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MEAT PRODUCTIVITY OF KHARKIV INBRED LAMBS OF THE PREKOS BREED BORN AS SINGLES AND AS TWINS

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Abstract

Studies of meat productivity and meat quality of lambs, taking into account the type of their birth, are relevant for the theoretical justification of the young lamb production issue. The aim of the work was to investigate the meat productivity of lambs taking into account their type of birth. The work was carried out following the Program of Research of the National Academy of Agrarian Sciences 32, "Selection and technological system of transformation of sheep breeding production directions in Ukraine". Kharkiv inbred lambs of the Prekos breed were the object of the study. The lambs were born as singles and as twins. Meat productivity was studied by conducting a control slaughter of 9-month-old lambs, three animals from each group. It has been established that the type of birth of single lambs ensured a reliable increase in pre-slaughter live weight by 13.4 and 19.4%, fresh carcass weight by 11.8 and 19.8%, slaughter weight by 14.0 and 22.2%, with a simultaneous increase in the absolute content of the first class pieces - by 13.1 and 23.5%, the content of pulp - by 24.8 and 30.8%, compared to lambs born among identical and different-sex twins. On the other hand, the muscle tissue of same-sex twins, compared to yearlings born as singles and among twins of different sexes, in terms of the amount of food components accumulated in the dry matter, is characterized by a higher mass fraction of fat - by 8.5 and 10.4%, and ash - by 0.63 and 0.83% and has a higher caloric value - by 38.2 and 43.3%.

Key words**:** *lambs, breed, type of birth, meat productivity, grade composition of half-carcasses, internal organs, chemical composition of lamb*

INTRODUCTION

Sheep breeding is one of the leading branches of animal husbandry, which is a source of food products - meat and milk, as well as sheepskin, lambskin, wool fat and other products [14].

A characteristic feature of modern sheep breeding is the growing importance of lamb compared to wool, and therefore the leading attention of specialists is devoted to the development of sheep breeding in the meat direction of productivity. In this area, increasing the meat productivity of sheep and improving the quality of lamb determine the main directions of breeding work with animals of any direction of productivity. Meat obtained from a young lamb in the year of its birth is considered the most valuable. At the same time, meat productivity is characterized

by qualitative and quantitative indicators of carcasses of slaughtered animals. It is caused by breed differences [2, 6, 29]. Crossbreeding is the most expedient method of increasing the meat qualities of sheep [1, 3, 5, 7, 25]. In addition, factors such as age of animals [9], breed [30], conditions of keeping, etc. influence the formation of meat productivity of young sheep. [4, 12]. Feeding is a key factor that affects not only the intensity of growth of young animals at an early age, but is also a determining criterion for animal development, which further contributes to the formation of carcass composition [10, 20]. In the case of unsustainable feeding, those organs and tissues that have the highest intensity of growth in the early period of ontogenesis are underdeveloped in young animals. With the improvement of feeding conditions, growth retardation can be compensated only partially. It is worth noting that extensive systems of sheep farming in the summer can also lead to both a decrease and an increase in sheep productivity [11, 15, 21]. And since pasture grass, as the only source of fodder, does not always provide the optimal level of feeding and production of sheep farming products, there is a need to feed sheep using concentrated fodder [8, 22, 26, 32]. Compared to animals of the specialized wool and wool-meat sectors, sheep of the meat-wool productivity direction are characterized by better development of muscle tissue, higher indicators of meat output, meatiness coefficient, growth energy, especially at a young age, as well as paying for feed with products at relatively low rates of skeleton development [31].

Kharkiv inbred sheep of the Prekos breed are typical representatives of sheep of the meat-wool direction of productivity, which are characterized by high precocity of young, good breeding, productive and meat qualities [27]. At the same time, the practice of sheep breeding development in many countries of the world shows that it is possible to overcome the problem of providing the population with mutton by increasing the fertility of ewes. However, the opinion of experts regarding the effectiveness of raising young animals among singles or multiple offspring is quite contradictory.

In the context of the above, some authors report that the body mass indices of triplets are lower than those of lambs born as twins and as singles [23]. Whereas, in the same publication, it is claimed that triplets, on the contrary, differ from singles and twins in a better formed physiological status. According to other experts, the type of birth also affects the live weight of lambs at different age periods: twin and triplet lambs are inferior in this indicator to lambs born as singles [13, 19]. Currently, as [28] emphasize that the survival rate of twins is higher than that of singles.

Therefore, the determination of the influence of the type of birth (singles, twins) on the manifestation of signs that characterize the meat productivity of sheep of the meat-wool direction of productivity, in particular, the Kharkivintrabreed type of the fine-wool breed Prekos, has scientific and practical significance and determines the relevance of the conducted research.

MATERIALS AND METHODS

The work aimed to investigate the meat productivity of lambs taking into account their type of birth.

The tasks of research include: the study of indicators characterizing slaughtering qualities, the morphological composition of lamb carcasses and the development of internal organs; assessment of the chemical composition and individual physical and technological properties of lamb.

The scientific and economic experiment was carried out on the lambs of the breeding plant for breeding Kharkiv inbred sheep of the fine wool breed Prekos of the State Enterprise Experimental Farm "Gontarivka" Institute of Animal Science of the NAAS, Chuhuiv District of the Kharkiv Region, and the experimental work was carried out in the Department of Selection and Technological Research in Small Animal Breeding and Horse Breeding. Housing - stable, feeding conditions - identical for all experimental

groups, using feed of own production and feed additives.

To study meat productivity, a control slaughter of 9-month-old lambs was carried out, 3 heads from each group, following the methodical principles given in the manual edited by I. I. Ibatullina and O. M. Zhukorskyi [16]. In the process of work, the quality composition of half-carcasses meat was studied - on the basis of their cutting, followed by weighing of separate parts following the requirements of GOST 7596-81. Morphological composition of half-carcasses - by carcass deboning and weighing meat and bones. Absolute mass and development of internal organs - by weighing and calculating their relative values to the pre-slaughter live weight of lambs. The assessment of the chemical composition and some physical and technological properties of meat was performed on samples that were studied in the Laboratory for Assessing the Quality of Feed and Animal Products of the Animal Husbandry Institute NAAS, which is accredited in accordance with the international requirements of DSTU ISO / IEC 17025:2006 as a basic organization of the metrological service of the Ministry of Agrarian Policy of Ukraine. The average meat sample was taken from the spine-costal part from the 9th to the 11th rib inclusively, deboned, tendons and cartilage were removed. Then the lamb was ground in a meat grinder and, after mixing, minced meat was taken in the amount of 0.3 kg to evaluate the content of mass fractions of moisture (according to the methodical recommendations of VASKhNIL, Moscow 1990), protein (according to GOST 25011-85), fat (according to GOST 23042-80), ash (according to the methodical recommendations of VASKhNIL, Moscow 1990 item 4.1.5).

The ratio of some components of the chemical composition of lamb was determined by calculation. Samples were examined 48 hours after slaughter.

Based on the results of the chemical analysis of the average sample, the caloric value of lamb was calculated, taking into account that one gram of protein contains 4.1 kcal, and one gram of fat - 9.3 kcal according to the formula of V. M. Oleksandrov:

$$C = (D – (F + A)) \times 4.1 + F \times 9.3,$$

where C: - caloric content 100 g of lamb, kcal; D - content of the mass fraction of dry matter, %; F - content of the mass fraction of fat, %; A - content of the mass fraction of ash, %.

The moisture-retaining capacity was investigated by the Grau and Gamm press method, improved by Volovynska and Merkulova; the active reaction of the medium - potentiometrically in a water-salt extraction with a pH meter; the area of stains (general, meat, wet) - by the press method according to DSTU ISO 2917:2001 [18].

During manipulations with animals, the bioethical requirements of the Law of Ukraine "On the Protection of Animals from Cruelty Treatment" were observed [17]. The research program is approved by the Bioethics Committee Institute of Animal Science of the NAAS.

The digital material of the experimental studies was processed biometrically according to V. P. Kovalenko et al. [24], using a personal computer and the MS Excel 2003 application package. The difference between groups was considered significant at $p<0.05$.

RESULTS AND DISCUSSIONS

Summarizing the obtained materials, it should be noted that by the most of the indicators characterizing the slaughter qualities, single lambs reliably exceeded coevals, born among identical and different-sex twins, while there was no significant and reliable difference between the latter in terms of the studied parameters. At the same time, lambs born in same-sex twins, under the same conditions of maintenance and feeding during the rearing period, grew more intensively and were able not only to compensate for their lag in development, obtained at the end of the weaning period, but also to slightly surpass coevals born as part of different-sex twins for the slaughter time. It is likely that the established fact of compensatory growth is due to more intensive individual features of the metabolic process that took place in their

bodies and were caused by a better assimilation of the nutrients of the rations and the conversion of feed into muscle tissue.

It has been established that lambs born as singles exceeded the same-sex twins in terms of pre-slaughter live weight by 5.56 kg or 13.4% ($p<0.05$) and by 7.67 kg or 19.4% ($p<0.05$) - different-sex twins. While in the weight of the fresh carcass meat, the advantage in favor of singles decreased to 2.06 kg or 11.8% ($p<0.05$) against same-sex twins and to 3.23 kg or 19.8% compared to different-sex twins (Table 1).

Table 1. Indicators of control slaughter of lambs, ($X \pm S_X$, n=3)

Indicator	Type of birth		
	Singles	twins	
		same-sex	different-sex
Pre-slaughter live weight, kg	$47.17 \pm 0.83^{0/\#}$	41.61±1.80	39.50±2.64
Weight of the fresh carcass, kg	$19.53 \pm 0.35^{\#}$	17.47±0.84	16.30±1.01
Output of fresh carcass, %	41.4	42.0	41.3
Mass of chilled carcass, kg	$18.93 \pm 0.31^{\#}$	16.95±0.83	15.80±0.99
Output of chilled carcass, %	40.1	40.7	40.0
Mass of internal fat, kg	$1.42 \pm 0.08^{0/\#}$	0.90±0.14	0.85±0.19
Output of internal fat, %	3.0	2.2	2.2
Slaughter weight, kg	$20.95 \pm 0.42^{0/\#}$	18.37±0.76	17.15±1.06
Slaughter output, %	44.4±0.12	44.2±0.34	43.5±1.25
Weight of fresh skin, kg	$5.93 \pm 0.15^{0/\#\#}$	4.97±0.18	4.40±0.25
Output of fresh skin, %	12.6	11.9	11.1
Weight of the head, kg	$2.63 \pm 0.02^{00/\#}$	2.24±0.07	2.27±0.09
Weight of limbs, kg			
including: front ones	$0.54 \pm 0.01^{000/\#\#}$	0.44±0.01	0.45±0.02
hind legs	$0.53 \pm 0.01^{00/\#}$	0.47±0.01	0.42±0.02

Note: $^{0}p<0.05$; $^{00}p<0.01$; $^{000}p<0.01$ - reliability of the same-sex difference and $^{\#}p<0.05$; $^{\#\#}p<0.01$ - different-sex twins
Source: own calculations.

Single lambs are characterized by a more intensive deposition of internal fat by 0.52 and 0.57 kg or 57.8 and 67.1%, compared to a similar indicator in both identical and different-sex twins, with $p<0.05$ in both cases of comparison. And as a result of this and heavier fresh carcasses, there was registered a proportional increase in slaughter weight by 2.58 kg ($p<0.05$) and 3.80 kg ($p<0.05$) or 14.0 and 22.2%, respectively.

Identified differences in these parameters did not have a significant impact on the level of slaughter yield, which ranged from 43.5% to 44.4%. However, despite the reliably greater mass ($p<0.05$ in both cases of comparison) of accumulated internal fat in the carcasses of single lambs, only a tendency to increase its relative value was followed, compared to coevals of the other groups.

Single lambs had a significantly higher mass of fresh skin, by 0.96 kg or 19.3% ($p<0.05$) compared to the same-sex by birth type coevals and by 1.53 kg or 34.8% ($p<0.01$) - compared to different-sex twins. However, the relative indicators of the mass of fresh skins to the pre-slaughter live weight of lambs did not differ significantly between the compared groups.

According to other parameters of the control slaughter (weight of the head and limbs), although the twins did not completely reach the level of singles, they approached it with a statistically significant difference between the groups in favor of singles ($p<0.05$-0.001). However, the proportional nature of the development of this trait is indicated by the fact that the relative weight as a percentage of the pre-slaughter live weight turned out to be almost the same.

The relative indicators of fresh, chilled carcasses, internal fat and fresh skin to the pre-slaughter live weight of the experimental lambs did not differ much from each other, with the exception of the yield of fresh skin, for which the difference between the groups was slightly larger by 0.7-1.5% with an advantage of singles compared both groups of twins.

However, the differences within both groups of twins in terms of indicators characterizing slaughter qualities varied from 5.3% to 13.0% and were slightly better in lambs born as part of the same-sex offspring, but no statistical significance was found between their values.

Due to the higher pre-slaughter live weight and weight of fresh carcasses, single lambs had an advantage over coevals born as twins in terms of the weight of chilled half carcasses and the content of cuts of the first and second grades (Table 2).

Table 2. Grade composition of the left half carcass, ($X \pm S_X$, n=3)

Indicator	Type of birth		
	singles	singles	
		same-sex	different-sex
Mass of chilled half -carcass, kg	9.60±0.16#	8.50±0.42	7.97±0.46
Weight of parts by grade, kg			
including: I	8.03±0.02⁰/#	7.10±0.26	6.50±0.48
II	1.57±0.15	1.40±0.15	1.47±0.03
Specific share of some parts in the half-carcass, %			
including: I	83.6	83.5	81.6
II	16.4	16.5	18.4

Note: ⁰p<0,05 - reliability of a difference with respect to same-sex twins and #p<0.05 - different-sex twins
Source: own calculations.

Analyzing the data of the grade composition, it was noted that single lambs by weight of chilled half-carcasses reliably exceeded coevals born among same-sex twins by 1.1 kg or 12.9% (p<0.05) and for different-sex twins - by 1.63 kg or 20.5% (p<0.05).

At the same time, by comparing the influence of the type of birth on the results of graded cutting of half-carcasses, it was found that the main increase in their mass in single lambs was due to an increase in the absolute content of the first grade parts, namely by 0.93 and 1.53 kg or 13.1 and 23.5% than in coevals-twins, which ensured statically significant difference between them (p<0.05) in both cases of comparison. The excess of the absolute content of second-grade parts in singles over twins was 0.17 kg (12.1%) and 0.10 kg (6.8%), respectively, over the indicators of the same-sex and different-sex by birth type coevals.

The specific share of parts of the first grade in half carcasses ranged from 81.6% to 83.6% with an increase in favor of singles.

The morphological composition of the three-rib cut confirmed the results obtained in the process of graded cutting of half-carcasses (Table 3).

Table 3. Morphological composition of a three-rib cut, ($X \pm S_X$, n=3)

Indicator	Type of birth		
	singles	twins	
		same-sex	different-sex
Weight of three-rib cut, kg	0.417±0.01⁰⁰/##	0.342±0.01	0.330±0.01
including: flesh, kg	0.327±0.01⁰⁰/##	0.262±0.00	0.250±0.01
%	78.4	76.6	75.8
bones and cartilage, kg	0.09±0.01	0.08±0.01	0.08±0.01
%	21.6	23.4	24.2
Coefficient of fleshiness	3.63±0.14	3.28±0.22	3.13±0.22

Note: ⁰⁰p<0.01 - the reliability of a difference with respect to same-sex twins and ##p<0.01 - different-sex twins
Source: own calculations.

It was found that single lambs in terms of absolute mass of the carcass cut outweighed twins from same-sex offspring by 21.9% and twins from different-sex offspring by 26.4%, with a statistically significant difference between them p<0.01 in both cases of comparison. According to the studies of the main indicator that characterizes the nutritional value of carcasses - flesh content, a reliable advantage of single lambs was established by 24.8% (p<0.01) and 30.8% (p<0.01), respectively.

Intergroup differences in the absolute parameters of bone and cartilage mass in the three-rib cut were leveled out and were at the level of 0.08-0.09 kg, while their relative indicators in the composition of the cuts were higher in both groups of twins.

In general, by the meatiness coefficients, single lambs were characterized by a greater availability of edible components in the carcasses, which also indicates their better meat productivity. Due to the more massive muscle tissue and almost the same content of bones and cartilage in the cuts, they had 3.65 kg of flesh per kilogram of bones and cartilage, which is 0.35 and 0.50 kg or 10.7 and 16.0% more than in coevals born as twins.

The birth of lambs as singles contributed to the better development of almost all internal organs that make up the category of offal (Table 4).

Table 4. Absolute and relative weight of internal organs of lambs, ($X \pm S_X$, n=3)

Indicator	Type of birth		
	singles	twins	
		same-sex	different-sex
Absolute mass of internal organs, kg	2.08±0.15	1.95±0.13	1.70±0.08
including: liver	0.84±0.05	0.71±0.06	0.68±0.05
spleen	0.09±0.02	0.08±0.01	0.05±0.01
heart	0.27±0.01	0.24±0.02	0.21±0.02
lungs without trachea	0.62±0.06	0.67±0.04	0.61±0.05
kidneys	0.26±0.03	0.25±0.02	0.15±0.01
Relative weight of internal organs to pre-slaughter live weight, %			
including: liver	1.78	1.71	1.70
spleen	0.19	0.19	0.10
heart	0.57	0.58	0.50
lungs without trachea	1.30	1.60	1.54
kidneys	0.55	0.60	0.38

Source: own calculations.

According to the results of weighing, it was established that the total mass of internal organs in single lambs in absolute terms was 2.08 kg, which is 0.13 and 0.38 kg or 6.7 and 22.4% more than in twins of the same age. Whereas in terms of the weight development of the rest of the internal organs, the differences in their favor were greater: the liver by 18.3 and 23.5%; spleens - by 12.5 and 80.0%; heart - by 12.5 and 28.6% and kidneys - by 4.0 and 73.3%.

The revealed peculiarities of the development of internal organs in single lambs were caused by a higher pre-slaughter live weight. The only exception is the lungs, the absolute weight of which was 7.5% lower in single lambs than in same-sex twins and close to that of different-sex twins (0.62 kg versus 0.61 kg).

Considering this sign in a relative sense, it can be seen that the mass of internal organs of lambs, regardless of the type of their birth, almost did not differ. In particular, the specific share of the liver in them was from 1.70% to 1.78%; spleen - from 0.10% to 0.19%; heart - from 0.50% to 0.58%; lungs without trachea - from 1.30% to 1.60%; kidneys - from 0.38% to 0.60% of pre-slaughter live weight. Which is quite natural from the standpoint of the proportionality of the development of live mass and internal organs in animals.

It should be noted that lamb obtained from same-sex lambs was characterized by a 7.2 and 6.6% higher mass fraction of dry matter, due to more intensive deposition of a mass fraction of fat in their muscle tissue - by 8.5 and 10.4 % with a statistically significant difference ($p<0.05$ in both cases of comparison) and ash - by 0.63 and 0.83% ($p<0.05$) against coevals born as singles and among different-sex twins. This gave it better taste qualities and marbling (Table 5).

Table 5. Chemical composition, caloric content and biological value of lamb, ($X \pm S_X$, n=3)

Indicator	Type of birth		
	Singles	twins	
		same-sex	different-sex
Mass fraction of moisture, %	70.20±1.25^{0}	63.01±1.71	69.64±1.34^{0}
Mass fraction of dry matter, %	29.80±1.25	36.99±1.71*$^{\#}$	30.36±1.34
including: mass fraction of protein	14.93±1.48	12.95±0.30	17.56±0.42^{000}
mass fraction of fat	13.47±1.95	22.01±2.22*$^{\#}$	11.60±1.04
mass fraction of ash	1.40±0.57	2.03±0.22$^{\#}$	1.20±0.13
Correlation:			
mass fraction of protein/fat	1.11 : 1	0.59 : 1	1.51 : 1
mass fraction of dry matter/moisture	0.43 : 1	0.59 : 1	0.44 : 1
mass fraction of fat/moisture	0.19 : 1	0.35 : 1	0.17 : 1
Caloric content of 1 kg of meat, kcal	1864.8±156.26	2577.9±264.12	1798.8±103.11

Note: *p<0.05 - the reliability of a difference with respect to singles; ^{0}p<0.05 and ^{000}p<0.001 - same-sex and $^{\#}$p<0.05 - different-sex twins
Source: own calculations.

At the same time, an inversely proportional trend with regard to the content of the mass fraction of fat was noted in the distribution of the mass fraction of protein, in which lamb obtained from different-sex twins was richer in its content, which is 2.6 and 4.6% (p<0.001) more than in single and same-sex lambs.

The highest content of the mass fraction of fat in the lamb of same-sex lambs provided an increase in the caloric content of one kilogram of minced meat by 713.1 and 779.1 kcal or 38.2 and 43.3%, compared to singles and twin-born lambs, but statistically significant difference between the groups for this indicator was not detected.

At the same time, the higher energy value of 1 kg of lamb obtained from lambs born among identical twins was complemented by a better ratio of mass fractions of dry matter to moisture, which was at the level of 0.59: 1 against 0.43 and 0.44 in coevals respectively, born among identical and different-sex twins. That is, the higher this ratio is, the higher the nutritional value of lamb and the precocity of animals. The most mature (according to the ratio of fat/moisture) is also the lamb obtained from same-sex twins 0.35 : 1 against 0.19 and 0.17 : 1 - in singles and different-sex twins.

In the process of laboratory experiments, it was established that in terms of the area of the total spot formed when the lamb samples were pressed, single lambs take the first place, those born as different-sex twins take the intermediate place, and the last is characteristic of lamb samples that were selected from half-carcasses of the same-sex twins (Table 6).

Table 6. Physico-technological indicators of lamb, ($X \pm S_X$, n=3)

Indicator	Type of birth		
	Singles	twins	
		same-sex	different-sex
Area of the total spot, cm^2	7.70±0.12	6.83±0.80	6.70±0.50
including: meat	2.30±0.21	2.57±0.17	2.97±0.45
moisture	5.40±0.16$^{\#\#}$	4.26±0.78	3.73±0.32
Moisture retention capacity, %	55.08±1.60	51.06±1.01	59.18±1.35^{00}
Active reaction of the medium, pH	5.87±0.03	5.84±0.03	5.88±0.18

Note: ^{00}p<0.01 - the reliability of a difference for the same-sex and $^{\#\#}$p<0.05 - different-sex twins
Source: own calculations.

However, according to the size of the meat spot, it can be stated that the lamb of rams born in different-sex twins is more tender, as it has a larger area (Table 6).

The values of moisture retention capacity and active acidity did not go beyond the optimal parameters. However, with a better ability to retain moisture, lamb obtained from identical

and different-sex twin lambs was characterized by greater juiciness and less loss of nutrients during heating. Almost close values of active acidity indicate a normal course of post-slaughter autolysis and an intensive maturation process of meat obtained from lambs of all groups.

CONCLUSIONS

Single lambs were characterized by the highest slaughter rates, which prevailed over coevals born among identical and different-sex twins in terms of pre-slaughter live weight by 13.4 and 19.4%, fresh carcass weight by 11.8 and 19.8%, slaughter weight - 14.0 and 22.2%, the absolute content of the first grade parts - by 13.1 and 23.5%, the flesh content - by 24.8 and 30.8%.

The slightly better development of internal organs in single lambs indicates a higher viability of their organism compared to coevals from same-sex and different-sex twins. Whereas, according to the results of the determination of the chemical composition, higher taste qualities are characteristic of lamb obtained from animals born among identical twins due to higher mass fractions of dry matter by 7.2 and 6.6%, including fat - by 8.5 and 10.4% and ash - by 0.63 and 0.83%, as well as caloric value - by 38.2 and 43.3%, compared to singles and coevals born among different-sex twins.

This indicates a relatively higher precociousness of these animals. The obtained results are the basis for the further detailed determination of the influence of the factors of differentiated feeding on the realization of the productive potential of lambs when reared for meat, taking into account the type of their birth, while simultaneously studying the heritability and repeatability of the investigated trait and assessing the share of the influence of fathers and mothers on the type of birth of the young animals.

REFERENCES

[1]Abdullah, A.Y., Qudsieh, R.I., Nusairat, B.M., 2011, Effect of crossbreeding with two exotic breeds on meat quality of Awassi lambs. Livestock Science. Vol. 142: 121–127. doi.org/10.1016/j.livsci.2011.07.002

[2]Ablikim, B., Liu, Y., Kerim, A., Shen, P., Abdurerim, P., Hong Zhou, G.,2016, Effects of breed, muscle type, and frozen storage on physico-chemical characteristics of lamb meat and its relationship with tenderness. CYTA-Journal of Food. Vol. 14(1): 109–116. doi.org/10.1080/19476337.2015.1054885

[3]Anderson, F., Pannier, L., Pethick, D.W., Gardner, G.E., 2015,Intramuscular fat in lamb muscle and the impact of selection for improved carcass lean meat yield. Animal. Vol. 9(6): 1081–1090. doi:10.1017/s1751731114002900

[4]Bjelanović, M., Grabež, V., Vučić, G., Martinovic, A., 2015, Effects of different production systems on carcass and meat quality of sheep and lamb from western Balcan and Norway. BiotechnologyinAnimal Husbandry. Vol. 31(2): 203–221. doi:10.2298/bah1502203B

[5]Calnan, H.B., Jacob, R.H., Pethick, D.W., Gardner, G.E., 2017, Selection for intramuscular fat and lean meat yield will improve the bloomed colour of Australian lamb loin meat. Meat Science. Vol. 131: 187–195. doi:10.1016/j.meatsci.2017.05.001

[6]Camacho, A., Capote, J., Mata, J., Argüello, A., Viera, J., Bermejo, L.,2015, Effect of breed (hair and wool), weight and sex on carcass quality of light lambs under intensive management. Journal of Applied Animal Research. Vol. 43(4): 479–486. doi.org/10.1080/09712119. 2014.987288

[7]Cardoso, M.T.M., Landim, A.V., Louvandini, H., Mcmanus, C., 2013, Performance and carcass quality in three genetic groups of sheep in Brazil. Revista Brasileira de Zootecnia. Vol. 42(10): 734–742. doi.org/10.1590/s1516-35982013001000007

[8]Costa, R.G., dos Santos, N.M., Queiroga, R.C.R.E., de Sousa,W.H., Marta SuelyMadruga, M.S., Cartaxo, F.Q.,2015,Physicochemical characteristics and fatty acid profile of meat from lambs with different genotypes and diets. Revista Brasileira de Zootecnia.Vol.44(7): 248–254. doi.org/10.1590/S1806-92902015000700003

[9]D'Alessandro, A.G., Maiorano, G., Ragni, M., Casamassima, D., Marsico, G., Martemucci, G.,2013, Effect of age and season of slaughter on meat production of light lambs: carcass characteristics and meat quality of Leccese breed. Small Ruminant Research.Vol.114(1): 97–104. doi.org/10.1016/j.smallrumres.2013.05.006

[10]De Almeida Rego, F.C., Françozo, M.C., Ludovico, A., 2017, Fatty acid profile and lambs' meat quality fed with different levels of crude glycerin replacing corn. Semina: Ciencias Agrarias, Vol. 38(4): 2051–2064. doi:10.5433/1679-0359.2017v38n4p2051

[11]De Brito, G.F., Ponnampalam, E.C., Hopkins, D.L., 2017, The effect of extensive feeding systems on growth rate, carcass traits, and meat quality of finishing lambs. Comprehensive Reviews in Food Science and Food Safety. Vol. 16: 23–38. doi.org/10.1111/1541-4337.12230

[12]De Lima Júnior, D.M., de Carvalho, F.F.R., da Silva, F.J.S., 2016, Intrinsic factors affecting sheep meat quality: a review. Revista Colombiana de Ciencias Pecuarias. Vol. 29: 3–15.

doi:10.17533/udea.rccp.v29n1a01
[13]Gootwine, E., 2013, Meta-analysis of morphometric parameters of late-gestation fetal sheep developed under natural and artificial constraints. Journal of Animal Science. Vol. 91: 111–119. doi.org/10.2527/jas.2013-5363
[14]Gootwine, E., 2020, Chapter 10 – Genetics and breeding of sheep and goats. Animal Agriculture. 183–198. https://doi.org/10.1016/B978-0-12-817052-6.00010-0
[15]Howes, N.L., Bekhit, A.E.D.A., Burritt, D.J., Campbell, A.W., 2015, Opportunities and implications of pasture-based lamb fattening to enhance the long-chain fatty acid composition in meat. Comprehensive Reviews in Food Science and Food Safety. Vol. 14: 22–36. doi.org/10.1111/1541-4337.12118
[16]Ibatullin, I.I., Zhukorskyi, O.M., Bashchenko, M.I., 2017, Methodology and organization of scientific research in animal husbandry. Kyiv: Agrarian Science. 328.
[17]Information of the Verkhovna Rada of Ukraine No. 27, 2006, On the protection of animals from cruel origins. https://zakon.rada.gov.ua/laws/show/3447-15#Text
[18]ISO 2917–2001, Meat and mea tproducts – determination of pH (control method). Derzhspozhivstandard.http://online.budstandart.com/ua/catalog/doc-page?id_doc=89528, Accessed on November 15, 2022.
[19]Janoš, T., Filipčík, R., Hošek, M., 2018, Evaluation of Growth Intensity in Sufolk and Charollais Sheep. Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis.Vol. 66(1): 61–67. doi.org/10.11118/actaun201866010061
[20]Jerónimo, E., Alfaia, C.M.M., Alves, S.P., Dentinho, M.T.P., Prates, J.A.M., Vasta, V.,Santos-Silva, J., Bessa, R.J., 2012, Effect of dietary grape seed extract and Cistusladanifer L. in combination with vegetable oil supplementation on lamb meat quality. Meat Science. Vol. 92: 841–847. doi:10.1016/j.meatsci.2012.07.011
[21]Karaca, S., Yilmaz, A., Kor, A., Bingöl, M., Cavidoğlu, İ., Ser, G., 2016, The effect of feeding system on slaughter-carcass characteristics, meat quality, and fatty acid composition of lambs. Archives Animal Breeding. Vol. 59: 121–129. doi:10.5194/aab-59-121-2016
[22]Kawęcka, A., Sosin-Bzducha, E., Puchała, M., Puchala, M., Sikora, J., 2018, Effect of maize DDGS addition on carcass and meat quality of lambs of native sheep breed. Journal of Applied Animal Research. Vol. 46(1): 301–305. doi.org/10.1080/09712119.2017.1299014
[23]Kenyon, P., Blumer, S., Fraga, F.R., Thompson, A., 2019, Triplet lambs and their dams – a review of current knowledge and management systems. New Zealand Journal of Agricultural Research, Vol. 113: 399–437. doi:10.1080/00288233.2019.1616568
[24]Kovalenko, V.P., Khalak, V.I., Nezhlukchenko, T.I., Papakina, N.S., 2010, Biometric analysis of the variability of characteristics of agricultural animals and poultry. Educational manual on the genetics of agricultural animals. Kherson.160.
[25]Kuchtík, J., Zapletal, D., Šustová, K., 2012, Chemical and physical characteristics of lamb meat related to crossbreeding of Romanov ewes with Suffolk and Charollais sires. Meat Science. Vol. 90: 426–430. doi:10.1016/j.meatsci.2011.08.012/
[26]Lanza, M., Fabro, C., Scerra, M., Marco Bella, M., Pagano, R., Brogna, D.M.R., Pennisi, P., 2011, Lamb meat quality and intramuscular fatty acid composition as affected by concentrates including different legume seeds. Italian Journal of Animal Science. Vol. 10(2): 18. doi.org/10.4081/ijas.2011.e18
[27]Pomitun, I.A., Korkh, I.V., Kosova, N.O., Boiko, N.V., Pankiv, L.P., Riazanov, P.O., 2019, Formation of meat of sheep at different intensity of growth and live weight at slaughter. Bulletin of agrarian science. Vol. 5: 31–37. doi.org/10.31073/agrovisnyk201905-04
[28]Ptáček,M., Ducháček, J., Stádník, J., Hakl, L., Fantová, J**.,** Fantová,M., 2017,Analysis of multivariate relations among birth weight, survivability traits, growth performance, and some important factors in Suffolk lambs. Archiv fur Tierzucht. Vol. 60: 43–50. doi.10.5194/aab-60-43-2017
[29]Ramírez-Retamal, J., Morales, R., Martínez, M., de la Barra, R.,2013, Effect of breed and feeding on the carcass characteristics of the Chilote breed lamb**.** Chilean Journal of Agricultural Research. Vol. 73: 48–54. doi.org/10.4067/S0718-58392013000100007
[30]Ramírez-Retamal, J., Morales, R., 2014, Influence of breed and feeding on the main quality characteristics of sheep carcass and meat: A review. Chilean Journal of Agricultural Research. Vol. 74(2): 225–233. doi.org/10.4067/S0718-58392014000200015
[31]Sliusarenko, I.S., 2019, Exterior and F1 Intermediate Brightness Growth from Crossbreeding of Gypsy Breeds with Meat Sheep. Bulletin of Agrarian Science of the Black Sea. Vol. 1: 90–94. doi:10.31521/2313-092X/2019-1(101)-13
[32]Uğurlu, M., Teke, B., Ekiz, B., Salman, M., 2017, Meat quality traits of male Herik lambs raised under an intensive fattening system. Turkish Journal of Veterinary and Animal Sciences. Vol. 41: 425–430. doi:10.3906/vet-1701-79