Scientific Papers. Series D. Animal Science. Vol. LIX, 2016
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

ASSESSMENT OF RAMS KARAKUL BREEDING VALUE AFTER SELECTION COMPLEX INDEX

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Abstract

The aim of the research was to: elaboration a method for estimating the value of Karakul breeding rams through the construction and applying selection complex indexes. The research was conducted on Moldavian Karakul sheep at the flock of National Institute of Animal Livestock and Veterinary Medicine, Maximovca village, Anenii Noi district, Republic of Moldova. In this paper has been examined the methodology of constructing complex index of breeding rams selection of Moldavian Karakul race. It was found that, prior, for construction selection index complex has been reduced the number of characters and appropriation of lambs skin evaluation marks from 29 to 7, and the latter have been synthesized into a single character - Class lamb expressed in points after the decimal system. Have been identified three basic morpho-productive characters (skins quality of descendents, own body weight, milk production of maternal ram) and followed by the selection of breeding rams. It was been determined the economic value (share) of each selection character in the total income of one animal per year. For each selection character in part was been calculated coefficient phenotype aggregate (C_{fa}), which allows expression of the value of each character in unique units of measure, using the following formula:

$$C_{fa} = \frac{P_{ve}}{M_s} \qquad (1)$$

where, C_{fa} *– coefficient phenotype aggregate;*
P_{ve} *– share the economyc value of selection character;*
M_s *– phenotype standard size of selection character*

Having the aggregate phenotype coefficient for each character selection basis, we have built complex selection index of ram, after following formula:

$$I_{cs} = (M_{fp} \cdot C_{fap}) + (M_{fmc} \cdot C_{famc}) + (M_{fpl} \cdot C_{fapl}) \qquad (2)$$

where, I_{cs} *– selection complex index of ram;*
M_{fp} *– phenotype size of skin quality of rams descendents;*
C_{fap} *- coefficient phenotype aggregate of skin character;*
M_{fmc} *– phenotype size of own body weight of ram;*
C_{famc} *- coefficient phenotype aggregate of body weight character;*
M_{fpl} *– phenotype size of mothers ram milk production;*
C_{fapl} *- coefficient phenotype aggregate of milk production.*

Key words*: Complex index, selection, rams, Karakul.*

INTRODUCTION

Determining the targets value, complex breeding of animals of different species of animals in the result of evaluation marks present a actual permanent problem which is of concern to livestock researchers and specialists in the field. Ordinary appreciation of the animals after several characters long applied in livestock. Class summary of the animal itself have been determined after evaluation marks represent, in her essence, an index. However, this ordinary appreciation by summary of accumulated points, can not be considered and a complex one, because it is not reflects the importance of the economic value of each selected character. In summary class the all characters have the same value, while in complex selection index each character, obligatorily find its economic value and breeding. Selection effect after complex indices it is, according to data by 10% (Тарасевич Л.И., 1979; Таинберг Р.Р., 1971), according to others (Гуревнина И.В., 2002) of 2.0 times higher than the method based on selection independent limits of selection characters.

The Moldavian Karakul sheep type has a mixed productivity (combined) of skins, meat, milk, which determines the necessity of the selection of animals after this complex of characters that may be organized through different method: in tandem, by the independents limits or by complex selection index. Latter model is considered the most modern method. Determination the animal selection index represent, in fact, a complex evaluation of its breeding by main selected characters, taking into account the productive performance and economic value.

Application selection indices at the Karakul race, in generally is not widespread. Are known only some publications (Гуревнина И.В., 2002; Карынбаев А.К. , 2009; Карынбаев А.К. et. al., 2014; Юлдашбаев Ю.А. et. al., 2010), relating the selection indices to determine the growth potential of Karakul lambs during the ontogenesis postnatal period. The authors communicate about the application of the selection indices of the harmony of body conformation, but these (indexes) have not a complex character because it reflects only some co reports of some external characters (size) such as: body weight, thorax perimeter and oblique trunk length. Therefore, mentioned selection indices by these authors can not be used to determine the overall value of the animal breeding.

Currently, in determining the general value of breeding (class) Moldavian Karakul sheep, according to the Guidelines of evaluation Karakul sheep principled of improvement in the Republic of Moldova (Buzu I.A. et. al., 1996), are not taken into account some of the most important morph-productive characters selection (such as the milk production and the meat - the body weight). In fact, the main flaw of the actual Guidelines is that production of skins is considered only basic character, expressed by the lamb class, but the body weight and the milk production are considered characters associated (secondary) and are not taken into consideration anymore in determining the breeding value of the animal (class). So between the value of main morpho-productive characters and the value of the animal breeding there is a evident rupture, requiring integrated into a unique complex of phenotypic, genotypic and economic values of animal. From here, appears the pressing need to improve these instructions through the development and inclusion in the methodology of selection some modern methods for estimating the breeding value with application complex indices of selection.

In this context, it was proposed to develop a method for estimating the breeding value of Karakul rams through the construction and applying the complex selection indices.

MATERIALS AND METHODS

The research was conducted on the Moldavian Karakul sheep from the flock of the National Institute of Livestock and Veterinary Medicine from Maximovca village, Anenii Noi district, the Republic of Moldova. In view of the fact that the effectiveness of selection for more characters is inversely proportional to the square root of the number of characters selected ($\frac{1}{\sqrt{n}}$), according to the recommendations by Iliev T.V. (1992), first of all, we have been limited the number of characters selected from appreciating the skin of lambs, from 29 to 7, and the latter have been synthesized into a single character - class lamb expressed in points after the decimal system. Finally, as a first step, for building selection complex indices of Karakul adults rams, have been identified only 3 major morph-productive characters:

- skin quality - the descendents - lambs at the evaluation marks, expressed in points assessment after the decimal system, or value (score) their skin - without assessing after skin qualities of descendents;
- own body weight of the ram, determined annually (in October) at the adults rams, in autumn before the start of the mating company, by weighing at the technical weight with 150 kg capacity (Buzu I., 2014);
- milk production of maternal ram, or the average of daughters milk production - in case of their result lactation, expressed in kilograms and determined according to the methodology perfected by us (Buzu I., 2014).

The second step, carried by us in the way of building indices selection was to determine the

economic value of the three selection characters and establishing its share in total income from a ewe per year (Buzu I. et al., 2014). Systematizing and generalizing the above research results, we have deduced the following shares the economic values of character selection:

- the skin quality - 12 %;
- the body weigth - 28 %;
- the milk production - 60 %.

As mentioned selection characters have different phenotypic measurements and values for building summary complex selection indices, we have proceeded to calculate *coefficients phenotype aggregate*, which allow phenotypic transformation size of the character in the economic value weighted single of the animal selection complex index.

As a reference point for determining the coefficients of phenotype aggregate served the phenotype standard size (Ms) of the selection character, that represents the race standard (level of I class), for each age group and sex of animals in part, developed by us for the type of Moldavian Karakul sheep (Buzu I., 2012).

The coefficient of phenotype aggregate of the ram was calculated for each character individually selected following formula:

$$C_{fa} = \frac{P_{ve}}{M_s} \qquad (1)$$

where,

C_{fa} –coefficient phenotype aggregate;

P_{ve} – share economic value of the character selection;

M_s –phenotypic standard size of character selection.

Having available the coefficients aggregate phenotype for each selected character, we have deduced the complex selection indices of the ram, after following formula:

$$I_{cs}=(M_{fp}\cdot C_{fap})+(M_{fmc}\cdot C_{famc})+(M_{fpl}\cdot C_{fapl})$$

where,

I_{cs} – index selection complex of ram;

M_{fp} – phenotype size of skin quality;

C_{fap} - coefficient phenotype aggregate of skin character;

M_{fmc} – phenotype size of rams body weight;

C_{famc} – coefficient phenotype aggregate of body weight caracter;

M_{fpl} - phenotype size of milk production;

C_{fapl} – coefficient phenotype aggregate of milk production.

RESULTS AND DISCUSSIONS

The research results have shown that complex selection index, determined according to the above formula, combine, through coefficients phenotype aggregate, the summary value of the three main selection characters of respectively ram. The numerical value of the index is expressed in numbers without measuring units, in the range of two or three integer digits and one (tenths) or two (hundredths) digits rounded after the comma. In case which the phenotypic size of the three characters selection will coincide exactly with the breed standard, the selection index value will be equal to 100. According to the size of the phenotypic selection characters, the value of the complex selection index can be lower or higher than 100. In principle, the complex selection index indicates the level of animals breeding value compared to the rase standard and, also shows the extent to which it fails, approaching or exceeding this standard. In case than selection index value exceeds 100, we can conclude that value of the animal breeding is greater than the race and, conversely, if the index is below 100, breeding value of the animal does not meet the race standard.

At the Moldavian Karakul sheep we have built complex selection indices of breeding rams, and established the following succession of calculating it.

1. Determination the coefficient phenotype aggregate of selection characters.

1.1. Giving the formula (1), the coefficient aggregate phenotype for the quality of skin was as follows:

$$C_{fap} = \frac{P_{vt}}{M_s} = \frac{12}{6} = 2.0$$

where,

C_{fap} – the coefficient phenotype aggregate for the skin quality;

P_{ve} – share economic value of leather character established by 12%;

M_s – Phenotype standard size of the character skin quality at level of class I = 6 points.
As a result of calculations made, the coefficient aggregate phenotype for the skin quality of character is equal to 2.0.

1.2. The coefficient aggregate phenotype for body weigth was:

$$C_{famc} = \frac{P_{ve}}{M_s} = \frac{28}{75} = 0.373$$

unde:

C_{famc} – the coefficient aggregate phenotype for body weigth;

P_{ve} – share economic value of the body weight = 28;

M_s – Phenotypic standard size for body mass for breeding rams is 75 kg.
As a result of calculations made, the coefficient phenotype aggregate of rams body weight character is equals 0.373.

1.3. The coefficient phenotype aggregate for milk production was:

$$C_{fapl} = \frac{P_{ve}}{M_s} = \frac{60}{70} = 0.857$$

where:

C_{fapl} – the coefficient phenotype aggregate for milk producton;

P_{ve} – share economic value of milk production = 60 kg;

M_s – phenotypic standard size of milk production = 70 kg
As a result of calculations made, the coefficient phenotype aggregate of ram mothers milk production character equals 0.857.

2. Determination the complex indexes of ram selection.
Thus, having coefficients aggregate phenotype of characters selection for breeding race, we built following formula of index complex selection:

$$\mathbf{I_{csb}=(M_{fp}\cdot 2{,}0)+(M_{fmc}\cdot 0{,}373)+(M_{fpl}\cdot 0{,}857)}$$

where,

I_{csb} – the complex selection index of reproducing ram;

M_{fp} – the phenotypic size of the descendants skin quality score expressed in mean value scores, or the value (score) own skin - in without assessing after the skin qualities of descendents;

M_{fmc} - phenotype size of their body weight;

M_{fpl} - phenotype size of mothers ram milk production, or daughters - in case of there of lactation results;

2.0 – the coefficient phenotype aggregate of the quality skin descendents;

0.373 - the coefficient phenotype aggregate of ram own body weight;

0.857 - the coefficient phenotype aggregate of rams mother milk production.

According to this formula, we have calculated complex selection index for breeding-rams from investigated flock (Tab. 1).
Thus, the data presented in table reveals that the largest amount of ram breeding has nr. 5422, which occupies the first rank in the string breeding rams.
Having 96 kg body weight, with the average score of quality skin descent worth 6.14 points and maternal milk production equal to 83 kg, the complex index of selection was:

$$\mathbf{I_{cs5422} = (6{,}14\cdot 2{,}0) + (96\cdot 0{,}373) + (83\cdot 0{,}857) = 12.28+35.81+71.13 = 119.2}$$

Examining the achieved complex index of selection, we can say that the ram no. 5422 has a complex superior breeding value breed standard 19.2% and part of the elite breeding of the flock, whose value exceeds the breed standard. This ram can be involved in the company mating with the best females in the flocks intensively using it to improve productivity, because it exceeds the quality breed standard of the race after descent skin quality with 2.3%, body weight with 28.0% and milk production with 18.6%. After complex index of selection this ram is the most valuable breeding of the flock.

Table 1. Complex selection indexes of breeding-rams from flock

Nr. of rank	Nr. matriculation ram	Mean score skin descendents	Body weight ram, kg	Milk production of mother, kg	Complex indices of selection
1	5422	6.14	96	83	119.2
2	4228	6.54	89	82	116.5
3	7823	6.04	91	78	113.6
4	6356	6.00	82.4	81	112.1
5	0073	6.16	88	75	109.4
6	6502	5.08	92	73	107.0
7	9125	5.02	89	74	105.7
8	1668	5.37	93	68	103.7
9	6218	4.58	81	71	100.2
10	4103	6.10	74.5	70	100.1
11	3982	4.17	78	72	99.1
12	8144	4.94	87	65	98.0

Another obvious example presents the ram no. 4228, with body weight of 89 kg, with the average score of quality skin descents worth 6.54 and the mothers milk production equal to 82 kg, whose complex selection index was:

$$I_{cs4228} = (6,54 \cdot 2,0) + (89 \cdot 0,373) + (82 \cdot 0,857) = 13.08 + 33.2 + 70.27 = 116.5$$

After calculating complex selection index, we can conclude that this getter is also a valuable breeding fairly good compared to the breed standard and the other rams, being part of breeding elite flock, whose value is estimated at high. This ram can be trained, also, mating with the best females in the flock using it intensively for productivity improvements. After the productive performance, this getter exceeds the standard race after quality of descendents skin by 9.0%, own body weight with 18.7%, and mother milk production with 17.1%. After the complex selection index of the ram exceeds standard with 16.5 units.

Another example shows the ram no. 4103 quality skins of 6.10 points, 74.5 kg body weight and the mothers milk production of 70 kg. Complex selection index of this ram is obviously located in the breed standard (class I) and are:

$$I_{cs4103} = (6,10 \cdot 2,0) + (74,5 \cdot 0,375) + (70 \cdot 0,857) = 12.2 + 27.94 + 59.99 = 100.1$$

As we observe this ram is neutral, after the productive performance, does not differ at all from the average breed standard. From this ram descendents cannot wait an amelioration of the morpho-productive performance compared to the breed standard. Use of this ram mating can lead to stabilization of morpho-productive performances in the flock.

If all breeding ram from flock for will be calculated the complex indices of selection, livestock specialist will be have the possibility determining the ranking each of them and revelation the most valuable breeding.

Generalizing the results of building the complexes indices of selection at the breeding rams, we find that the constructive principle of complex selection index is based on the integration of the three selection characters, such as, skin quality, body weight and milk production. The difference between the complexes indices of selection of each ram consists in the diversity of phenotypic values of skin qualities progeny, their body weight and production of breast milk, the last two character being the decisive complex in formula for calculating the selection index.

Having the above formulas, livestock specialist, at the end of the year, calculated the complex indices of selection, and determines the breeding value of each animal. These calculated indices, is entered in the register of complex evaluation marks of sheep. Based on these entries, the specialist determines the rank of animals in the flocks, selecting the most valuable of these in batches of breeding for reproduction.

CONCLUSIONS

1. Assessing the value of breeding of ram by complex selection index, reflects objectively

the actual quality of breeding, combining integrally three important selection characters, such as skin quality, body weight and milk production.

2. Implementing the method for estimating of value breeding animals after complex selection index will be help increase the efficiency of Moldavian Karakul sheep selection.

3. The method for estimating the value of breeding the rams after complex selection indices to be formalized by inclusion of these provisions in the rules (instructions) livestock of evaluation marks and certification of material sheep genetically material of breeding, with their approval in the established manner.

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