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IMPROVEMENT OF MEAT LAMB PRODUCTION IN MURES COUNTY BY CROSSBREEDING OF LOCAL TSIGAI BREED WITH GERMAN BLACKHEADED BREED

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Abstract

The Tsigai breed occupies the second place in the structure of breeds of sheep from Romania after the Tsurcana breed. These breeds are kept in mountain and sub mountain regions with large areas of pastures (24 % of the total pastures of Romania are located in these areas), which could be used for grazing with crossbreed lambs. For this reason, we preferred to use the Tsigai breed as the local breed for crossbreeding with specialized breeds for meat production in this experiment. In addition heterosis effect is used for meat production improvement The results of a 100-day fattening experiment with young sheep crossbred (German Blackheaded x Tsigai) and Tsigai young sheep are presented in this paper. The crossbred lambs and Tsigai pure breed lambs were maintained under the same conditions, received the same food and benefited from the same microclimate factors during entire fattening period.

Key words*: Tsigai breed, German Blackheaded breed, average daily gain, carcass quality.*

INTRODUCTION

In year 2014, Romania had 9,135,678 heads of sheep, currently holding 4th place in Europe after United Kingdom, Russia and Spain and 3rd place in European Union after United Kingdom and Spain. The Tsurcana breed holds the highest share in the breed structure, followed by the Tsigai breed, both being rustic breeds, which are kept on large areas of pastures in mountain and sub mountain regions (24% of the total pastures of Romania are located in these areas).

The local sheep breeds are optimally adapted to the environmental conditions. The Tsigai breed is a rustic breed, with a distinct degree of mobility, with high resistance to disease and weather and is not very susceptible to technological environment conditions.

After 1990, the orientation of sheep rearing in Romania was changed to milk and/or meat production, and this tendency is expected to be continued in the future years (Pădeanu et al., 2008; Dărăban, 2008).

The main way to rapidly improve the growing speed, meat quality and milk production is the crossbreeding of the local sheep breeds (Tsurcana, Tsigai and Merino) with specialized sheep breeds for milk or meat production (Dărăban, 2008; Dragomirescu, 2007; Pădeanu et al., 2008).

For this purpose the professional associations of sheep breeders from Romania, as well as the specialized universities and research centres, imported female and male sheep specialized in milk or in meat productions from different European countries for reproductive purposes during the last 10 years. We can mention the import of the meat breeds as: Charollais in the Arad and Timis counties; Hampshire in Cluj; Texel in Dobrogea area; and Bluefaced Leicester in Timis, Mures and Bacău counties.

For milk production we note the import of males and females from Sarda breed in the Banat area and milk Belgian rams brought for experimental purposes by the University of Agricultural Sciences and Veterinary Medicine from Cluj-Napoca.

These imports show the reorientation of the sheep breeders from mixed production towards the unidirectional productions in a first stage, followed by their specialization within a short time according to European and world orientation (Dărăban, 2008).

MATERIALS AND METHODS

The intensive fattening experiment developed over a 100-day time period was performed on Tsigai young male sheep (lot 1), and young male sheep crossbred German Blackheaded (GBH) x Tsigai (lot 2), obtained at the Reghin Research and Development Station for Sheep and Goats in Mures County in 2016. The age of the Tsigai young sheep at the beginning of the fattening phase was 59 days and 61 days at GBH x Tsigai. The experimental groups were formed with 12 heads each.

The fattening period comprised three phases: adaptation phase of 15 days, breeding-fattening phase of 65 days and finishing phase of 20 days. The animals 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 case of adaptation phase; combined fodder, Lucerne hay and hill hay in the case of breeding-fattening phase; combined fodder, corn flour and hill hay in the finishing phase.

During the fattening period, the following parameters were determined in the two groups: body weight at the beginning and in the end of each fattening phase, total body weight gain and average daily weight gain, dry matter intake and specific consumption. To determine dry matter intake (DMI) and specific consumption, the daily offers and leftovers were quantified during all experimental periods.

The following parameters were recorded in slaughtered young sheep: live weight before slaughter, cold carcass weight, warm carcass weight, hot, cold and commercial slaughter yield, the weight of the main carcass parts (gigot, cutlet, shoulder + arm, rest of carcass) and conformational traits of the carcass (lengths, widths, depths).

The main statistical parameters were calculated (average, standard deviation, coefficient of variation, average error, etc.) and the significance of differences between groups was performed by applying Student test.

RESULTS AND DISCUSSIONS

The average daily weight gain and the fodder specific consumption are the most important growing parameters which influence the biological and economical growing efficiency in fattening young sheep.

In Table 1 the dynamics of the body weight are presented, as total weight gain of the male young sheep during the fattening period of 100 days (01.05.2016 - 08.08.2016).

Table 1. The dynamics of the body weight in male young sheep during fattening period

Breed/ Crossbred (n=12)	Weight beginning fattening (kg)	End of adaptation phase (kg)	End of the growth - fattening phase (kg)	Weight in the end of finishing (kg)	Total gain (kg)
Tsigai	16.61 ± 0.38	18.78 ± 0.50	33.22 ± 0.97	36.72 ± 0.78	20.11 ± 0.56
GBH x Tsigai	17.26 ± 0.37 NS	20.50 ± 0.49*	35.76 ± 0.52*	39.88 ± 0.64**	22.62 ± 0.49**
Note: Student test: NS = not significant ($p > 0.05$); * = significant ($p < 0.05$); ** = distinctly significant ($p < 0.01$); ***= very significant ($p < 0.001$).					

The average weight in the beginning of the fattening phase was of 16.61 kg at the Tsigai lot and 17.26 kg at the GBH x Tsigai lot. The difference of 0.65 kg in advantage of the GBH x Tsigai is statistically not significant ($p>0.05$). At the end of the fattening phase, GBH x Tsigai has an average weight of 39.88 kg and Tsigai young rams 36.78 kg. The difference between groups at the end of the fattening is statistically distinctly significant ($p < 0.01$).

Average daily gain recorded in fattening phases and in the total fattening period is presented in the Table 2. The data table reveals that the crossbred group have a greater potential for meat production.

Table 2.The dynamics of the average daily gain (ADG) in male young sheep during fattening

Breed/ Crossbreed (n=12)	Adaptation (15 days)	Growth-fattening (65 days)	Finishing (20 days)	Average daily gain of total fattening (100 days)
Tsigai	144.60 ± 11.36	222.30 ± 12.62	175.00 ± 11.29	201.10 ± 6.83
GCCN x Tsigai	215.90 ± 13.19***	234.90 ± 4.46 NS	206.00 ± 13.83 NS	226.20 ± 4.70**
Note: Student test: NS = not significant ($p > 0.05$); ** = distinctly significant ($p < 0.01$); *** = very significant ($p < 0.001$).				

Obtaining relatively low average daily gains during the accommodation phase can be attributed to the weaning crisis, reduced duration of phase (only 15 days), and accommodation of fattening technology. The two lots included in the experiment are recorded statistically significant differences.

In the growth-fattening phase there were no significant differences ($p>0.05$) between groups of animals about average daily gain.

Appreciable difference, but not spectacular of 12.60 g/day between Groups 1 and 2 show the same similarity confirmed by other authors, and say that a protein level around 15% crude protein is recommendable to the lambs of Tsigai breed (Călătoiu et al., 1977), while the lambs obtained from specialized breeds for meat production or crossbred, need a higher protein level, situated at around 17% (Călătoiu, 1986).

In the finishing phase, the difference between Groups 1 and 2, although the absolute difference recorded is 31 g/day, due to high variability, the difference is not significant ($p>0.05$). It appears that during finishing phase, with increasing age of lambs, decrease the average daily gain comparative to growing-fattening period, with 47 g of the Tsigai breed and 29 g at GBH x Tsigai.

Concerning average daily weight gain, the differences between the average values of lambs from the crossbreeding and those of Tsigai breed are statistically distinctly significant between Group 1 and Group 2 ($p < 0.01$).

The values obtained regarding daily dry matter intake, metabolizable energy and crude protein are given in Table 3.

Table 3. Daily dry matter intake (DMI), ME (metabolizable energy) and CP (crude protein) during fattening period

Fattening phases	Tsigai			GBH x Tsigai		
	DMI kg/ head	Mcal ME/ kg/head	Crude protein g/ head	DMI kg/ head	ME MJ/ head	Crude protein g/head
Adaptation	0.91	2.8	158.9	1.07	3.4	187.42
Breeding-fattening	1.20	3.7	179.87	1.21	3.7	180.13
Finishing	0.95	3.5	131.53	0.97	3.6	133.28

The data table shows that in the growth-fattening phase the highest dry matter intake was recorded, with values very close between the two groups. Lower dry matter intake recorded in the finishing phase can be explained by the fact that this experience was made in 2016 (finishing phase ranged last decade of July and first decade of August), a year characterized by very high temperature, being the warmest year in the last 100 years (source: National Meteorological Administration - Ministry of Environment and Sustainable Development). The values observed are within the range recommended for the NRC (1985), for this animal category, which varies from 1.0 to 1.3 kg/day (for the first two fattening periods, where the live weight of animals varies from 18.78 to 39.68 kg). For the last fattening period (20 days), voluntary dry matter intake is under norms for the NRC (1985).

Recovery feed capacity depends on a number of hereditary and environmental factors. Among hereditary factors, the race, sex, age, individuality play an important role, and of the environmental factors, the energy-protein level of the food, feed structure (single fodder) and mode of ad- ministration influence the results of young sheep submit-ted to intensive fattening.

The evolution of specific consumption (SC) of feed throughout the fattening period has a major importance in the sense that the economic efficiency of fattening is dependent on this indicator.

The evolution of specific consumption (SC) of feed at all stages of fattening and total fattening period are shown in Table 4.

Table 4. Evolution of specific consumption (SC) on fattening phases

Specification	Tsigai		GBH x Tsigai	
	ME Mcal/kg gain	Crude protein g/kg gain	ME Mcal/kg gain	Crude protein g/kg gain
Accommodation	19.6	1098.38	15.5	867.70
Breeding-fattening	16.5	809.67	15.7	767.27
Finishing	19.8	751.63	17.4	647.01
Total fattening	17.4	830.72	15.9	759.75

Compared to the fattening phases, it is noticed that in the adaptation phase the highest protein consumption was recorded in all groups and in finishing stage, the highest energy consumption. High values of specific consumption in finishing phases can be explained by the fact that summer 2016 was

very dry, with high maximum temperatures, which led to reduction in the feed recovery.
The highest potential for meat production, with the lowest specific consumption (SC) it followed very closely by GBH x Tsigaicrossbreed. In less improved breeds from Romania (Tsigai, Tsurcana), the conversion degree of fibrous feed in meat production is greater than in improved breeds that have higher nutrient requirements, are early, and are more demanding with the food quality meaning they require higher proportions of concentrates in the ration (Călătoiu A., 1986).
The average values and differences concerning body weight before slaughter, hot and cold carcass weight, hot, cold and commercial slaughter yield are presented in Table 5. Thus,the average of body weight before slaughter is for GBH x Tsigai 39.68 kg, while for Tsigai young sheep is 36.80 kg.

Table 5.The mean values of the carcass weight and slaughtering yield

Breed/ Cross bred (n=5)	Trait					
	WBS (kg)	HCW (kg)	CCW (kg)	HSY (%)	CSY (%)	CY (%)
Tsigai	36.80	16.95	16.56	46.06	45.00	49.27
GBH x Tsigai	39.68 **	19.04 **	18.66 **	47.98 ***	47.03 ***	51.23 ***

Note: WBS-Weight before slaughtering; HCW-Hot carcass weight; CCW-Cold carcass weight; HSY – Hot slaughter yield; CSY – Cold slaughter yield; CY – Commercial yield; Student test: ** = distinctly significant ($p < 0.01$); *** = very significant ($p < 0.001$).

The warm carcass weight in crossbreed and Tsigai breed recorded average values of 19.04 kg at GBH x Tsigai and 16.95 kg at Tsigai breed, with significant difference to the advantage of the GBH x Tsigai (+2.09 kg, $p < 0.01$). Also, significant differences between a group of GBH x Tsigai (+2.10 kg) were recorded regarding the cold carcass weights compared with the Tsigai breed. The differences were in favour of crossbred lot.
Regarding the hot, cold and commercial slaughter yield, significant differences ($p< 0.001$) were recorded between crossbreed lot and the Tsigai breed, the differences being to the advantage of crossbreed lambs.
Concerning the gigot, cutlet, shoulder + arm and carcass rest, the result is presented in Table 6.
The crossbred lot recorded greater average values compared to the Tsigai pure breed. The values obtained for the GBH x Tsigai were also higher compared to Tsigai breed, the differences recorded were distinctly significant for gigot (1.13 kg, $p < 0.01$).
In Table 7 are presented the average values and variability estimates for the carcass conformational traits of the slaughtered young male sheep.

Table 6.The main cut sections of carcass from young rams submitted to intensive fattening

Geno-types (n=5)	Trait				
	Cold carcass weight (kg)	Gigot (kg)	Cutlet (kg)	Shoulder + arm (kg)	Carcass rest (kg)
Tsigai	16.56 ± 0.44	5.16 ± 0.25	2.72 ± 0.09	2.94 ± 0.13	5.74 ± 0.15
GBH x Tsigai	18.66 ± 0.38**	6.29 ± 0.22**	3.08 ± 0.03**	3.43 ± 0.12*	5.86 ± 0.08 NS

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

Table 7.Carcass conformation traits in slaughtered young rams

Trait	Tsigai (n=5)	GBH x Tsigai (n=5)
Big length of the carcass (cm)	71.22 ± 0.11	74.12 ± 0.67**
Small length of the carcass (cm)	61.53 ± 0.09	63.36 ± 0.28***
Width at shoulders (cm)	18.62 ± 0.19	20.21 ± 0.16***
Width at thorax (cm)	25.65 ± 0.24	26.72 ± 0.27*
Width at gigot (cm)	19.81 ± 0.19	21.54 ± 0.49*
Deep of the thorax (cm)	26.69 ± 0.48	28.55 ± 0.46*
Thorax perimeter (cm)	71.63 ± 0.59	74.82 ± 0.16***
Gigot perimeter (cm)	42.20 ± 0.64	46.92 ± 0.49***
Gigot length (cm)	23.82 ± 0.49	25.33 ± 0.33*

In all analysed traits, the crossbreed group recorded greater average values compared to the Tsigai breed.
Distinctly differences ($p <0.01$) were recorded between GBH x Tsigai and Tsigai breed in big length of the carcass (+2.90 cm).The differences are in favour of crossbred lot.
Significant differences ($p<0.05$) between GBH x Tsigai and Tsigai breed were recorded in width at thorax (+1.07 cm), width at gigot

(+1.73 cm), deep of the thorax (+1.73 cm) and gigot length (+1.51 cm).

CONCLUSIONS

The growth and development dynamics of young sheep from the two types of breeds subjected to intensive fattening highlights a higher potential of meat production in GBH x Tsigai crossbred, compared with the Tsigai breed.

For conformational carcass traits, the crossbred GBH x Tsigai show longer and larger carcasses compared with Tsigai breed, which approaches the carcass format of meat breeds.

Because the F1 crossing effect will not remain on a national level, the Tsigai breed may be added in a plan to create a local type, characterised by high indices of meat production, by crossing with specialised breeds in this direction.

The Tsigai breed was improved towards meat production in pure breed rearing. A national programme (EU funded) could help to preserve local breeds through crossbreeding.

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