

RESISTANCE PARTICULARITIES AND CURLING OF THE CURLS AT THE MOLDAVIAN KARAKUL LAMBS

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Abstract

The purpose of this scientific paper was to focus on the peculiarities of resistance and rolling of curls at the Moldavian Karakul lambs, and to reveal the relations of these attributes with other qualities and characteristics of the skin for the improvement of the lamb selection procedures of the requested type. The scientific researches were carried out on the lots of Moldavian Karakul lambs from the ewe flock of Experimental House „Tevit” of the National Institute of Animal Husbandry and Veterinary Medicine (INZMV) from Maximovca village, Anenii Noi district and Agricultural Production Cooperative (APC) “Agrosargal” from the Sarata Galbena village, Hâncești district. The nonparametric properties of the curl have been researched according to the methods elaborated or perfected by us, in accordance with the Karakul ewe Guidelines for Breeding with the amelioration principles in the Republic of Moldova. It was found that with the increase of the length of the curls from the short to the very long category, increases the share of lambs with excellent resistance from 3.9% to 100% or by 96.1% ($td = 36.7$; $P < 0.001$) and, at the same time, lowers the low lame weight with low and insufficient curls strengths from 85.7% to 0.0% ($td = 6.0$; $P < 0.001$). With the increase in the degree of silkiness of the sheathing of lambs from reduced to excellent, the overall weight of individuals with the excellent and suitable curls strength is significantly increased from 46.3% to 91.7% or by 45.4% ($td = 9.2$; $P < 0.001$). For lambs with jacket curl type, the mixed (59.5%) and cranial (32.5%) of curls rolling direction is characteristic. For the lambs with the flat and coastal curl type it is characteristic the caudal direction of curls rolling (92.4 and 95.0% of the cases). Lambs with the type of kaukasian curl have, for their part, an indeterminable direction (60.8%) of curls rolling. It is considered that the lower degree of slaughter in lamb is more advantageous because it offers the possibility of retaining the lamb for a few days (4-5 days) before slaughter until the degree of ablation reaches 10-11 points. During this time, the surface of the skin and the body mass of the lamb will increase, which leads to the obtaining of the economic benefits. The most desired degree of rolling at birth is considered to be 5-7, while grade 10-11 already indicates the need to slaughter the lamb. Finding that the degree of the curls rolling increases daily by 0.3 points and the lamb can be retained until reaching 10.5 points, we have determined that lambs with jacket curl can be detained up to at slaughter for 1-2 days, those with the type of coastal curl 4-5 days, those with the type of flat curl 6-7 days, and those with the kaukasian curl require urgent slaughter. As a result of the research, the following conclusions were deduced: the strength and elasticity of the curls at the Moldavian Karakul lambs is in a phenotypical correlation positive and evident with the length of the curls, the fibres density and the density of the skin, and, at the same time, negative with the length of the fibres. The best resistance of the curls is found at the lambs with valuable, long and very long curls, with short and med. long fibres, with excellent and suitable silk, with supple and dense skin; The direction of curl abutment is in positive correlation with the type of modelling, with the qualities of the fibres, especially with their silk and gloss. So, the better the qualities of the hairpiece, the more the rolling direction of the curls is more valuable - to the head, tail or mixed (sinusoidal); The rolling degree of the curls is in a genetically negative (but beneficial for selection) relationship with the type of curl and the lamb class at the evaluation. The smallest degrees (but, desired - 6 and 7 points) are recorded in lambs with med. and large curls, with flat, coastal, and jacket type of curl. The highest degree of rolling (undesired - 12 points) was recorded at lambs of class II with the type of kaukasian curl; The knowledge of the resistance and elasticity relationships, as well as curling of the curl with a string of other characters of the curls and hair fibres allowed the selection of the most valuable lambs in the breeding lots of the new sheep type Moldavian Karakul.

Key words: Peculiarities, resistance, elasticity, curling, curl, Moldavian Karakul

INTRODUCTION

The curl of the Karakul lamb as a whole

is composed of curls of different types (wave, bob, horns, rings, peas, corkscrew, mirrors, deformations), various forms (tubular, coast, length, height). These are, as such, parametric properties of the curls and the curl as a whole, which are of great importance in the formation of the qualitative value of the skin.

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At the same time, besides these curl properties, there are a number of other attributes, called new nonparametric properties (which cannot be measured), which are important, not less in the evaluation of skin quality. Among these are: the strength and elasticity of the curls, the rolling and the degree of rolling of this. Resilience and elasticity of the curl are associated as a complete acquisition, as these two notions are inextricably linked to one another and are manifested simultaneously. By resistance, in particular, it is understood that the curl's property is opposed to the external mechanical action on it. By elasticity it is understood the curl's property of doubting the mechanical action from the outside and of returning to its original form after the ceasing of the action of this force, which imposed the temporary deformation of the curl. The direction of the curls curling represents meaning where the curls curling ends with the peaks of the coating fibres, distinguishing between the following directions: *cranial* - head, *caudal* - tail, *mixed or mixed* - when the curls have a linear sinusoidal (mixed) arrangement, When the curling of the curls on different body regions is in different directions, and, *indefinable* - when each curl has different direction of rotation, and in the curls of the rings, simians, peas, corkscrew is impossible to determine, Is not parallel to the skin, but may have different tilt angles to a perpendicular position. The degree of curling represents the length of the circle segment of the curl cross-section (curling). Among the nonparametric properties of the curls, the strength (elasticity), the direction and the degree of their rotation are important for the exploitation of Karakul leather garments. The garments made from the resilient and elastic curtains with the desired direction and degree of abrasion are more durable when worn and more demanded on the market. In the special literature, most scientific papers are devoted to the research of the parametric properties of the curls and the curl as a whole. Particularly these were investigated by academician Иванов М.Ф. and his collaborators at the Moscova Institute of Oviculture [18, 19, 20, 21] and the Askania Nova Step-by-Step Animal Breeding Institute, Herson [28], by academician Vasin B.N. - at the Moscow Fencing Institute [11], by Professor Гигинейшвили Н.С.- at the Union of Animal Husbandry in Dubrovîți [12, 13], by

the researchers of the Scientific Institute for Scientific Research on Karakulture in Samarkand, Uzbekistan: Дьячков И. Н., Письменная Р. Т., Закиров М., Каримов К., Кошевой М. А., Ролдугина Н.П. et al. [14, 15, 16, 17, 24, 32] as well as researchers at the Neidam Research Resort in Namibia, South Africa [25, 26, 27, 34, 35]. The nonparametric properties of the Karakul lambs' laughter were less analysed in our research [1, 2, 3, 4, 5, 6] and in the work of other researchers [9, 30, 31, 33].

In the territory of the Republic of Moldova, the most profound research of the curl of Karakul lamb was carried out by Th. Nicov [8], who for the first time described the parametric and non-parametric properties of the curls. Subsequently, Prof. Ильев Ф.В.[23] and zootechnist engineer Богданович Н.И. [10] described the variability of the curl properties at the metists lambs (Țuşca x Karakul), resulting from the crossing of the local Tsuşca sheep with the Karakul rams Asiatic type up to the third generation. Therefore, we can see that the level of knowledge about the properties of lamb loaf for the skin is a valuable database in the field and refers predominantly to the Asian Karakul race and less to the metists lambs of local races.

Appreciated positively the existing researches value in the field, we can also mention that the variability of the nonparametric properties of the curl at the Karakul lamb, especially to the Moldavian types, is not sufficiently elucidated. Correlative relationships and factors that influence the manifestation of non-parametric properties of the curl are not fully revealed.

Based on these, the knowledge of the degree of manifestation of the non-parametric properties of the curls and the relationships of these attributes with other skin features is a current problem for the efficiency of the selection process. In this context, the purpose of this work was to highlight the peculiarities of resistance and curling of the curl at the Moldavian Karakul lambs and to reveal the relations of these attributes with other qualities and characteristics of the skin for the improvement of the lamb selection procedures of the requested type.

MATERIAL AND METHODS

The scientific researches were carried out on the lots of Moldavian Karakul lambs from the ewe flock of Experimental House „Tevit” of the National Institute of Animal Husbandry and Veterinary Medicine (INZMV) from Maximovca village, Anenii Noi district and Agricultural Production Cooperative (APC) "Agrosargal" from the Sarata Galbena village, Hâncești district.

The nonparametric properties of the curl have been researched according to the methods elaborated or perfected by us [3], according to the Karakul Sheep Welfare Guidelines for Breeding Principles in the Republic of Moldova [7]. In particular, the *strength* and *elasticity* of the curls was determined by hand palpation of the lambs and skin sorting. According to the instructions in force, curls strength and elasticity has been assessed and differentiated into four terminological stages: *excellent*, *suitable*, *low (weak)* and *insufficient*.

Curls with *excellent* resistance are characterized by returning to the original form, regardless of the size and duration of the mechanical force they have acted upon. On palpation, it is obviously the curl relief through their durability. No matter how we try to deform the curls, we will not succeed because they return to their original form. Curls with excellent resistance are appreciated, at the evaluators latitude, 8-10 points and are the most valuable. Curls with suitable (good) do not oppose hard resistance to palpation, but they feel their relief anyway, so they are considered to have good resistance. After the action of the mechanical force, the curls also return to their original form. This degree of strength and elasticity of the curls is appreciated by 5-7 points. Low (reduce) resistance and elasticity is considered when, after the action of mechanical force, the curls partly do not fully return to the initial form, and when feeling

palpable, the softness of the curls is felt. This degree of resilience and elasticity is appreciated by 3-4 points. Insufficient resilience and elasticity is considered if the curls, after the action of the mechanical force, do not return to their original shape, and when sensed by the palpation, the sensation is soft as cotton. With good standing, this degree of resilience and elasticity is appreciated by only 1-2 points.

The curls curling direction was determined by the boning of the lamb by flating the curl with the hand on the crotch and the lamb's spin in longitudinal (cranial, caudal) directions. If the curls, on flating, improved the modelling and shape, the flating direction coincided with the direction of rotation, and vice versa, if the curls curved (deformed) their shape and modelling, the flating direction was reverse to the direction of rotation. In case of, on flating, both in a longitudinal direction and in another, part of the curls did not corrupt their shape, and another part deformed, the direction of spin was considered to be mixed. The direction of *cranial* obliquity of the curls is estimated with 8-10 points, the *caudal* - by 5-7 points. The *mixed* or *combined* direction of the curls is characterized by the simultaneous alternation of several types of mixed curl with the linear arrangement of the curls in sinusoidal form. In qualifying, this direction of rotation is appreciated by 3-4 points. The indeterminable direction of curls curling is considered when each curl in part has an independent rudder direction disordered relative to the others, therefore virtually lacks a general curls rotation direction as a whole on the skin. This type of curling is appreciated by only 1-2 points. The curling degree of the curls was determined by estimating the length of the circle segment of the cross section of the tubular curl formed by spliced fibers (curling) (Fig. 1).

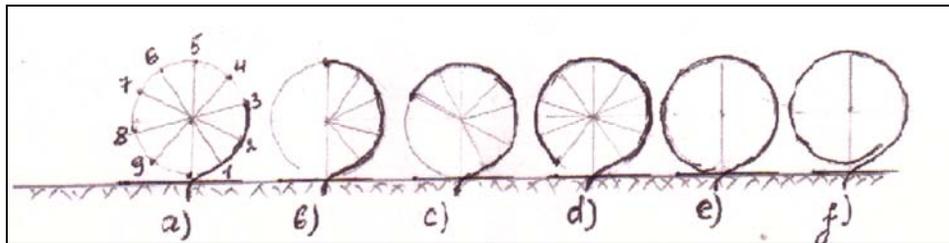


Fig. 1. Sketching of the curling degree

a) degree of curling = 3; b) degree of curling = 5; c) degree of curling = 7; d) degree of curling = 9; e) degree of curling = 10; f) degree of curling = 11.

If we imagine that the cross section of the fully spelled curl represents a circle that we divide into 10 parts, the degree of curling of the various curls can oscillate from 1 to 10. If the spin of the curl fibres forms a closed circle, it is considered equal to 10 units. There are curls in which the degree of junction extends beyond the full circle and begins the second junction parallel to the first, so the degree of curling of the curl is more than 10 and can be equal to 11, 12 etc.

The data obtained as a result of the research were statistically processed using the computerized software "STATISTICA - 12" and their certainty was assessed, according to variational biometric statistics, according to Плохинский Н.А., 1989 [29].

RESULTS AND DISCUSSIONS

The **strength** and elasticity of the curls, as well as other qualities of the skin, are hereditary and conditioned by some environmental factors, such as: the nutrition of the sheep in the gestation period, especially during the second period. Optimal nutrition, balanced in the nutrients needed, especially in proteins, with a high sulphur content, contributes to increasing the strength and elasticity of the curls [32, 33]. Our research has shown that the curl strength is positive and evident phenotypical correlation with the length of the curls, the fiber density and the density of the skin, and, at the same time, the negative length of the fibres (Table 1).

We have revealed that the best strength of the curls was found at the lambs with very long curls. Virtually all the lambs (100%) of this batch had excellent curl strength. In the group of lambs with long curls, individuals with excellent resistance (83.6%) and suitable (15.8%) of the curls also predominate. At the lambs with med. long curls predominate the right strength (58.6%) and excellent (32.6%) of the curls. At the same time, the lambs with the short and very short curls have predominantly low resistance (66.7-57.1%) and insufficient (0.5-28.6%) of the curl s. With the increase of the length of the short to the very short lengths, the lambs increase with excellent resistance from 3.9% to 100% or 96.1% ($td = 36.7$; $P < 0.001$) and, at the same time, decreases lower the summary weight with low resistance and insufficient curl strengths from 85.7% to 0.0% ($td = 6.0$, $P < 0.001$). Therefore, there is a positive correlation between the length of the curls and their resistance, which adds to the increase in the efficiency of the selection after these characters.

The loop strength is in a positive relationship with the silk of the fibres. We have found that with the increase in the degree of silkiness of the sheathing of lambs from reduced to excellent, the overall weight of individuals with the excellent and appropriate loop strength significantly increases from 46.3% to 91.7% or by 45.4 % ($td = 9.2$; $P < 0.001$).

Table 1 Resistance of curls at the Moldavian Karakul lambs depending on their length, the qualities of the fibres and the skin

Specification	Effective of lambs, head	Resistance of curls							
		Excellent		Suitable		Reduced		Insufficient	
		head	%	head	%	head	%	head	%
Depending on the length of the curls ¹									
Very long	22	22	100***	-	-	-	-	-	-
Long	311	260	83.6***	49	15.8	2	0.6***	-	-
Average	476	155	32.6***	279	58.6***	42	8.8***	-	-
Shot	180	7	3.9	52	28.9	120	66.7	1	0.5
Very shot	7	-	-	1	14.3	4	57.1	2	28.6
Depending on the silkiness of the sheeting ²									
Excellent	433	251	58.0***	146	33.7	36	8.3***	-	-
Suitable	420	136	32.4***	211	50.2***	72	17.2***	1	0.2
Reduced	121	19	15.7	37	30.6	65	53.7	-	-
Insufficient	4	-	-	-	-	3	75.0	1	25.0
Depending on the length of the fibers ³									
16-17	23	-	-	10	43.5	11	47.8***	2	8.7
14-15	58	13	22.4***	28	48.3	16	27.6***	1	1.7
12-13	147	52	35.4**	71	48.3	24	16.3**	-	-
10-11	189	94	49.7	74	29.2	21	11.1*	-	-
8-9	146	84	57.5	52	35.6	10	6.9	-	-
6-7	59	35	59.3	22	37.3	2	3.4	-	-
4-5	3	3	100	-	-	-	-	-	-
Depending on skin density ⁴									
Very dense	126	64	50.8***	60	47.6**	2	1.6***	-	-
Suitable	443	204	46.0***	186	42.0**	53	12.0***	-	-
Reduced	237	80	33.8**	119	50.2***	38	16.0***	-	-
Loose	165	30	18.2	48	29.1	84	50.9	3	1.8

Remark: *P<0.05; **P<0.01; ***P<0.001; 1- compared to shot curl; 2- compared to reduced; 3- compared to 6-7 mm; 4- compared to loose

With the diminished silkiness of the fibres in the lambs from excellent to low, the share of individuals with excellent curl strength decreases from 58.0% to 15.7% or 3.7 times (td = 10.4; P <0.001) And the low lame rate of the curls increases from 8.3% to 53.7% or 6.5 times (td = 9.6; P <0.001). Therefore, there is a positive correlation between the silkiness of the sheathing and the curl strength that favours the efficiency of the selection after these important characters. The strength of the curls is closely related to the length of the fibres. Research has shown that lambs with short (6-9 mm) and average (10-13 mm) fibres have the best excellent curl strength (57.5-59.3 and 49.7-35.4%) and appropriate (37.3-35.6 and 29.2-48.3%) of curls. According to the weight of individuals with excellent curl strength, the lambs with the length of the short fibres (8-9 mm) significantly exceeded the congeners of the long fibre length group (14-15 mm) by 35.1% (td = 5.1 or P < 0.001) and lambs with

very short fibre lengths (6-7 mm) exceeded the congeners in this batch by 36.9% (td = 4.9; P <0.001). With the increase of fibre length at the lambs from 12-13 mm to 14-15 mm, the weight of individuals with excellent curl strength decreases from 35.4% to 22.4% (td = 2.3; P <0.05) and increases the lamb's overall weight with reduced and insufficient loop strengths from 16.3% to 29.3% (td = 1.94; P <0.05). Therefore, the strength and elasticity of the curls are in negative correlation with the length of the hair fibres, so, the shorter the fibres, the better the curl strength and, conversely, the longer the fibres, the more curl strength weak. Strength of curls at the Karakul lambs depends on skin properties, especially on its density. Research has shown that very dense and proper lambs possess predominantly excellent resistance (50.8-46.0%) and suitable (47.6-42.0%) curls. In the batch of lambs with tender skin (sponge) predominate the individuals with low resistance of the curls (50.9%). With the

increase of skin density in lambs from loose to very dense, the share of individuals with excellent resistance from 18.2% to 50.8% or 32.6% ($td = 6.0$; $P < 0.001$) and vice versa, with decreasing skin density at then lambs from very dense to loose, also decreases the share of individuals with excellent loop resistance. Therefore, there is a positive correlation between the curl strength and the density of the skin. Summarizing the results of the research, we can conclude that the best strength of the curls is meets at the Karakul lambs with valuable, long and very long curls with short and med. long fibres, with excellent and suitable silk, with supple and dense skin. Elucidating these laws, we selected for breeding the most suitable lambs after the loop strength. With the increase of skin density at the lambs from lax to very dense, the share of individuals with excellent resistance from 18.2% to 50.8% or 32.6% ($td = 6.0$; $P < 0.001$) and vice versa, with decreasing skin density in lambs from very dense to loose, also decreases the share of

individuals with excellent loop resistance. Therefore, there is a positive correlation between the loop strength and the density of the skin. Summarizing the results of the research, we can conclude that the best strength of the curls is encountered in lavish Karakul lambs with valuable, long and very long loops with short and med. long fibres, with excellent and suitable silky with supple and dense skin. Elucidating these laws e selected for breeding the most suitable lambs after the curl strength.

Direction of curling curls is considered valuable when they are curling to the head, tail or mixed. The indeterminate curling direction is not required. The direction of curling is a determined hereditary character and is in several correlative ties with other attributes of curl and skin [16, 24, 25]. Our investigations have shown that the direction of ablation is related to the type of curl, the type of modelling, the silky and the gloss of the sheathing (Table 2).

Table 2 Direction of curling at the Moldavian Karakul lambs In relation to the type of curl, the type of modelling and the features of the sheathing

Specification	Effective of lambs, head	Direction of curling							
		Cranial		Tail		Mixt		Indeterminable	
		cap	%	cap	%	cap	%	cap	%
Depending on the type of curl ¹									
Jachet	427	139	32.5***	34	8.0	254	59.5***	-	-
Coastal	236	6	2.5	218	92.4***	11	4.7***	1	0.4***
Flat	120	1	0.8	114	95.0***	3	2.5***	2	1.7***
Kaukazian	199	2	1.0	9	4.5	67	33.7	121	60.8
Depending on the type of curls modelling ²									
Parallel-concentric	171	93	54.4***	64	37.4***	14	8.2	-	-
Parallel-scale	271	9	3.3	258	95.2***	4	1.5	-	-
Mixt	424	81	19.1***	34	8.0***	287	67.7***	22	5.2***
Indeterminable	114	-	-	-	-	10	8.8	104	91.2
Depending on the silk of the sheathing ³									
Excellent	478	88	18.4***	261	54.6***	122	25.5	7	1.5***
Suitable	424	87	20.5***	123	29.0'	162	38.2'	52	12.3***
Reduced	121	1	0.8	23	19.0	36	29.8	61	50.4
Insufficient	6	-	-	-	-	-	-	6	100**
Depending on the gloss of the sheathing ⁴									
Intense	340	67	19.7***	183	53.8***	84	24.7	6	1.8***
Suitable	492	103	20.9***	147	29.9'	193	39.2'	49	10.0***
Reduced	145	4	2.7	31	21.4	42	29.0	68	46.9
Insufficient	4	-	-	-	-	-	-	4	100***

Remark: * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; 1- compared with kaukazian; 2- compared with indeterminable; 3-compared to reduced 4- compared to reduced

For lambs with jacket curl type, the mixed (59.5%) and cranial (32.5%) curls direction is characteristic. For the lambs with the coastal

and flat curl type it is characteristic the caudal direction of curling (92.4 and 95.0% of the cases).

Lambs with the type of kaukasian curl have, for their major part, an indeterminable direction (60.8%) of curling. Our data on the curl direction are consistent with the research by Дьячков И.Н. [14] concerning Asian Karakul, including some particularity. We have found that the curling direction of the curls is in positive correlation with the modelling type, with the qualities of the fibres, especially with their silk and gloss. So, the better the qualities of the sheathing, the more the curling direction is more valuable.

The degree of curling is important because it influences other qualities of curls and skin as a whole. As the lamb advances, the degree of curling increases. It is considered that

lower curling at the birth is advantageous because it offers the possibility to hold the lamb for a few days (4-5 days) before slaughter until the degree of ablation reaches 10-11 degrees (points). During this time, the surface of the skin and the body mass of the lamb will increase, which leads to the obtaining of the economic benefits. The most desirable degree of curling at birth is considered to be 5-7, whereas grade 10-11 already indicates the need to slaughter the lamb. Research shows that the degree of curling is hereditary determined and correlates with the type of curl, shape, type and size of the curl, as well as with the lamb class (Table 3).

Table 3 The degree of curling of curl at the Moldovan Karakul lambs

No. registration lamb	Class, type of curl	Degree of curling	No. registration lamb	Class, type of curl	Degree of curling
9001	II small, coastal	7	9100	elite med. jachet	8
9002	I big flat	7	7044	elite big flat	7
1222	I big flat	7	0512	II med. aukazian	12
9003	II mic, kaukazian	9	9103	I med. jachet	8
9004	I med. jachet	10	1668	I big flat	7
1820	I big flat	7	1823	I med. jachet	10
9005	I med. costal	9	1859	I big jachet	10
9006	I med. jachet	10	7028	I med. coastal	7
1260	elite med. jachet	8	9109	II med. flat	5
1863	II med. kaukazian	10	9110	I med. jachet	9
9017	elite big coastal	8	9112	II mic, kaukazian	12
1740	II med. kaukazian	10	9113	elite med.	7
9021	II med. kaukazian	10	9114	jachet	10
9022	elite med. jachet	8	9115	I mic, jachet	9
7022	elite med. plat	6	9116	I med. jachet	10
9037	elite med. jachet	10	7046	I med. jachet	7
9038	elite big flat	8	9124	elite med. coastal	8
0914	elite med. jachet	9	9125	elite med. flat	7
9090	I big jachet	11	9189	I big flat	9
0927	II small kaukazian	12	9190	I med. jachet	9
				I smal, jachet	

We have found that the lowest degrees of curling (6 and 7) are recorded in lambs with med. and large curls, with flat curling, coastal and jackets. The highest degree of curling (12 points) was recorded at the lambs of class II with the type of kaukasian curl.

There are definite differences between lambs with different types of curl according to the degree of curling (Table 4). Caucasian Lambs with Caucasian curl exceeded, after the curling degree of the curls, the contemporaries with the type of jacket curl - by 1.7 points or 17.6% ($P < 0.001$), the ones with the type of coastal curl - by 1.8 points or 22.9% ($P < 0.001$) and those with flat type of

curl, 2.6 points, or 36.8% ($P < 0.001$). The degree of curling is in negative correlation (beneficial for selection) with the lamb class.

We have found that, at the lambs of upper classes (elite and class I) there is a lower degree of curling of the curls compared to lower class lambs (class II). Class II lambs possess, as a rule, full degree or over curling, which reaches 10-12 points.

The lowest degree of curling was found at the lambs from elite class (8.33 ± 0.11 points). This degree of curling constituted the optimal parameter, conditional for obtaining high quality of skin.

Table 4 The degree of curling of curls at the Moldavian Karakul lamb depending on the type of curl and class

Specification	N	The degree of curling of the curls, points		
		M ± m	σ	Cv, %
depending on the type of curls				
Jachet	426	9.66 ± 0.06	1.14	12.0
Coastal	231	7.86 ± 0.09***	1.34	10.5
Flat	121	7.06 ± 0.12***	1.39	19.6
Kaukazian	205	11.36 ± 0.11***	1.55	13.6
depending on the class of lambs ²				
Elite	246	8.33 ± 0.11	1.58	19.0
Class I	494	9.02 ± 0.07***	1.54	17.1
Class II	236	10.98 ± 0.13***	2.00	18.2
Total on the herd	976	9.32 ± 0.06***	1.93	20.7

Remark: ***- P<0.001; 1- compared with Jachet; 2- compared with Elite class

Finding that the curling degree of the curls increases daily by 0.3 points, and the lamb can be retained until reaching 10.5 points, we have determined that lambs with jacket curl can be detained up to at slaughter for 1-2 days, those with the type of coastal curl 4-5 days, those with the type of flat curl 6-7 days, but those with the kaukazian curl require urgent slaughter.

Knowing these resilience and elasticity relationships, as well as curling the curl with a series of other characters of curls and hair fibres, allows the revealing and mating of the requested type of individuals, ensuring the selection of the most valuable lambs in the breeding lots of the new type of sheep Moldovan Karakul.

CONCLUSIONS

1. Resistance and elasticity of curls at the Moldavian Karakul lambs is in positive and obvious phenotypical correlation with the length of the curls, the fibre silky and the density of the skin, and, at the same time, negative the length of the fibres. The best strength of the curls is found at the lambs with valuable, long and very long curls, short and med. long fibres, with excellent and suitable silk, with supple and dense skin.

2. The direction of curling is in positive correlation with the modelling pattern, with the fibre qualities, especially with their silk and gloss. So, the better the qualities of the hairpiece, the curl direction of the curling is more valuable - to the head, tail or mixed (sinusoidal).

3. The curling degree of the curls is in a genetically negative (but beneficial for selection) relationship with the type of curl and the lamb class at the evaluation. The smallest degrees of curling (but desired - 6 and 7 points) are recorded at the lambs with med. and large curls, with flat, coastal and jacket type of curl. The highest degree of curling (undesired - 12 points) was recorded at the lambs of class II with the type of kaukazian curl.

4. Knowing the relationships of resistance and elasticity, as well as the curling of the curl with a string of other characters of curls and hair fibres, allowed the selection of the most valuable lambs in the breeding lots of the new type of Moldovan Karakul sheep.

REFERENCES

- [1]. Buzu I. The length curls – important character in selection of Karakul lambs. In: *International Scientific Symposium „Modern animal husbandry – food safety and durable development” at the University of Agricultural Sciences and Veterinary Medicine Iasi. Scientific papers. Animal Science*. Ed. „Ion Ionescu de la Brad”. CD-Rom, ISSN 2284-6964, Iași, 2016, p. 87-93.
- [2]. Buzu I. The size of curls at the Moldavian Karakul skin. In: *International Scientific Symposium „Modern animal husbandry – food safety and durable development” at the University of Agricultural Sciences and Veterinary Medicine from Iasi. Scientific papers. Animal Science*. Ed. „Ion Ionescu de la Brad”. Vol. 64(20), ISSN 2067-2330, Iași, 2015, p. 53-61.
- [3]. Buzu I. Tip de ovine Karakul Moldovenesc Corpulent: teoria și practica creării și perfecționării (monografie). Academia de Științe a Moldovei, Institutul Științifico- Practic de Biotehnologii în Zootehnie și Medicină Veterinară, Institutul de Zoologie. ISBN 978-9975-4369-9-1. Tipografia „Elena V.I.”, Chișinău, 2012, 513 p.

- [4]. Buzu I. Corelația lungimii corporale a mielului Karakul la naștere cu unele însușiri de pielică. În: Simpozion științific jubiliar internațional „50 ani de învățământ superior zootehnic la Iași”. Facultatea de Zootehnie. Universitatea de Științe Agricole și Medicină Veterinară. Iași, 2001, p. 172 - 173.
- [5]. Buzu I. Insușirile comerciale ale pielicelelor Karakul de tip Moldovenesc, în funcție de sortiment și mărimea buclei. În: Simpozion științific de zootehnie, cu participare internațională „Relansarea zootehniei – o șansă pentru România în mileniul III”. Ediția a X-a. Iași, 1999, p. 72.
- [6]. Buzu I. Calitățile de pielică ale mieilor Karakul în funcție de mărimea buclei. În: Simpozion Științific Jubiliar Internațional „65 ani ai Universității Agrare de Stat din Moldova” (Lucrări științifice din 7-9 octombrie 1998). Chișinău, 1998, p. 59-60.
- [7]. Buzu I., Zelinski N., Evtodienco Silvia. Instrucțiuni de bonitare a ovinelor Karakul cu principii de ameliorare în Republica Moldova (în două limbi: Md și Ru). Departamentul Edituri, Poligrafie și Comerțul cu Cărți al Tipografiei Centrale. Chișinău, 1996, 72 p.
- [8]. Nicov Th. Die Karakulzucht in Rumänien. z. Halle, 1936, 213 p.
- [9]. Pascal C. Tratat de creștere a ovinelor și caprinelor. Ed. „Ion Ionescu de la Brad”, ISBN 978-973-147-196-9, Iași, 2015, 709 p.
- [10]. Богданович Н. И. Выведение молдавского каракуля в колхозах Згурицкого района. В: Труды Кишиневского с-х института, т. XIV, 1957, с. 109-133.
- [11]. Васин Б. Н., Васина-Попова Е. Т., Гравовский И. Н. Руководство по каракулеводству. Изд. «Колос», Москва, 1971, 320 с.
- [12]. Гигинейшвили Н. С. Каракулеводство за рубежом (Сборник переводов статей и обзоров из иностранной периодической литературы, 2-й выпуск). Москва, «Колос», 1975, 431 с.
- [13]. Гигинейшвили Н. С. Племенная работа в цветном каракулеводстве. Москва, «Колос», 1976, 190 с.
- [14]. Дьячков И. Н., Письменная Р. Т. Новая классификация каракульских вальковатых завитков и гривки. Сообщение 1-е. В: Труды ВНИИК, т. V, 1951, с. 135-211.
- [15]. Дьячков И. Н., Письменная Р. Т. О морфологическом строении и типах вальковатых завитков. В: «Каракулеводство и звероводство», 1952, № 2, с. 24-30.
- [16]. Дьячков И. Н. Племенное дело в каракульском овцеводстве. Изд. «Фан», Ташкент, 1980, 163 с.
- [17]. Закиров М., Каримов К. Смущковедение. Изд. «Мехнат», Ташкент, 1987, 191с.
- [18]. Иванов М. Ф. Сортировка черных каракульских смущков и ее научные основы. В: Полное собрание сочинений, том 3. Москва, «Колос», 1964, с. 376 – 398.
- [19]. Иванов М. Ф. О селекции каракульских овец. В: Полное собрание сочинений, том 3. Москва, «Колос», 1964, с. 271–292.
- [20]. Иванов М. Ф. Строение завитков серых и цветных каракульских смущков по длине и тонине их волос. В: Полное собрание сочинений, том 3. Москва, Изд. «Колос», 1964, с. 442–457.
- [21]. Иванов М.Ф. Классная бонитировка каракульских овец. В: Полное собрание сочинений, том 4. Москва, Изд. «Колос», 1964, с. 522–525.
- [22]. Иванов М. Ф. Овцеводство. В: Полное собрание сочинений, том 3. Москва, Изд. «Колос», 1964, с. 15–26.
- [23]. Ильев Ф. В. Методы скрещивания, применяемые при выведении молдавского Каракуля, и полученные результаты. В: Труды Кишиневского с.-х. института им. М. В. Фрунзе, том XIV, Кишинев, 1957, с. 25-108.
- [24]. Кошевой М. А. Селекция и условия разведения каракульских овец. Ташкент, изд. «Фан», 1975, 247 с.
- [25]. Маттер Х. Э. Влияние длины волоса на размер завитка новорожденного каракульского ягненка. В: Каракулеводство за рубежом. Москва, «Колос», 1975, с. 227-232.
- [26]. Нел Дж. А. Точность визуальной оценки некоторых смущковых свойств. В: Каракулеводство за рубежом. Москва, «Колос», 1975, с. 185-194.
- [27]. Нел Дж. А. Некоторые соображения в отношении селекции каракульских ягнят. В: Каракулеводство за рубежом. Москва, «Колос», 1975, с. 64-75.
- [28]. Перегон И. Л., Глубочанская Р. А. Асканийский многоплодный породный тип каракульских овец. В: Труды научно-исследовательского института животноводства степных районов им. М. Ф. Иванова «Аскания – Нова», том XV, пгт Аскания Нова, 1972, с. 50-60.
- [29]. Плохинский Н. А. Руководство по биометрии для зоотехников. Москва, «Колос», 1989, 255 с.
- [30]. Прманшаев М., Ережепов С. Наследование смущкового типа и классности каракульских ягнят. В: Овцы, козы, шерстяное дело. Москва, 2016, №2, с. 5-6.
- [31]. Прманшаев М., Ережепов С. Сопряженность некоторых селекционных признаков у черных каракульских овец разных смущковых типов. В: Овцы, козы, шерстяное дело. Москва, 2016, №3, с. 24-26.
- [32]. Ролдугина Н.П. Факторы влияющие на сохранность завитков у каракульских ягнят разных окрасок. В: Овцы, козы, шерстяное дело. Москва, 2003, № 4, с. 40-41.
- [33]. Туекбасов М.К. Наследование качественных признаков в каракулеводстве. В: Овцы, козы, шерстяное дело. Москва, 2011, № 2, с. 38–40.
- [34]. Филлингер О. К. 60 лет каракулеводства Юго-Западной Африки. В: Каракулеводство за рубежом. Москва, «Колос», 1975, с. 30-34.
- [35]. Шефер Х. Волосной покров – исходный фактор в оценке качества шкурки. В: III-й Международный симпозиум по каракулеводству (Самарканд, 1975). Москва, «Колос», 1977, с. 38–43.