformity will be better expressed.

6. The smoothness of the fibers from the loop has seen a noticeable improvement in all varieties, but the stabilization of this character at a level that is associated with a good quality looping is found in several varieties.

6.1. At the black variety the improvement of this character is more advanced and if the same intensity of selection in the following generations is maintained, it will stabilize around the value of 13 µm.

7. Frequency analysis of the lambs in relation to the mode of reflection of light, indicates an improvement of this character and a proportion increase of lambs from 47.03% at the generation evaluated in the season of 2013 at nearly 52% in 2015

8. The gloss of the fibers has been improved considerably as a result of a more accurate match of breeding pairs, and in 2015 the proportion of lambs that presented the desired type for this character was of 85%.

9. The proportion of lambs with the desired type of silkiness increased in 2015 related to 2013 by more than 6%, and the difference between the average values was significant for $p < 0.01$.

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