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Carcass Conformation and Tissue Composition of Tsigai and Crossbred Lambs by Suffolk and German Blackface Breeds

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Abstract. Carcasses of Tsigai breed and Suffolk and German Blackface crossbred lambs fattened in an intensive system were subjectively (according with EUROP system) and objectively evaluated. After conformation, carcasses of Suffolk crossbred lambs were included in U and R, German Blackface x Tsigai in R, and carcasses from Tsigai pure breed in R and O classes. After the layer of fat, carcasses of Suffolk crossbred lambs were included in 2 and 3 classes, German Blackface x Tsigai in 3, and carcasses from Tsigai breed in 3 and 4 classes. Suffolk and German Blackface crossbred lambs had a higher (P<0.001) muscle proportion in all carcass parts than Tsigai breed lambs. Tsigai breed had a higher fat proportion than Suffolk and German Blackface crossbred lambs in almost all carcass pieces, but significant differences were founded in carcass rests (P<0.001). It was concluded that Suffolk and German Blackface rams could be used for crossing with Tsigai ewes to produce lambs with better carcass conformation and leaner carcass**.**

Keywords: Tsigai, meat, fat, bone, EUROP scale, lambs

INTRODUCTION

The consumption of sheep meat in Romania is still very low, both in absolute and in comparative values in relation to other meat. The production and marketing sectors for sheep meat in recent years have shown great effort to enlarge the market, always keeping the concern for quality in mind.

The standardization of lamb carcasses to be made available at market is needed to enhance the product and to attract the consumer.

The quantity and quality of fat are important to consumers (Sendim *et al*., 1997), who are more and more interested in healthy products and usually prefer lean meat and carcasses. As a result, a primary objective in many countries is the reduction of fat in order to improve the efficiency of commercial lamb production and prevent the demise of the sheep industry (Beermann *et al*., 1995).

The genetic improvement of carcasses and carcass composition to meet consumer demands for lean meat can be effected by selection between and within breeds.

Carvalho *et al*. (1980) reported that the use of industrial crossings could provide benefits in the carcass and meat quality.

Kempster *et al.* (1987a) pointed out that matching crossbreeding with production systems is the key factor in lamb production improvement in order to get leaner carcasses at optimum slaughter weight and age. Kirton *et al.* (1995a) supported the theory that to produce heavy lambs with higher meat content, producers must use rams with large mature size as sire breeds and raise lambs to higher slaughter weights. Several authors (Croston *et al.,* 1987; Kempster *et al.*, 1987a, 1987b; Teixeira *et al.*, 1996; Ellis *et al.*, 1997) have investigated the effect of crossbreeding in lamb carcass composition with promising results. Nevertheless little information is available on crossbreeding effects on carcass quality and tissue composition.

In the period from 1994-2008, Romania holds first place in Europe (FAOSTAT, 2011) in terms of the number of living sheep exported and destined for slaughtering. Over 97% of the volume of this export is Turcana young sheep (because Turcana is the prevalent breed in Romania), and the 3% difference is comprised of Tsigai young sheep (in the breed structure, Tsigai occupies the second place in our country).

The Tsigai breed is a mixed breed exploited in mountain and submountain regions, with great resistance and adaptability. From a genetic, and therefore productive, point of view, the Tsigaie is more valuable than the Turcana breed (Miclea *et al*., 2009), but production in terms of carcass conformation and meat quality is not as successful. The capitalization is made with highly reduced prices in comparison to prices for the meat of specialized breeds or their crossbreeds on international market.

Dărăban *et al.* (2010) suggest that increasing of crossbreeds with meat breeds will probably make a difference in acquisition manner, capitalization, and implicitly in the adding of plus-value for exploitation in meat production. On the other hand, using the crossbreeding between local breeds with specialized breeds for meat production can maintain animal genetic resources, because of the need to maintain parts of sheep flocks with pure breeds (Ilişiu *et al*., 2010).

The aim of this study was to evaluate the effect of two improved ram breeds, Suffolk and German Blackface, when mated to Tsigai local breed ewes, on carcass conformation and tissue composition in intensive production systems in Romania.

MATERIALS AND METHODS

The study analyzes lamb carcasses from a cross between Suffolk x Tsigai (S x Ti), German Blackface x Tsigai (GCCN x Ti) and Tsigai (Ti) pure breed (five from each genotype).

After weaning (59-61 days), lambs were fattened for a 100-day period in an intensive system with 3 phases: adaptation phase of 15 days, breeding-fattening phase of 65 days and finishing phase of 20 days. The animal groups were fed *ad libitum* with unique feed in three daily meals at 7:00, 13:00 and 19:00 for all groups. Water and salt were at discretion. The unique fodder was formed of combined fodder and lucerne hay in the adaptation phase; combined fodder, lucerne hay and hill hay in the breeding-fattening phase; and combined fodder, corn flour and hill hay in the finishing phase. The unique fodder used during the fattening period was composed as follows (per kg dry matter): 174 g crude protein and 3.1 ME Mcal in the adaptation phase, 149 g and 3.1 ME Mcal in the breeding-fattening phase, and 138 g and 3.7 ME Mcal in the finishing phase, respectively.

Research was conducted at the Reghin Research and Development Station for Sheep and Goats in Mures County during 2007.

At the end of the fattening phase, five heads of each group were slaughtered and subjective assessment of carcasses was made based on the EUROP system.

Determinations on tissue composition of carcasses were carried out (after a cooling period of 24 hours at 2-4°C) on the right halves of carcasses.

The carcass halves were weighed, and separately the gigot, shoulder+arm and the rest of the carcass.

The gigot was separated by joint cutting between the lumbar vertebrae L5 – L6 and tibio-metatarsal. Shoulder+arm separation was done by cutting the muscles which connect it with the trunk.

After gigot and shoulder separation, the rest of the carcass remains with the bone basis comprised of the cervical, dorsal, lumbar L1–L5 vertebrae, all ribs and sternum.

From the rest carcass the cutlet (bone base L1–L5 vertebrae), chuck (bone base D6-D13 vertebrae) and its corresponding ribs were cut perpendicular to their axis at 10 cm distance of spine, distance measured with a ruler.

After weighing, each piece of the right half of the carcass was dissected by separating the muscles, total fat (cover + intermuscular fat) and bones.

After dissection, muscles, total fat and bones were weighed for each cut piece. Research was conducted at the Reghin Research and Development Station Sheep and Goats for in Mures County during 2007.

The results obtained on tissue composition were expressed as mean value and as percent (by reporting meat, bones and fat in carcass pieces).

The statistical analysis carried through with aid of the Winstatistical program, and statistical interpretation data was done based on Student test.

RESULTS AND DISCUSSION

In the present experiment, the number of slaughtered animals from each group and those subjected to subjective assessment by EUROP system is low (n = 5). However, there are some differences between Tsigai breed and crossbred Suffolk x Tsigai and GCCN x Tsigai, in terms of conformation and fat cover of carcasses (Tab. 1).

Tab. 1

Carcass quality appreciation with the EUROP system at young ovine from different genotypes

Specification	Breed/Crossbreed (n = 5)		
	Tsigai	Suffolk x Tsigai	GCCN x Tsigai
I. Class after conformation			
- E excellent	-	-	-
- U very good	-	3	-
- R good	2	2	5
- O average	3	-	-
- P weak	-	-	-
II. Class after the layer of fat			
-1 small	-	-	-
-2 thin	-	3	-
-3 average	3	2	5
-4 big	2	-	-
-5 very big	-	-	-

Of the carcasses subjected to subjective assessment after conformation, 60% of carcasses from Suffolk x Tsigai crossbred lambs were included in the class U and 40% in class R, those from GCCN x Tsigai crossbred were all (100%) classified in class R, and carcasses from Tsigai breed could be included in percent of 40% in class R and 60% in class O.

Inclusion in R and O conformation classes was based on carcass downgrading due to insufficient general development of the muscles, previous train with widths less obvious, and the hindquarters of a dressing in the muscles and average convexity. Assessment of the degree of cover fat of carcasses was done on the scoring scale of 1 to 5.

The most obvious fat dressing was found in the Tsigai breed, with the greatest amount of fat cover and internal deposit (in the chest cavity). Suffolk x Tsigai and GCCN x Tsigai crossbred showed a lower amount of fat cover.

Carcasses are considered very good for assessing the degree of fat cover. A total of 13 carcasses were classified in 2nd and 3rd classes, and two carcasses in class 4. The most carcasses classified in the 2nd and 3rd classes were from crossbred lambs (76.92%), while two carcasses from the Tsigai breed were included in class 4 (fat carcass, undesirable on the EU market). Fat cover was moderate, and carcasses covered with fat were on all surfaces, there are no deposits located in certain regions. There were moderate fat deposits in the thoracic cavity, around the internal organs and as mesenteric fat and caul fat.

The results obtained from Dărăban *et al.* (2010) regarding the subjective assessment of carcasses from German Blackface x Tsigai crossbred lambs confirms the results obtained in the present experiment.

The fat was a glassy white color that was maintained after 24 hours of cooling. The fat distribution on carcasses, in relation to carcass weight, is assessed differently, depending on country or consumer preferences. On the Anglo-Saxon and New Zealand markets, carcasses well covered with fat are more pointed. However, the general worldwide trend is to reduce fat development. In France, carcasses with a fat layer of 2-3 mm are most desirable.

Differences in carcass weights and butcher pieces (gigot, shoulder, cutlet and carcass rest) between the three lots were discussed in another paper (Ilişiu *et al.*, 2010).

Based on the analysis of tissue composition of carcass regions (Tab. 2), the best muscle dressing to gigot level is observed in S x Ti group, the rate is of 64.66%, compared with Tsigai breed, at which the proportion of meat in gigot is 62.40%. Between the two groups recorded significant differences ($P<0.001$). Significant differences ($P<0.001$) are also recorded between Tsigai group and the GCCN x Tsigai.

Regarding the fat quantity in gigot, S x Ti group has the highest raw value, but as percentage is situated under Tsigai breed and slightly above of GCCN x Ti group, the difference of 0.23 kg between S x Ti and Tsigai groups is significant ($P<0.01$).

The GCCN x Tsigai crossbred has the highest quantity of bone in gigot, both in raw value as also in percentage, higher than the other two groups. There is a significant difference ($P<0.01$) between GCCN x Ti and Tsigai breed groups regarding the proportion of bone in the gigot. At the cutlet level, the meat quantity indicates significant differences ($P<0.001$) between local race and S x Ti group and between Tsigai and GCCN x Ti groups ($P<0.01$).

The differences between the 3 groups are insignificant regarding the fat quantity, but there is a significant difference between Tsigai and GCCN x Tsigai groups on the cutlet bone ($P<0.05$).

Absolute difference of 0.49 kg was between Tsigai and S x Ti groups and 0.45 kg between Tsigai and GCCN x Tsigai on the meat quantity from the shoulder + arm, creating significant differences ($P<0.001$). There are no significant differences found on fat and bone quantity at this level.

Regarding the rest carcass, we find significant differences ($P<0.001$) both between the Tsigai group and S x Ti, as also between Tsigai breed and GCCN x Ti on the meat quantity.

Significant differences occur between the Tsigai breed and S x Ti (P<0.001) and between Tsigai and GCCN x Ti (P<0.01), both in favor of the Tsigai breed.

Tab. 2

Carcass tissue in slaughtered young rams (mean ± SEM and %)

Trait		Breed/Crossbreed (n=5)		
		Ti	S x Ti	GCCN x Ti
Cold carcass weight (kg)		16.56 ± 0.44	19.48 ± 0.27**	18.66 ± 0.38**
Gigot	kg	5.16 ± 0.25	6.65 ± 0.09***	6.29 ± 0.22**
Meat	kg	3.22 ± 0.08	4.30 ± 0.07***	3.95 ± 0.06***
	%	62.40	64.66	62.79
Fat	kg	0.83 ± 0.05	1.06 ± 0.03**	0.96 ± 0.04 NS
	%	16.09	15.94	15.26
Bones	kg	1.11 ± 0.06	1.29 ± 0.04 NS	1.38 ± 0.02**
	%	21.51	19.40	21.95
Cutlet		2.72 ± 0.09	3.26 ± 0.06**	3.08 ± 0.03**
Meat	kg	1.49 ± 0.07	2.01 ± 0.03***	1.82 ± 0.05**
	%	54.78	61.66	59.09
Fat	kg	0.74 ± 0.03	0.70 ± 0.02 NS	0.72 ± 0.03 NS
	%	27.21	21.47	23.38
Bones	kg	0.49 ± 0.01	0.55 ± 0.03 NS	0.54 ± 0.02*
	%	18.01	16.87	17.53
Shoulder + arm	kg	2.94 ± 0.13	3.55 ± 0.04**	3.43 ± 0.12*
Meat	kg	1.56 ± 0.04	2.05 ± 0.03***	2.01 ± 0.03***
	%	53.06	57.57	58.60
Fat	kg	0.71 ± 0.03	0.70 ± 0.01 NS	0.68 ± 0.02 NS
	%	24.15	19.72	19.83
Bones	kg	0.67 ± 0.04	0.80 ± 0.04 NS	0.74 ± 0.03 NS
	%	22.75	22.53	21.57
Carcass rest	kg	5.74 ± 0.15	6.02 ± 0.06 NS	5.86 ± 0.08 NS
Meat	kg	3.31 ± 0.04	3.82 ± 0.08***	3.61 ± 0.03***
	%	57.67	63.46	61.60
Fat	kg	1.37 ± 0.03	1.17 ± 0.01°°°	1.24 ± 0.02°°
	%	23.87	19.43	21.16
Bones	kg	1.06 ± 0.04	1.03 ± 0.01	1.05 ± 0.02
	%	18.47	17.11	17.92

Note: Student test: NS=not significant (p>0.05);*=significant (p<0.05); **, °°=distinctly significant (p<0.01); ***,°°° =very significant (p<0.001).

Early fat deposition in the Tsigai breed is reflected in the tissue reported at slaughter, in the evolution of average daily gain (ADG) and specific consumption (CS) in this race.

The differences between genotype for bone proportion were little. However, lambs from the Suffolk x Tsigai and GCCN x Tsigai crossbred presented higher muscle proportion in all carcass pieces and had a lower fat proportion. These results could be explained by the differences of lambs from different breeds. Superiority in cover and intermuscular fat in Tsigai breed lambs were observed in all carcass pieces.

Kempster (1983) mentioned that the muscle weight distribution is a trait with little variation. However, Kirton *et al.* (1995b) observed higher muscle proportion in Suffolk lambs than in Merino lambs when compared at same carcass weight. When compared at equal carcass weight, animals with lower mature weight are fatter than animals with high mature weight (Kirton *et al.*, 1995a, 1995b).

Mireşan (1982) highlights that the quality of carcasses obtained from young sheep of Tsigai breed is good, except that if body mass exceeded 35-36 kg, fat percentage increased significantly in the carcasses.

CONCLUSIONS

In conclusion, based on the results, we can say that crossbreeding between the Tsigai breed and rams from the specialized Suffolk and German Blackface breed for meat production can contribute to high quality carcasses, which should be accepted on the EU market.

A reduction of fat in the Tsigai breed can be realized by using crosses between the Tsigai breed and the races used in the experiment.

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