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Model Of Tsigai Breed' Meat Quality Improvement In Pure Breeding.

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ABSTRACT

Selective and technological basis of improving the meat quality of Tsigai breed are stated in article. The application of the target parameters of animals, the technological factors and using in selection of parental pairs animals of meat line was substantiated. Basis includes a following essential requirements: choice and selection of the parental pairs must be carried out according to the target parameters of animals: live weight of young rums is 25 - 30 kg, young females is 22 - 25 kg at 4 months. At 14 months, correspondingly, 42 - 45 kg and 34 - 38 kg, wool length at weaning is 4 - 6 cm for young rums and 3 - 5 cm for young females; the period of ewes' lambing: not later than the second ten days of March; the period of weaning of lambs: it is efficient early weaning 3.5 – 4.0 months; use of intensive fattening of young animals for meat after weaning at the period up to 7 - 8 months; using in selection of parental pairs animals of meat line: lines must be configured to the increased body weight (live weight of adult rum no less 90 kg, and adult ewes no less 60 kg. Also high average daily gain of fattening for the young sheep in period from weaning to implementation for slaughter in 7 - 8 months no less 200 – 210 g; economic benefit from the introduction of selective and technological basis of Tsigai breed meat quality improvement in the implementation of 100 heads of young animals obtained by meat lines allows obtaining the extra economic benefits to $1,325 from100 heads of young sheep. Selection is desirable to lead in pure breed in order to preserve the unique genotype of the Tsigai breed.
Keywords: Tsigai breed sheep, Model, line, parental lines, target parameters, productivity, economic benefits, selective and technological basis of meat quality improvement, pedigree farms.

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INTRODUCTION

Tsigai breed is quite common in the CIS sheep breeding. This breed of sheep is widespread in the farms of South Ukraine [1], some regions of Russia [2], Kazakhstan [3] and Europe [4, 5, and 6].

Tsigai breed sheep are characterized by a rather high variability of characteristics: animals are capable to produce wool fiber with fineness of 25 to 43 microns and length of 8 to 19 cm and density of rune from 1 to 4.5 thousand to 1 cm² of skin [7]. Intensive selective work with Tsigai sheep breed is carried out since the middle of 20th century to the present time at the pedigree farms. The most famous pedigree farms are "Chernomorskoe" and "Slavnoe" in the Steppe Crimea.

Working on this pedigree farms specialists and scientists achieved high results in work with Tsigai breed sheep. Adults rums have a height of 80 cm, ewe - is 72 cm, and body length, correspondingly, is 126 and 106 cm. Wool of Tsigai sheep that are breed in the Crimea, is long enough (12.5 - 15.0 cm), Wool grease is a light cream color, the fineness of the fibers - 31.2 - 36.8 mm [8, 9].

The first records about Tsigay breed sheep are dated by the second half of the 19th century. At that time, State Commission had worked on a peninsula to study the state sheep farms. The results of the work of the State Commission had been published the Report in St. Petersburg in 1884 [10]. An interesting was the fact that the opinion of the State Commission' members were divided about the appearance of Tsigai breed sheep in the Crimea. Some believe that the sheep originally were bred in Spain, and others, by the nature of wool and constitution, admit that the sheep of this breed were first obtained on the coast of present-day Georgia, and widespread through Middle Asia to Greece and Italy, and from there - to Bessarabia. Then, animals from Bessarabia were introduced in the Crimea in the middle of19th century. These facts were stated in Report of State Commission.

And if in the 19th and 20th centuries the sheep breeders of the Crimea were focused on the wool production improvement, at the modern stage of sheep breeding market wood need to focus on further breeding work towards improving the quality of sheep meat. With this purpose it is necessary to pay attention to such indicators as multiple pregnancy and dynamics of growth and development of young animals. If a lamb has a high rate of growth, it will be characterized by greater live weight. Author believes that ewes should also have a considerable body weight [11].

Generalizing the data of many years of work, a number of foreign scientists believe that the sheep population should combine a high level of multiple pregnancy, dairy, high-quality wool and meat productivity at a low cost of feed [12, 13]. Other scientists have developed a technique to improve sheep's multiple pregnancy. The given technique is that animals of twins and triplets are encouraged to be selected in the nucleus of main herd [14].

The modern market of Crimea dictates the reorientation of the sheep industry at the meat production. Sheep-breeders in Europe are also concerned with the same problem. Relative economic value for the wool trait did not exceed 0.3%. Also, scientists report that, the relative economic value for the complex of milk production traits ranged 30.6–48.1%, for growth traits 6.3–9.4%, and that for functional traits 45.4–59.7% [4, 5, 15].

Immunogenetic markers are widely used in sheep breeding. But selection by phenotype remains an important factor in improving existing and emerging breeds, types, crosses or lines of farm animals and ensures the involvement of animals with high genetic potential during the selection process [16, 19-25].

By our previous investigations the influence of technological factors on the expression of meat productivity levels in Tsigai breed sheep in the conditions of the Crimea is proved significantly. These factors includes: the conditions of feeding and maintenance, the timing of lambs weaning, etc. [17].

The main aim of the study was to suggest for sheep breeders the selective and technological basis of improving the meat quality of Tsigai breed sheep on the basis of our research. Use of the target parameters have developed by authors of this article. The economic benefits of using of Tsigay breed meat lines with increased productivity in the Republic of Crimea was also calculated.

MATERIAL AND METHODS

Animals:

Studying of productive indicators of sheep in the enterprises of the Crimean peninsula is carried out. The Tsigai breed is the main breed in the Crimea breeding system.

Research work on selective and technological basis of Tsigai breed meat quality improvement was conducted during 2010-2015 years.

Place of research:

Pedigree farm "Chernomorskoe" ("Black Sea Land") of the Republic of Crimea. Location of the enterprise with the coordinate's 45°20'55" north latitude 33°52'44" east longitude. The climate is characterized by sunny dry summers, warm autumn and mild winters. The predominant direction of the wind in the warm period of the year is the north-east and south-west, in the cold period is north-east mainly. The maximum wind speed is 27 meters per second every year; 32-34 meters per second once every 5-10 years; 35-36 meters per second s once every 15-20 years. Agro climatic conditions are characterized by significant thermal resources: the number of days with an average daily temperature above ten degrees Celsius is 190 days. However, during the vegetation period, there is insufficient precipitation (210 mm) and drought (80 days), which cause damage to agriculture. The number of sunny days per year is 225.

Sheep' indicators:

Milk of ewes is determined by the calculation method. The difference in live weight of lamb in 20 days of age and at birth, multiplied by a factor of 5.2. This calculation procedure is based on the fact that a lamb up to 20 days of age does not receive other foods than mother's milk. Live weight at birth, at 20 days of age and at weaning (at 4.5 - 5.0 months of age). Economic indicators.

Basic indicators of the target parameters of animals, we have developed in previous investigations:

Following the evaluation of young sheep, at the age of 4 and 14 months, the animals should be selected to form the nucleus of main herd by following indicators: live weight of young rums is 25 - 30 kg, young females is 22 - 25 kg at 4 months. At 14 months, correspondingly, 42 - 45 kg and 34 - 38 kg, wool length at weaning is 4 - 6 cm for young rums and 3 - 5 cm for young females. At 14 months, 10 - 11 cm and 8 - 9 cm, correspondingly. The thickness of the wool fiber at 4 months for young rums is 50th quality and 48 – 50th quality for young females. At 14 months: young rams have wool of 46 - 50th quality and young females - 48 - 50th of the wool quality. The class breeding of young females breeds to the nucleus of main herd is only the "Elite" one. Filter for animal must be a strong constitution and a harmonious body. Ewes' milking should be sufficient for the feeding of two lambs with live weight of not less than 24 kg of young females and 26 kg of young rums for weaning [17].

Statistical analysis

Selection parameters statistics using a PC in the Excel program were studied according to the following indicators:

- an unbiased estimator of the population (X) - the average value of the index in the group of animals;
- average deviation (m_X) - the value of this parameter depends on the trait variability;
- coefficient of variation (C_v) - the ratio of the average deviation to the arithmetic mean, expressed as a percentage (in %);
- correlation takes values from 0 to ±1;
- statistical error of the correlation coefficient (m_r);
- a level significant: P > 0.5; P > 0.001.

RESULTS

A complex development of selective and technological basis of Tsigai breed meat quality improvement includes several of the following demands.

Using of technology factors in selective and technological basis of meat quality improvement:

Ewes' dairy should be sufficient to grow at once lambs single and twins. Early weaning (at 3.5 months) and use of improved diet for lambs with premixes suitable for ruminants, and grazing on the pastures have contributed to their intensive growth while reducing feed costs per unit of production. Body weight of lambs was almost the same at the start of experiment. Early weaning animals group predominated over animals with the traditional system of growing (weaning at 4.5 – 5.0 months) to 0.5 kg, and at 7 months the difference was 4.5 kg in favor of animals of the group of early weaning.

For the analysis of features three groups of youngsters were formed. The groups were divided according to the period of lambing: lambing' period 01.03 - 20.03; lambing' period 21.03 - 09.04; lambing' period until the first of March.

Development of young sheep depending on lambing' period described in Table 1. Females' live weight at birth in period from 01.03 to 20.03 had the advantage with analogues in lambing' period from 20.03 to 10.04 by 0.02 kg or 0.61 % and with analogues in lambing' period until the first of March by 0.13 kg or 3.91 % (P > 0.5). Males' live weight at birth in period from 01.03 to 20.03 had the highest rates: difference with analogues that were born in period from 20.03 to 10.04 buy 0.15 kg or 4.0 % (P > 0.5) and with analogues in lambing' period until the first of March by 0.01 kg or 0.26 %.

Table 1: Development of young sheep depending on lambing' period

Young sheep' sex	Lambing' period	n	Statistical indicator	Live weight, kg		Correlation between live weight at birth and at weaning ($r \pm m_r / t_r$)
				at birth	at weaning	
Females	from 01.03 to 20.03	28	$X \pm m_X$	3.51±0.04[a]	30.54±0.63	0.80±0.07 [a]
			C_v	6.3	11.0	12.0
	from 20.03 to 10.04	28	$X \pm m_X$	3.49±0.04	30.36±0.47	0.32±0.17
			C_v	6.2	8.2	1.9
	until the first of March	14	$X \pm m_X$	3.38±0.04	28.79±0.75	0.42±0.22
			C_v	4.4	9.8	1.9
Males	from 01.03 to 20.03	32	$X \pm m_X$	3.89±0.05 [a]	37.06±0.76 [a]	0.85±0.05 [a]
			C_v	6,8	11,6	17.7
	from 20.03 to 10.04	47	$X \pm m_X$	3.74±0.04	34.52±0.46	0.58±0.10 [a]
			C_v	7.0	9.2	6.0
	until the first of March	25	$X \pm m_X$	3.88±0.05	36.92±0.54	0.74±0.09 [a]
			C_v	6.4	7.3	8.3

Remark: in this table - a level significant [a] - P > 0.001

A similar pattern is saved for such a factor as live weight at weaning but the difference in females in this parameter is not significant: with analogues in lambing' period from 20.03 to 10.04 by 0.18 kg or 0.58 % and with analogues in lambing' period until the first of March is 1.8 kg or 6.1 %. Males' live weight at weaning characterized by the following features. Animals with lambing' period from 01.03 to 20.03 differ by their advantage in this indicator with analogues in lambing' period from 20.03 to 10.04 by 2.5 kg or 7.3 % (P > 0.5); difference with analogues that were born in period until the first of March is not significant: 0.14 kg or 0.37 %.

Correlation between live weight at birth and on weaning of Tsigai Breed youngsters has a positive and strong level. The highest rate was a youngster that was born in lambing' period from 01.03 to 20.03: females is 0.80±0.07 (P > 0.5) and males is 0.85±0.05 (P > 0.5).

Thus, the lambing' periods is 01.03 - 20.03 and 21.03 - 09.04: this one is the optimal timing of ewes' lambing of Tsigai breed in conditions of Crimean peninsula. 91% of ewes in the first group and 80% of ewes of second group are characterized by a high mark during selection. Young animals at the age of four and fourteen months from the ewes of these two groups are characterized by a satisfactory development in accordance with the target parameters. These animals are suitable both for fattening (receiving a high-quality meat production) and subsequent reproduction (replacements animals).

In our opinion, this is due to the fact that the pregnant ewes until the end of December were located in pastures and fields with stubble residues of winter crops. The ewes with later insemination has been transferred almost completely to the maintenance and feeding of canned food (silage, hay, haylage, straw) and the weight of lambs at birth is less. Thus, the ewes, who gave birth in later terms, received a winter diet almost throughout the pregnancy; this probably did not contribute to the intensive intra-uterine development of the lambs.

Conditions of welfare and feeding the sheep:

Feeding conditions for young animals in the period following the birth of the animal very important [18]. When we speak about basic indicators of the target parameters of animals and using of factors of technology we need to raise issues nutrition and animals' welfare. For the Steppe Crimea the optimal mixture for sheep is hay and haylage. A grain of barley and oats are used as the concentrates.

Only high-grade sheep feeding provides an optimal implementation of selective and technological basis of Tsigai breed meat quality improvement in the Crimea. According to our calculations it is necessary to harvest per one sheep per year next quality types of feed, kg: hay - 200 - 220, including hay from legumes - 120; straw spring - 150 - 200; haylage - 600 - 620; sugar beet - 150 - 200; concentrated feed - 100; straw as bedding - 40 - 50; green fodder - 1200 - 1500.

Feeding ewes should be organized, taking into account their physiological conditions, body weight, wool productivity, the planned number of lambs at lambing. In the first two months of suckling period of daily ewes' milking is 1.2 - 1.5 kg of milk, so the nutritional value of the diet should be 1.95 feed units and 195 - 200 g of digestible protein, calcium - 11.7 g, P - 7.8 Mg - 1.6, sulfur – 7 g, the salts - 17g, carotene - 22 mg, vitamin A - 850 mg. In the second half of the suckling period ewes' milking is reduced to 0.7 - 1.2 kg, so the lower feeding rate in a ration feed should be 1.45 feed units, digestible protein - 145 g, calcium - 8.7, P - 8.8, Mg - 1.3, sulfur - 5, salt - 14 g, carotene - 17 mg, vitamin A - 700 mg.

Two groups of ewes were formed in the experiment on directed lamb growth. First group of ewes received a diet, which is given in this paragraph of our article. Second group of ewes to the main diet was given a premix. Ewes' dairy is sufficient to grow both lambs that were alone in the litter, and the twins (table 2).

Table 2: Tsigai ewes' dairy

Statistical	Ewes' first group				Ewes' second group			
	young female sheep		young rams		young female sheep		young rams	
	alone in the litter	twins	alone in the litter	Twins	alone in the litter	twins	alone in the litter	twins
X ± m x	28.6 ± 0.4	29.1 ± 0.7	28.5 ± 0.4	28.9 ± 0.5	29.01± 0,8	29.94 ±1.2	32.4 ± 0.5	33.7 ± 0.5
C_v	8.5	12.7	6.7	9.0	11.5	20.3	7.3	4.5

Monitoring of lambs to study the dynamics of them growth and development in each group were conducted. In the experiment the young sheep were divided into four groups: alone in the litter at birth young female sheep; single-lamb at birth young female sheep; alone in the litter at birth young rams; single-lamb at birth young rams. The results of growth and development of young animal from birth to weaning are given in Table 3.

Table 3: Dynamics of development of lambs in experiment

Statistical	Ewes' first group				Ewes' second group			
	young female sheep		young rams		young female sheep		young rams	
	alone in the litter	twins	alone in the litter	Twins	alone in the litter	twins	alone in the litter	twins
Live weight at birth								
$X \pm m_x$	4.2 ± 0.1	3.7 ± 0.04	4.4 ± 0.1	3.6 ± 0.1	4.3 ± 0.1	3.6 ± 0.04	4.7 ± 0.1	3.8 ± 0.02
C_v	11.3	10.0	14.2	10.8	6.3	14.2	11.7	1.8
Live weight in 5 months, kg								
$X \pm m_x$	25.0 ± 0,4	21,2 ± 0.5	27.1 ± 0.2	25.4 ± 0.3	28.9 ± 0.3[a]	28,5 ± 0.1[a]	35.4 ± 0.6[a]	33.1 ± 0.1[a]
C_v	7.7	14.9	5.3	6.1	8.0	2.4	8.8	1.9
Average daily gain, g								
$X \pm m_x$	139 ± 2.2	117 ± 3.8	151 ± 2.0	145 ± 2.3	164 ± 2.8[a]	166 ± 0.5[a]	205 ± 4.1[a]	195 ± 1.1[a]
C_v	8.7	17.2	7.4	7.6	10.1	1.7	10.2	2.4

Remark: in this table - a level significant: [a] - $P > 0.001$

There is a significant ($P > 0.001$) advantage of the development of the young animals, obtained from the ewes who had feeding with the addition of premix. During the entire period, the difference of young animals from second group with the analogues from first group varieties from 13.0 to 30.3 %.

Using of high-quality selective lines of Tsigai breed:

In breeding are used nine main selective lines of Tsigai breed in Crimea. These lines are suitable for use in breeding to produce animals that would be responsible for selective and technological basis of Tsigai breed meat quality improvement. Selective lines' numbers are: 1128; 65204; 80077; 20832; 66796; 01684; 82104; 884; 0173.

The herd of Tsigai breed at the pedigree farm "Chernomorskoe" was observed in the period from 2013 to 2015. The fact that body weight of adult rums had the advantage in lines of animals of selective lines №№ 80077 and 0173 was identified. In meat and fattening indicators of young, the best ones were selective lines №№ 20832 and 01684. According to the fineness of wool sheep lines №№ 80077 and 0173 were classified as perspective, and on the evenness of wool were sheep in line number 20832.

The advantage of live weight had young females of lines №№ 1128, 80077, 884 and 66796 (live weight of the animals ranges 51.1 - 50.3 kg). At the length of wool predominant are selective lines №№ 80077 and 66796, correspondingly, 15.5 and 14.9 cm. The prevailing quality of wool is marked only to young females of selective line number 0173.

After calculating the indexes of body build, meat shape is formed by the young sheep of next lines, №№: 82104, 20832, 80037, 1128 and 66796.

We analyzed the correlation between Tsigai breed rams and their descendants on such important indicators as live weight and length of wool fiber. The results are shown in Table 4.

Table 4: Correlation between Tsigai breed rams and their descendants by the live weight and length of wool fiber

Selective line of Tsigai Breed	n	Correlation between:	
		the live weight of the ram and the live weight of the descendant	the length of the ram's wool fiber and the length of the descendant's wool fiber
1128	6	0.36±0.36	0.09±0.40
884	8	0.44±0.28	0.45±0.28
66796	6	0.48±0.32	-0.37±0.35
173	3	-0,40±0.48	-0.33±0.52
20832	7	0.26±0.35	0.15±0.37
82104	5	0.02±0.45	-0.40±0.37
80077	6	0.82±0.13[b]	0.27±0.38
65204	3	0.30±0.52	-0.50±0.43
1684	3	0.99±0.02[b]	-0.50±0.43
The average for selective lines	47	0.29±0.13[a]	0.12±0.14

Remark: in this table - a level significant [a] - P > 0.5; [b] - P > 0.001

The correlation between the rams of the Tsigai breed and their descendant in terms of the live weight index has a positive level in the main. In this case, only in the lines Nos. 80077 and 01684, the correlation has a high and reliable degree level. On average for the sample, the correlation of this indicator is positive 0.29±0.13 (P > 0.5). This fact may additionally indicate that the selection of paternal forms for obtaining a raised descendant's live weight can be quite effective. The correlation between length of wool fiber of the Tsigai breed rams and their descendant on average for the sample is low level and not reliable.

Economic benefit from the introduction of selective and technological basis of Tsigai breed meat quality improvement:

Table 5 shows the effect of the economic profit of different variants of selection of animals using selective and technological basis of Tsigay breed meat quality improvement.

Table 5: The economic profit of assessment of the various options for the selection of animals to improve meat productivity features

Index	Young sheep' growing	
	in commercial herd	from the lines of parents with improved indicators of meat productivity
Lambs in group, heads	100	100
Age weaning, months.	4.5 – 5.0	4.5 – 5.0
Average daily gain, g	127	172
Average live weight, kg:		
at birth	4	4.2
at 20 days. Age	9.9	11.1

at 5 months. age	25.2	32.6
The absolute increase in the period of the experiment with 20 days prior to weaning, kg	15.3	21.5
Cost of concentrate portion of the diet, $ per head per day	0.02	
The cost of the cereal feed, $ per head per day	0.018	0.021
The costs for the whole period of growing for grain feed group, $ per head	2.20	2.53
Average live weight of 1 head of young sheep at 5 months., kg	25.2	32.6
Revenues from sales, at a price of 1.79 $ for 1 kg of live weight, $ per head	45.13	58.38
Economic benefits, $ per head	–	13.25

According to given calculations of economic benefit period of weaning young sheep was traditional: at five months age. In the data given in the table 5, the extra economic benefit was $ 1,325 per 100 heads of young sheep, which had been selected from parents at high rates of meat productivity lines, if it is implemented at five months of age.

CONCLUSION

Thus, it should be taken into account in the selection of parental pairs of Tsigay breed selective and technological basis of meat quality improvement. The basis includes a following essential requirements:

- choice and selection of the parental pairs must be carried out according to the target parameters of animals;
- you must take into account the technological factors, such as the period of ewes' lambing: not later than the second ten days of March; you must take into account the period of weaning of lambs: it is efficient early weaning 3.5 – 4.0 months, but with the application of improved diet for lambs with premixes for ruminants, and their grazing on spring pastures; use of intensive fattening of young animals for meat after weaning at the period up to 7 - 8 months;
- using in selection of parental pairs animals of meat line: lines must be configured to the increased body weight and high average daily gain of fattening for the young sheep;
- economic benefit from the introduction of selective and technological basis of Tsigai breed meat quality improvement in the implementation of 100 heads of young animals obtained by meat lines allows obtaining the extra economic benefits to $1,325 from100 heads of young sheep.

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