RATING OF THE MOLDAVIAN KARAKUL SHEEPS AFTER ONE COMPLEX SET CHARACTERS

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Abstract

The purpose of this paper was the successive description of the methodology of the complex evaluation of the breeding value of Karakul sheep, which finally allowed the development of fundamentally new Instructions for the complex rating of Moldavian Karakul sheep. The scientific research was carried out on the biological material of pure-breed Karakul sheep, imported from Central Asian countries, as well as cross-breed sheep (Tuşca x Karakul) of different generations, obtained from crosses, within the research programs of the National Institute of Animal Husbandry and Medicine Veterinary, approved by order of the State in the period 1979-2005. On the basis of multiple scientific researches in the Republic of Moldova, official instructions (approved by the Order of the Ministry of Agriculture and Food Industry) have been developed, for rating with principles of genetic amelioration of Moldavian Karakul sheep, which represent a normative act in the field that must be implemented by breeding farm owners from this sheep race. In the respective normative act, the methodological procedures for the complex rating of Moldavian Karakul sheep are described according to the three particular characters (pelt quality, body mass and milk production) and the deduction of the general class of the sheep, which reflects the complex value of the animal. In order to objectively evaluate the level of development of the selected morpho-productive characters, for each particular character (pelt quality, body mass, milk production) the minimum standards of inclusion in the respective value categories (classes) were elaborated. The mandatory implementation of complex rating sheep in all breeding farms and, optionally, in some production farms, contributes to the genetic amelioration of the Moldavian Karakul sheep populations in the country and the increase of their productivity.

Key words: *Sheep, Moldavian Karakul, rating, characters*

INTRODUCTION

In the Republic of Moldova, oviculture is one of the oldest and traditional branches of the livestock sector (Ильев, 1965a, 1965b). Sheep ensure the food security of the rural population with dairy products (cheese, curd) and meat, and the processing industry - with raw materials (pelts, furs, pelts, wool). Sheep efficiently use natural pastures and plant residues after harvesting agricultural crops. For these reasons, oviculture is an accessible and indispensable branch for the local population and of major importance for the national economy. According to historical traditions, in the Northern and Central areas of the country, the natives raised the Țușca sheep race, with mixed production skills for pelts-milk-wool, but the qualities of the pelts were inferior. In order to improve their qualities, the local Țușca race began to be absorbed by crossbreeding with the improving Karakul race, imported from Central Asia. Imports of Karakul sheep into Bessarabia were carried out periodically, starting from 1884 (Иванов, 1914) until the beginning of the Second World War (Buzu, 2016d).

In the period after the Second World War (1947-1979), imports of Karakul sheep from Central Asia were carried out permanently, and the local Țușca sheep race was practically replaced by the Karakul race through mass absorption crosses (Богданович, 1957; Богданович et al., 1979; Богданович et al., 1983; Богданович et al., 1984; Ильев, 1957a, 1957b; Ильев et al., 1966; Ильев, 1966a, 1966b; Ильев, 1969; Ильев, 1976; Ильев et al., 1981; Ильев, 1984). However, the amelioration of the flock of sheep for pelts

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was difficult. The share of type I pelts per republic did not exceed 12.0-15.0% (Бузу et al., 1992). As a result of these crosses, it was observed that the level of milk production and body mass in sheep began to decrease (Buzu, 1995; Богданович et al., 1979), which did not correspond to the traditions of the exploitation of sheep as producers of milk and meat.

It should be mentioned that, until 1976, breeding crosses had a mass companion character, because the standard purpose of animal models of the requested type was not developed, the genetic parameters of the selected characters and the morpho-biological particularities were not taken into account in the selection - productive of the original sheep breeds. As a result of these crossings, a population of crossbred sheep (Ţ x K) of different generations was created in the Republic, which was unofficially named Moldavian Karakul (Богданович, 1957; Ильев, 1957b). The productivity of these sheep continues to be low, even in the breeding farms. This situation persisted, because there were no objective methods for evaluating the pelt characteristics and complex selection of sheep under local conditions.

For example, in the Karakul Lamb Rating Instructions in force in the post-Soviet countries (Инструкция, 1974; Инструкция, 1989), each pelt character is diversified into 3-4 degrees of manifestation expressed in words, for example: very good, moderately good, less good (reduced) and insufficient (unsatisfactory). The method of appreciation by words expresses, to some extent, the quality of the pelt according to one or another character, but it has flaws. The main shortcoming of this method is that it gives the character a narrow, unnatural variability, compared to the normal distribution of the manifestation values of polygenic characters in the genetic population, according to the Muavr-Gauss-Laplas law (Плохинский, 1989). Being non-parametric, the assessment results are not expressed in numbers of the metric systems of measurement, which makes it difficult to apply the electronic computer to the processing of the experimental material through the methods of variational biometric statistics and to obtain the genetic parameters of the populations, without which it is impossible to conduct the argumentative selection process.

Due to the lack of an objective, explicit and efficient methodological framework for the evaluation of the pelt qualities of the lambs, which would take into account the biological morpho-productive particularities of the Moldavian Karakul lambs, as well as due to the application of the unilateral selection of sheep only according to the quality of the pelt, without taking into account the specificity of their phenotypic and genotypic correlative links with the main productive characters (body weight, milk), without estimating the degree of heritability and variability of characters and selection traits, the process of genetic amelioration of Karakul sheep has stagnated (Buzu, 2016d).

Until recently, when determining the general breeding value (class) of Karakul sheep, according to the Rating Instructions in force at the time (Buzu et al., 1996), some of the most important morpho-productive selection characters were not taken into account, such as production of milk and meat (body mass). In fact, the main flaw in those Instructions was that pelt production was considered the only basic character, expressed by the class of the lamb, and the body weight and milk production of the ewe were not taken into account at all in determining the general class. So, between the values of the main morpho-productive characters and the breeding value of the animal, there is an obvious break, which needs to be integrated into a unique complex of the phenotypic, genotypic and economic values of the animal.

In this context, the purpose of this paper was the successive description of the methodology of the complex evaluation of the breeding value of Karakul sheep, which finally allowed the elaboration of official Instructions (approved by the Order of the Ministry of Agriculture and Food Industry) of rating with principles of genetic amelioration of Moldavin Karakul sheep (Buzu et al., 2022).

MATERIAL AND METHODS

Scientific research was carried out on the biological material of pure-breed Karakul

sheep, imported from Central Asian countries (Uzbekistan, Turkmenistan) until 1980, as well as crossbred sheep (Tuşca x Karakul) of different generations, obtained from crosses, within the programs of research of the National Institute of Animal Husbandry and Veterinary Medicine, approved by order of the State in the period 1979-2005, in which the author of this paper participated as a senior scientific researcher, and in the last research programs (1991-2005), being leader of projects registered by the state with the figures: 05.01.03., 07.10.02. and 04.49.02. The last project, being registered with the name "Creation of new performing types of Karakul and Ţigaie sheep".

The basic concept of the research methodology resides in:

a) Investigating the degree of manifestation of morpho-productive characters in Moldovan Karakul lambs and adult sheep, the factors that influence their manifestation and variability, the development and perfection of methods for evaluating the selection characters, differentiated into three blocks that include: lambs' pelt quality at birth, conformation and body development of sheep of all ages, milk production of ewes (Buzu et al., 1993; Buzu, 2001a, 2012a, 2012b, 2014a, 2014b, 2014c, 2015a, 2015b, 2015c, 2015d; Buzu et al., 2015; Богданович et al., 1982; Богданович et al., 1983; Богданович et al., 1986; Бузу, 2000).

b) Establishing the optimal parameters for the selection of sheep of the required type and their efficient mating variants according to the selected characters, the development of the breed standard and the standard-purpose selection of the Moldavian Karakul sheep (Buzu, 2001b; Buzu et al., 2002; Buzu, 2002, 2003a, 2003b; Buzu et al., 2009a, 2009b; Buzu, 2012b).

c) The genetic consolidation of the type, the creation of the genealogical structure and the formation of elite lines, the homologation of the new type of Moldavian Karakul sheep (Buzu, 2000a, 2000b; Buzu et al., 2009a, 2009b, Buzu, 2015d, 2016a, 2016b, 2016c).

d) Elaboration of methods for perfection the Moldavian Karakul sheep type, based on the evaluation of the lambing value of sheep according to complex selection indices (Buzu, 2012b, 2016a, 2016b, 2021).

e) Elaboration of a fundamentally new Instruction for complex rating with principles of genetic amelioration of Moldavian Karakul sheep (Buzu et al., 2022).

RESULT AND DISCUSSIONS

The results of the above-mentioned research allowed the development of a fundamentally new Instruction of rating with principles of genetic amelioration of Moldavian Karakul sheep, which includes three particular compartments, regarding the evaluation of the three basic morpho-productive characters (pelt quality in newborn lambs, mass bodies and milk production) and a general compartment – deduction of the general class of sheep.

1. Evaluation of pelts quality in lambs. The quality of the pelt is assessed 1-3 days after birth by evaluating the 7 main synthetic characters, such as: *breed expression, color and shade, curl type and quality, hair fiber quality, skin quality, body development and, finally, class of credit*. The first 6 synthetic characters are evaluated, according to the specialized methodological technique, described in detail in the relevant literature (Buzu, 2021), which is studied and mastered by licensed specialists from the Faculty of Animal Science of the Agricultural University. The degree of manifestation of the quality of these characteristics is differentiated into four levels of quality expressed by words (*excellent, suitable, weak (reduced), insufficient*). Each level of quality is in turn differentiated into 2-3 grades of quality expressed in points.

The top tier of "excellent" quality can be rated with 8, 9 or 10 points. The "right" level of quality can be rated with 5, 6 or 7 points. We would like to mention that quality grade 6 is also considered the average standard of the race for any character evaluated in the score. The "poor (reduced)" level of quality can be rated with 3 or 4 points. The "insufficient (defective)" tier of character quality can only be rated with 1-2 points.

Finally, after assessing the average degree of expression of the quality of the 6 synthetic characters, the degree of quality of the pelt as a whole is deduced, expressed by the credit rating class of the quality of the pelt of the lamb at birth. The quality of the lamb pelt is expressed by the following rating classes:

Elite, Class I, Class II and Brac. Each credit rating class is in turn differentiated into 2-3 grades of quality expressed in points.

Elita class lambs can be rated with 8, 9 or 10 points. Elita class lambs, in the credit register, are registered with the symbol "El" and scored, in the view of the creditor, with 8-10 points. For example "El-9". The assessment with 10 points is made if the whole body surface of the lamb is covered with long and very long curls, all the traits of race, color, qualities of curls, fibers, pelt and body conformation are absolutely excellent, perfect. With 9 points are appreciated the lambs that possess, mainly, excellent qualities with some deviations from perfection. With 8 points are appreciated the lambs that possess, for the most part, excellent quality attributes, with some exceptions, within the limits of the minimum requirements for the Elite class. Elita class lambs are the most preferred for selection and breeding for the creation of ewe nuclei, highly productive lines and flocks of requested type sheep.

Class I lambs, at rating, are characterized by appropriate (good, moderate) properties of pelt qualities, they are registered in the rating register with the symbol "Cl. I" and are valued with 5-7 points. For example "Cl.I-6". First Class lambs are valued with 7 points if their pelt qualities are very close to the Elite class with some deviations that do not allow their reference to this higher class. With 6 points, the lambs are appreciated, which, according to the characteristics of the pelt qualities, occupy an average position for the race, with the characters to be properly expressed, which also represents the minimum standard of the race as a whole. Lambs are valued with 5 points, which, according to their pelt quality, are somewhat close to Class II, but have not yet fallen into this class according to the quality characteristics. Class I lambs are also required for selection and breeding for the creation of breeding herds, animal lines of the requested type.

Class II lambs, at the grading, are characterized by mediocre (weak, reduced) pelt qualities, they are entered in the register with the symbol "Cl.II" and can be rated with 3 or 4 points, at the sight of the grader. For example "Cl.II-4". Class II lambs are valued with 4 points, which, according to many qualitative characteristics, approach the qualifications of Class I, but do not fully reach those levels. Lambs are valued with 3 points, which, according to the quality characteristics, approach the minimum limit, after which the lowest class begins. Class II lambs are not required for selection and reproduction, but lambs can be allowed to grow for production exploitation - goods (pelt, milk, meat).

Brac class lambs are considered all those individuals, who do not fit into Class II according to the qualitative qualifications, are registered in the rating register with the symbol "Brac" and are valued with only 1-2 points. For example "Brac-2". Since the commercial value (pelt price) of these lambs is very low, they are reformed for rating and recommended for growth and fattening for the purpose of slaughtering for meat.

2. Estimating the body mass of sheep. Body mass, in Moldavian Karakul sheep, presents one of the most important morpho-productive characters, given the fact that it has a direct impact on meat production, which results from carcasses of 2.5-3.5 kg, obtained from lambs slaughtered for pelt (at the age of 2-5 days after birth), from 5-10 kg carcasses, obtained from lambs nursed up to the age of 2 months (at weaning) and slaughtered for meat, especially during the Easter holidays , from carcasses of 13-20 kg, obtained from young sheep, raised and fattened for meat until the age of 6-18 months, as well as from carcasses of 25-35 kg, obtained from adult sheep, reformed and removed, for different reasons, from the reproductive circuit of the herd.

At the same time, the body mass of Karakul sheep is also of great importance when obtaining large surface pelts, because the body mass of the lamb at birth is in direct and positive correlation with the surface of the pelt obtained at slaughter (r_{xy} = 0.64). Sheep body mass also has a positive influence on milk production. The correlation attitude coefficient (η_{xy}) is not high (0.2 – 0.3), but quite significant (P<0.05) (Buzu, 2014c).

Based on these considerations, the body mass of Karakul Moldovenesc sheep was included in the process of genetic

amelioration of the type as one of the most important selection characters at all stages, starting from rating (1-2 days after birth), at 2, 6 and 18 months, until adulthood. The body mass of sheep is evaluated (assessed) at different ages with different technical scales.

At birth (at rating), the lamb is weighed with a hand scale, using the method described in the relevant literature (Buzu, 2016, 2021). The hand scale is the most convenient and practicable tool for determining the body mass of lambs at the rating in farm conditions.

Starting from the age of 2 months, the young sheep are weighed individually on technical scales with a capacity of 50 - 100 kg, which have a precision of 0.1 kg.

At weaning, when the lambs are on average 2 months old per flock, all the lambs in the lot are weighed individually on one day. On this day, some of the lambs have not yet reached the age of 60 days, and another part has exceeded this age. In this case, after weighing, the body mass is recalculated from the scale data - into the standard age data (2 months). If the lamb on the day of weighing has not reached the standard age, the recalculated body mass is added to the weighed body mass and, conversely, if the lamb on the day of weighing has exceeded the standard age, the recalculated body mass is subtracted from the weighed body mass. The recalculated body mass is determined by multiplying the average daily gain of the lamb in the period from birth to the day of weighing, by the number of days that do not reach 60 days, or that exceed this age, according to the Register of records of the body development of Moldavian Karakul youth sheep.

A technical scale with a capacity of 150 kg and a graduation accuracy of 0.2 kg is used to perform the weighing of adult sheep. A narrow cage (box) with two doors (input and output) is installed and fixed on the platform of the scale. The dimensions of the cage are such that a ram without horns can fit tightly closed (rams with horns are weighed in a larger cage, or in a separate crate). In this cage the sheep voluntarily enters when the door is opened, after the door is immediately closed. In the cage, the sheep is practically fixed in a free state and cannot turn in the opposite direction, which allows reading the registration number, examining the exterior and weighing it.

Based on multi-year research, we developed the minimum parameters of the Moldavian Karakul race standard, depending on age (Tab. 1).

Table 1. Parameters of the minimum standard of sheep body mass Moldavian Karakul, kg

Age of sheep	For the class:		
	Elita	Class I	Class II
At birth (1-2 days)	4.7	4.5	4.0
At 2 months: ram	17	16	15
ewe	16	15	14
At 6 months: ram	34	32	30
ewe	31	29	27
At 18 months: ram	65	60	55
ewe	47	45	42
Adult sheep: ram	80	75	-
ewe	50	48	45

According to the results of the respective weighing at the established ages, each sheep is assigned a particular class according to its body mass, which is entered annually in the centralizing documents for the general rating of sheep.

Monitoring the body development at different ages of the Moldavian Karakul sheep allows highlighting at an early age the precocious individuals in the flock, as well as revealing the sheep with higher body mass repeatability and increased meat production skills.

3. Estimation of milk production of ewes. Sheep milk production has the main productive character, given the fact that its economic value is predominant and occupies about 60% of the total economic income obtained from one sheep per year (Buzu et al., 2015). For these reasons, flock selection of the best ewes after milk production is of major importance.

The milk production of Moldavian Karakul ewes is assessed after calving in each lactation through the control milking, carried out systematically, once every 30 days, during the entire lactation.

Control milking is performed according to T. Nica's method (Nica, 1940). The technical principle of this method consists in the individual milking of each ewe once a

day (in the morning) and the determination, based on this, of the amount of milk produced by the ewe during the entire control day. Control milking is performed on both calving and lactating ewes.

To carry out the control milking of ewes with nursing lambs, on the eve of the control day, after the evening milking of the calves, the nursing ewes are separated from their lambs, or the lambs are separated from their mothers. They are locked in a separate pen over an impenetrable wall or in another stable, so that their screaming is less heard by their mothers. During one night the separated ewes accumulate milk in the mammary gland for control milking. In the morning, on the control day, the lactating ewes are milked individually, first, so that they can then be admitted to their lambs.

On the control day, before milking begins, when the ewe is fixed in the lathe, the technical controller's assistant reads the sheep's registration number aloud so that it can be heard by the controller, who records it on the Milk Production Control Sheet (F6K). The milker milks the ewe in a cup or mug with a volume of at least 1 liter, arranged inside the milking bucket, after which he passes it to the technical controller and takes another empty cup for milking the next ewe. The controller weighs the milk cup on the electronic scale with the capacity of 1500-2000g, after the milk is poured into the storage tank, and the empty cup is placed next to the milker.

To determine the amount of milk produced by the sheep throughout the day, the amount of milk milked in the morning of the control day is multiplied by the *control coefficient*. This coefficient is determined by the formula:

$$K_c = \frac{Pt}{Pd} \cdot C_r$$

where:

K_c – control coefficient;

P_t – the total amount of milk milked from the ewes in foals on the control day;

P_d - the amount of milk milked from the foaling ewes in the morning of the control day;

C_r – milk retention coefficient:

- for lactating ewes with infant lambs C_r=1.3;

- for ewes in the first two weeks after weaning the lambs C_r=1.2;

- for the other lactating ewes C_r=1.0.

Later, the data from the Control Sheet regarding the amount of milk milked on the control day, according to the registration number of each individual ewe, are transcribed in the Register of record of milk production of Moldavian Karakul ewes (F7K), in which the individual calculation is performed of the ewes milk production during each control period and over the entire lactation.

According to the amount of milk production, the ewes, depending on their age in lactation, are divided into the following classes, according to the parameters of the minimum standard of the race (Tab. 2).

Table 2. Parameters of the minimum standard of milk production of Moldavian Karakul sheep, kg

Depending on lactation	For the class:		
	Elita	Class I	Class II
For ewes with the third lactation and bigger	70	60	50
For ewes with the second lactation	63	54	45
For ewes with the first lactation	53	45	40

In the autumn, after the milking of the calves has stopped (October-November), the milk production totals are made for all the ewes in the whole flock, preparing the necessary materials for the general rating of the ewes.

If it is necessary to forecast (equalize) the milk production at mature age, achieved by young ewe in the 1st or 2nd lactation, then its recalculation is carried out by means of the established correction coefficients. To recalculate milk production from the first lactation to the mature one, its value is multiplied by the coefficient 1.35. To recalculate the milk production achieved in the second lactation, its value is multiplied by the coefficient 1.11. These coefficients are used to equate lactation of daughters for genotypic testing of ewes after progeny milk production.

4. Deduction of the general class of sheep. After the completion, during the year, of the sheep rating procedures according to all the particular characters, such as pelt quality, body weight and milk production, the zootechnical specialist proceeds to the general assessment of the sheep's phenotypic performances.

Based on the performances achieved in terms of the rating of the three particular basic characters, the general class is deduced for each sheep, which is entered in the Centralized Bulletin of general rating of Moldavian Karakul sheep (F8K). The general class is determined according to the classes assigned according to pelt quality, body weight and milk production. For young sheep and rams of any age, the milk production class of the mothers is taken into account when deducting the general class. In ewe, the own milk production obtained in the most productive lactation is taken into account. The deduction of the general class is made in accordance with the correspondence requirements of the classes obtained for the particular characters, established by us as a result of lengthy research (Tab. 3).

Table 3. Deduction of the general class of Moldavian Karakul sheep, kg

Age of the sheep		Minimum requirements for particular characters			General class
		Pelt quality	Body mass	Milk production	
Lambs at birth (1-2 days)		Elite	Elite	Class I	Elite
		Class I	Class I	Class I	Class I
		Class II	Class II	Class II	Class II
Youth at 2 months	ram	Class I	Elite	Class I	Elite
		Class I	Class I	Class I	Class I
	ewe	Class I	Elite	Class I	Elite
		Class II	Class I	Class I	Class I
		Class II	Class II	Class II	Class II
Youth at 6 months	ram	Class I	Elite	Class I	Elite
		Class I	Class I	Class I	Class I
	ewe	Class I	Elite	Class I	Elite
		Class II	Class I	Class I	Class I
		Class II	Class II	Class II	Class II
Youth at 18 months	ram	Class I	Elite	Class I	Elite
		Class I	Class I	Class I	Class I
	ewe	Class I	Elite	Class I	Elite
		Class II	Class I	Class I	Class I
		Class II	Class II	Class II	Class II
Adult sheeps	ram	Elite or Class I - improver according to the pelt qualities of the descendants	Elite	Class I or improver for milk production of daughters	Elite
		Class I	Class I	Class I	Class I
	ewe	Class I	Class I	Elite	Elite
		Class II	Class I	Class I	Class I
		Class II	Class II	Class II	Class II

Table 3 shows that the rating system provided for in the Instruction allows the general rating of sheep at any age, starting from birth to adulthood.

For the deduction of the general class of the Moldavian Karakul lambs at birth, the quality of the pelt and their own body development are of primary importance. Thus, in order to obtain the higher general class Elita, the lamb must have the pelt qualities and the body development of the class Elite and the milk production of the mother at least Class I. The most valuable lambs are considered those individuals, which have the class Elite in all the three particular characters (pelt quality, body mass and milk production of the mother).

For the deduction of the general class of the young sheep at all ages, the first importance is the own body development, then the milk production of the mother and the quality of the own pelt.

Thus, in order to obtain the upper general class Elite, the young sheep (both rams and ewes) must necessarily have the body development of the Elite class, and the quality of its own pelt and the mother's milk production can be at least Class I. In order to obtain Class I at the general certification, rams, starting from the age of 6 months, must have at least Class I in all three particular characters. Rams that did not meet the parameters of Class I rating, even in one of the particular characters, are not admitted to breeding (for reproduction). In these rams, the tip of the right ear is cut off, and they are later raised and fattened for meat. The youth ewes, in order to obtain Class I in the general rating, must meet, at least, the requirements for Class I in the body development and milk production of the mother, and the quality of its own pelt can be even Class II. If the lamb obtained Class II in two of the particular rating characters, having a higher class in only one of the characters, it obtains only Class II in the general rating.

Young sheep and adult sheep, which have not met the requirements of the general rating of Class II, is/are considered outside the rating class, and is/are not admitted to breeding (for reproduction).

Breeding rams can only achieve the top overall Elite class if they have Elite class for their own pelt quality, they have Elite class for their own body development (mass) and at least Class I for the mother's milk production. In order to obtain a Class I general credit rating, the breeding ram must have at least Class I in all three particular credit rating characters (quality of its own skin, body weight and milk production of the mother).

In deducing the general class of the ewe, among the particular characters, its own milk production has the first importance. For these reasons, the ewe can obtain the general Elite class only if it has obtained the upper Elite class for its own milk production, even if for the other two particular characters (its own pelt quality and body weight) it has only Class I. To obtain at general rating Class I, the sheep must have its own milk production and body mass of at least Class I, and the quality of its pelt can be at least Class II.

If information is missing on the milk production of the mother of the young sheep and adult rams, as well as on the ewe's own milk production, the sheep cannot be assigned higher than Class II at the general rating, even if the pelt quality and body mass has higher classes.

At the end of each calendar year, in January of the following year, the keeper (owner) of the Karakul sheep farm presents to the State District Service for the Selection and Reproduction Activity of the Republican Center for the Improvement and Reproduction of Animals, the centralizing bulletin of general rating of Molaovian Karakul sheep (F8K), signed by the animal husbandry specialist who carried out the rating and the keeper (owner) of the farm, confirmed by the stamp of the legal entity.

The mandatory implementation of complex sheep breeding in all breeding farms and, optionally, in some production farms, contributes to the genetic amelioration of the Moldavian Karakul sheep populations in the country and the increase of their productivity.

CONCLUSIONS

1. On the basis of multiple scientific researches in the Republic of Moldova, official instructions (approved by the Order of the Ministry of Agriculture and Food Industry), fundamentally new, have been developed, for rating with principles of genetic amelioration of Moldavian Karakul sheep, which represent a normative act in the mandatory field of execution by the owners of breeding farms of this sheep race.

2. In the respective normative act, the methodological procedures for the complex rating of Moldavian Karakul sheep are described according to the three particular characters (pelt quality, body weight and milk production) and the deduction of the general class of the sheep, which reflects the complex breeding value of the animal.

3. In order to objectively evaluate the level of development of the selected morpho-productive characters, for each particular character (pelt quality, body weight, milk production), the minimum standards of inclusion in the respective value categories (classes) were elaborated.

4. The mandatory implementation of complex rating sheep in all breeding farms and, optionally, in some production farms, contributes to the genetic amelioration of the Moldavian Karakul sheep populations in the country and the increase of their productivity.

REFERENCES

1. Buzu I., Zelinschi N., Barbu Marieta, et al. (1993). Structura morfologică şi histologică a învelişului lanat al ovinelor Karakul (R.Moldova) şi Ţurcana albă (România). În: Cong. XVIII Acad. Rom.-Americ. Şt. Art. „Mold: deschid. Şt. Cult. Vest". Chişinău, Vol. 4, p. 263.
2. Buzu I. (1995). Direcţiile principale şi rezultatele ameliorării ovinelor în Republica Moldova. În: Problemele actuale ale tehnologiei producerii producţiei animaliere. (Tezele conferinţei practico-ştiinţifice internaţionale). Maximovca, p. 50-51.
3. Buzu I., Zelinschi N., Evtodienco Silvia (1996). Instrucţiuni de bonitare a ovinelor Karakul cu principii de ameliorare în Republica Moldova (în două limbi: Md şi Ru). Departamentul Edituri, Poligrafie şi Comerţul cu Cărţi al Tipografiei Centrale. Chişinău, 72 p.
4. Buzu I. (2000a). Crearea liniilor de berbeci Karakul ciuţi. În: Ses. An. Com. Şt. UASMV din Iaşi. Fac. Zoot. Iaşi, p. 30.
5. Buzu I. (2000b). Particularităţile testării berbecilor Karakul după calităţile descendenţei. În: Ses. An. Com. Şt. UASMV din Iaşi. Fac. Zoot. Iaşi, p. 30-31.
6. Buzu I. (2001a). Calităţile de marfă ale pielicelelor de tip Karakul Moldovenesc în curs de creare. În: Lucr. Şt. INZMV. Maximovca, p. 65-68.
7. Buzu I. (2001b). Caracteristica morfologică a învelişului pilos al mieilor Karakul brumării de diferite colorații. În: Lucr. Şt. INZMV. Maximovca, p. 68-72.
8. Buzu I., Evtodienco Silvia (2002). Relaţia între producţia de lapte a oilor Karakul şi calităţile de pielicică a mieilor. În: Probl. Act. persp. zoot. Ses. An. Comun. Şt. USAMV din Iaşi. Facult. Zoot. Iaşi, p. 36.
9. Buzu I. (2002). Aspecte privind împerecherea oilor Karakul negre şi brumării cu berbeci de culoare sur. În: Probl.Act. persp. zoot. Ses.An. Comun. Şt. USAMV din Iaşi. Facult. Zoot. Iaşi, p.60.
10. Buzu I. (2003a). Selecţia ovinelor Karakul de tip solicitat. În: Simp. Şt. Int. „70 ani ai UASM", Zoot. Chişinău, p. 88-89. ISBN 9975-946-84-4.
11. Buzu I. (2003b). Masa corporală a ovinelor Karakul Moldovenesc de tip solicitat. În: Mater. Simp. Şt. Int. „70 ani ai UASM". Zoot. Chişinău, p. 86-87., 0,09 c.a.
12. Buzu I., Evtodienco Silvia, Maşner O., Liuţcanov P. (2009a). Intrarasial type of Big Moldavian Karakul Sheep. In: Int. Sci. Symp. „Modern animal husbandry – science, creativity and innovation" at the UASVM of Iasi. Sci. pap. Anim. Sci. Ed. „Ion Ionescu de la Brad". Vol. 52 (14), Iaşi, p. 49-56. ISSN 2067-2330.
13. Buzu I., Evtodienco S., Tentiuc S. et al. (2009b). Tip de ovine (Ovis aries L.) Karakul Moldovenesc. AGEPI. Brev. invenţie MD 3825 G2 2009.02.28. BOPI nr. 2, p. 21-22.
14. Buzu I. (2012a). The model of Moldavian Karakul lambs of requested type. In: Int. Sci. Symp. „Modern zootechny, factor of sustainable development" at the at the UASVM of Iasi. Sci. pap. Anim. Sci. Ed. „Ion Ionescu de la Brad". Vol. 57 (17), Iaşi, p. 125-129. ISSN 2067-2330.
15. Buzu I. (2012b). Tip de ovine Karakul Moldovenesc Corpolent: teoria şi practica creării şi perfecţionării. AŞM, IŞPBZMV, IZ. Tip. „Elena V.I.", Chişinău, 513 p. ISBN 978-9975-4369-9-1.
16. Buzu I. (2014a). The milk production variability of Moldavian Karakul ewes. In: Int. Sci. Symp. „Modern animal husbandry – strategies, opportunities and performances" at the UASVM of Iasi. Sci. pap. Anim. Sci. (Plenary Session). Ed. „Ion Ionescu de la Brad". Vol.62(19), Iasi, p.52-61. ISSN 2067-2330.
17. Buzu I. (2014b). Genotypic assessment of Karakul rams by fur skin qualities of progeny. In: Int. Conf. „Agriculture for Life, Life for Agriculturer" at the UASVM of Bucharest. Sci. Pap. Ser. D. Anim. Sci. Ed. „CERES" Publ. House. Vol. LVII, Bucharest, p. 15-24. ISSN 2285-5750.
18. Buzu I. (2014c). Selection of Moldavian Karakul sheep by the body weight. In: Int. Conf. „Agriculture for Life, Life for Agriculturer" at the UASVM of Bucharest. Sci. Pap. Ser. D. Anim. Sci. Ed. „CERES" Publ. House. Vol. LVII, Bucharest, p. 25-34. ISSN 2285-5750.
19. Buzu I. (2015a). Research regarding some specific features of Moldavian Karakul lambs hide. In: Int. Conf. „Agriculture for Life, Life for Agriculturer" at the UASVM of Bucharest. Sci. Pap. Ser. D. Anim. Sci. Ed. „CERES" Publ. House. Vol. LVIII, Bucharest, p. 11-21. ISSN 2285-5750.
20. Buzu I. (2015b). The size of curls at the Moldavian Karakul skin. In: Int. Sci. Symp.

„Modern animal husbandry – food safety and durable development" at the UASVM of Iasi. Sci. pap. Anim. Sci. Ed. „Ion Ionescu de la Brad". Vol. 64(20), Iași, p. 53-61. ISSN 2067-2330.
21. Buzu I. (2015c). New researches concerning variability of milk production at the Moldavian Karakul ewes. In: Int. Sci. Symp. „Modern animal husbandry – food safety and durable development" at the UASVM of Iasi. Sci. pap. Anim. Sci. Ed. „Ion Ionescu de la Brad". Vol. 64(20), Iași, p. 84-92. ISSN 2067-2330.
22. Buzu I. (2015d). Genealogical structure of Moldavian Karakul type sheep. In: Int. Conf. „Agriculture for Life, Life for Agriculturer" at the UASVM of Bucharest. Sci. Pap. Ser. D. Anim. Sci. Ed. „CERES" Publ. House. Vol. LVIII, Bucharest, p. 22-31. ISSN 2285-5750.
23. Buzu I., Spătaru T. (2015). The economic value of selection characters of Moldavian Karakul sheep. In: Int. Sci. Symp. „Modern animal husbandry – food safety and durable development" at the UASVM of Iasi. Sci. pap. Anim. Sci. Ed. „Ion Ionescu de la Brad". Vol. 63(20), Iasi, p. 102-109. ISSN 2067-2330.
24. Buzu I. (2016a). Determining the breeding value of Karakul ewes after complex selection index. In: Int. Sci. Symp. „Modern animal husbandry – food safety and durable development" at the UASVM Iasi. Sci. pap. Anim. Sci. Ed. „Ion Ionescu de la Brad". Iași, vol. 66, p. 46-53. ISSN 1454-7368.
25. Buzu I. (2016b). Assessment of rams Karakul breeding value after selection complex index. In: Int. Conf. „Agriculture for Life, Life for Agriculturer" at the UASVM of Bucharest. Sci. Pap. Ser. D. Anim. Sci. Ed. „CERES" Publ. House. Vol. LIX, Bucharest, p. 23-28. ISSN 2285-5750.
26. Buzu I. (2016c). Economic efficiency of growth and exploitation of Moldavian Karakul sheep. In: Int. Conf. „Agriculture for Life, Life for Agriculturer" at the UASVM of Bucharest. Sci. Pap. Ser. D. Anim. Sci. Ed. „CERES" Publ. House. Vol. LIX, Bucharest, p. 173-178. ISSN 2285-5750.
27. Buzu I. (2016d). Creşterea ovinelor şi ameliorarea rasei Karakul (lucrare de sinteză). Academia de Ştiinţe a Moldovei, Institutul Ştiinşifico-Practic de Biotehnologii în Zootehnie şi Medicină Veterinară. Departamentul Editorial-Poligrafic al ASE. Chişinău, 80 p. ISBN 978-9975-75-819-2.
28. Buzu Ion. (2021). Evaluarea calității mieilor Karakul Moldovenesc (Monografie științifico-metodică). Universitatea Agrară de Stat din Moldova, Institutul de Zoologie. ÎS FEP „Tipografia Centrală", Chișinău, 288 p. ISBN 978-9975-157-71-1.
29. Buzu Ion, Evtodienco Silvia. (2022). Instrucțiuni de bonitare cu principii de ameliorare genetică a ovinelor Karakul Moldovenesc. Ministerul Agriculturii și Industriei Alimentare al Republicii Moldova, Direcția politici în sectorul zootehnic. ÎS FEP „Tipografia Centrală". ISBN 978-5-88554-086-5. Chișinău, 94 p.
30. Nica T. (1940). Norme pentru controlul producției de lapte la oi. Facultatea de Agronomie, Laboratorul de Zootehnie. Chișinău, 19 p.
31. Богданович Н.И. (1957). Выведение молдавского каракуля в колхозах Згурицкого района. В: Труды Кишиневского с-х института, т. XIV, с. 109-133.
32. Богданович Н. И., Ильев Ф. В., Бузу И. А. (1979). Продуктивность смушковых овец в условиях комплекса. В: Продуктивность сельскохозяйственных животных на промышленных комплексах. Кишинев, «Штиинца», с. 97-107.
33. Богданович Н.И., Бузу И.А. (1982). Коррелятивные связи признаков определяющих качество каракуля в условиях Молдавии. В: Техн. Вед. Жив. Пром. Основ. МСХ МССР, Кишинев, с. 164-171.
34. Богданович Н. И., Бузу И. А., Зелинский Н. А. (1983). Підсумки досліджень і селекції в каракулівнитцтві Молдавії за 1976-1981 р.р. В: Вівчарство. Республіканський міжвідомчий тематичний науковий сбірник, вип. 22, Киів, «Урожай», с. 37- 41. ISSN 0331-0089.
35. Богданович Н. И., Бузу И. А., Зелинский Н. А. (1984). Результаты селекционно-племенной работы в каракулеводстве. В: Генетические основы селекции сельско-хозяйственных растений и животных. Кишинев, «Штиинца», с. 145-146.
36. Богданович Н.И., Бузу И.А., Зелинский Н.А. (1986). Пути повышения продуктивности каракульских овец. В: Сел. Содерж. Профил. Забол. Жив. Кишинев, «Штиинца», с. 39-45.
37. Бузу И.А., Зелинский Н.А., Евтодиенко С.А. (1992). Качество каракуле-смушкового сырья в Республике Молдова. В: Биотехнологические аспекты развития животноводства. Сборник научных трудов НИТИЖВ. Кишинев, «Молдагро-информреклама», с. 45-49.
38. Бузу И.А. (2000). Разведение каракульских овец молдавского типа в частном секторе Республики Молдова. В: Матер. Межд. Науч.-практ. Конф. «Проблемы

пастбищного животноводства и экологии пустынь». Самарканд, с. 20-21.
39. Иванов М.Ф. (1914). Каракулеводство на югъ Россіи. Полтава, 246 с.
40. Ильев Ф.В. (1957a). Краткий исторический обзор развития молдавского овцеводства. В: Труды Кишиневского с.-х. института им. М. В. Фрунзе, том XIV, Кишинев, с. 2-24.
41. Ильев Ф.В. (1957b). Методы скрещивания, применяемые при выведении молдавского Каракуля, и полученные результаты. В: Труды Кишиневского с.-х. института им. М. В. Фрунзе, том XIV, Кишинев, с. 25-108.
42. Ильев Ф.В. (1965a). Из истории развития овцеводства в Бессарабии в дореформенный период. В: Труды КСХИ, т. 44, стр. 105 – 114.
43. Ильев Ф.В. (1965b). Из истории овцеводства Бессарабии в пореформенный период. Политическая экономия и экономика сельского хозяйства. В: Труды КСХИ, том XLII, стр. 113–128.
44. Ильев Ф.В., Богданович Н.И. (1966). Некоторые вопросы отбора и подбора при разведении местных серых смушковых овец. В: Труды Кишиневского с.-х. института им. М. В. Фрунзе, том 47, Кишинев, с. 49-55.
45. Ильев Ф.В. (1966a). О молочной продуктивности овец. В: Труды Кишиневского с.-х. института им. М. В. Фрунзе, том 47, Кишинев, с. 83-88.
46. Ильев Ф.В. (1966b). К вопросу об акклиматизации каракуля. В: Труды Кишиневского с.-х. института им. М. В. Фрунзе, том 47, Кишинев, с. 33-47.
47. Ильев Ф. В. (1969). Крештереа оилор ын Молдова. Ед. «Картеа Молдовенеаскэ», Кишинэу, 88 п.
48. Ильев Ф.В. (1976). Вопросы селекции в условиях индустриализации животноводства. В: Генетика и селекция сельскохозяйственных животных в Молдавии. Изд. «Штиинца», стр. 3-11.
49. Ильев Ф.В., Могоряну И.И., Богданович Н.И., Бузу И.А., и др. (1981). Итоги научных исследований за 1975-1980 г.г. по разработке и внедрению промышленной технологии в смушковом и цигайском овцеводстве Молдавии. В: Пути дальнейшей интенсификации сельского хозяйства Молдавской ССР. Тезисы докладов республиканской научно-производственной конференции Кишиневского с-х института им. М.В.Фрунзе (март 1981). Часть I, Кишинев, с. 110-111.
50. Ильев Ф.В. (1984). Селекция сельскохозяйственных животных. Изд. «Картеа Молдовенеаскэ»,Кишинев, 232 с.
51. Инструкция по бонитировке каракульских овец с основами племенного дела (1974). Изд. «Колос», Москва, 34 с.
52. Инструкция по ведению племенной работы в каракулеводстве (1989), составленная коллективом авторов: Юсупов Ш., Арипов М., Кошевой М., Ахметов Р., Укбаев А., Бузу И., и др. Самарканд, 83 с.
53. Плохинский Н.А. (1989). Руководство по биометрии для зоотехников. Москва, «Колос», 255 с.