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ANALYSIS OF FATTENING ABILITY, CARCASS AND MEAT QUALITY OF HEAVY TSIGAI LAMBS

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ABSTRACT

The aim of the investigation was to analyze fattening ability, carcass and consumer meat quality from purebred Tsigai heavy lambs produced by sucking their mothers and natural grazing. Carcass and meat quality characteristics of 20 heavy lambs of Tsigai sheep were recorded at the average age of 137 days. Samples of *musculus longissimus thoracis et lumborum* were taken for physic-chemical analysis (proteins, fat, total water content) and consumer meat quality (pH, water holding capacity, electro conductivity, colour and shear force) 48 hours after slaughter. The devices Nicolet 6700 Spectrometer, Infratec 1265, pH meter Toledo and MiniScan XE plus or Spectrometer CM 2600 were used for the analysis. Seven days after slaughter, the grilling losses and shear force of grilled meat were obtained.

Relatively high variability, more than 10 %, was found for dressing percentage, weight of carcass, weight of meat in carcass, weight of valuable cuts in carcass, average daily gain and lean meat production per day. The highest variability was found for fat proportion in carcass. Linear correlation coefficient was r = -0.41 for shear force and dressing percentage. On the other hand correlation coefficient of shear force with age and weight at slaughter were almost the same r = 0.40. It means that share force was increasing with increase in slaughter age and weight but decreasing with increase in dressing percentage. Despite of limited number of analysed animals in this preliminary study, these findings indicate that dual purpose breed Tsigai in the ewe-lamb production system is able to produce heavy lambs with good meat quality. Results also demonstrate a high variability within group of purebred Tsigai animals.

Key words: sheep production; heavy lambs; Tsigai; meat quality

INTRODUCTION

Currently sheep production is being one of very limited number of growing commodities in Slovak animal production, the second one is suckle cow production and meat sheep production. All commodities are closely connected to using natural sources of green matter by grazing. It is maybe due to quite suitable geographical and climatic conditions. More than 60 % of Slovak territory is hilly and mountain area with high level of steepness, high latitude, less fertile soil and high rainfall. More than 800 thousand hectares of natural meadows and pastures are located here. Sheep production is one of very traditional ways of animal production of mentioned hilly and mountain regions. There are two traditional breeds of sheep in Slovakia: Improved Valachian and Tsigai sheep. Traditional product of dairy sheep is fresh cheese from which the national speciality "Slovenská bryndza" - a recognised product - has been prepared. Tsigai is a dual purpose breed kept in traditional milk production scheme named "Carpathian system" with lambing in winter and selling of light lambs before Easter. Breeding season is accommodated to the date of next year Easter, because majority of lambs should be sold at this event, at about 12-15 kg of live weight. After selling of lambs, the milking period starts and cheese is produced. Ewes are kept in mountain cottages named "salaš" during summer season. Production of heavy lambs by sucking their mothers on pastures is not traditional for the breed in the region, but due to various impacts, as diversification of

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production, market demands high price of specialised meat production breeding stock and lack of trained manpower is going to be more interesting today.

The aim of the investigation was to analyze fattening ability, carcass and consumer meat quality from purebred Tsigai heavy lambs produced in the ewe-lamb production system by sucking their mothers and natural grazing.

MATERIAL AND METHODS

Fattening characteristics, carcass and meat quality of 20 heavy lambs of Tsigai sheep were obtained at the average age of 137 days. Detail dissection of right half carcass was done 24 hours after slaughtering to obtain weight and proportion of basic tissues (muscle, fat and bones). Weight of valuable cuts was calculated as a sum of weight of round (boneless round without back shank), shoulder (boneless shoulder without front shank), back (boneless *musculus longissimus thoracis et lumborum* between 1st thoracic vertebra and last lumbar vertebra) and tender loin. The samples (approximately 500 g) were taken from MLTL (*musculus longissimus thoracis et lumborum*) and for the first time they were analysed as a fresh meat for physic-chemical meat quality after 48 hours of chilling. The samples of lamb's meat were processed before the analysis (removal of surface fat, membranes and tendons) and grounded. Chemical parameters of meat (proteins, fat and total water content) were analysed afterwards, when no more changes in chemical composition of meat are in progress. The devices Nicolet 6700 Spectrometer or Infratec 1265 with the application module for fat content assessment 1 - 10 % were used. The pH meter Toledo with combined stab electrode was used to measure pH value. Water holding capacity was analysed by the Gramm Hama method. Meat colour (values L, a and b) were measured by the MiniScan XE plus and CM 2600 Spectrometer. Seven days after slaughter, when boneless meat is supposed to be in consumer maturity, the samples were cut into approximately 2 cm slices and were grilled afterwards. Smaller samples, typical for lamb's meat, were left untouched and grilled as a one piece. Contact grill PM-1015 was used for samples processing. After 4 minutes, grilling losses and shear force of grilled meat were measured by Texture Analyser. Grilling losses were valued by weighing the samples before and after grilling. Basic statistics of all obtained variables and correlation coefficients between selected characteristics of carcass and meat quality were calculated using SAS 9.2 statistical package.

RESULTS AND DISCUSSION

Relatively high variability, more than 10 %, was found for dressing percentage, weight of carcass, weight of meat in carcass, weight of valuable cuts in carcass, average daily gain and lean meat production per day. The highest variability was found for fat proportion in carcass (Tables 1 and 2). Characteristics of consumer quality also showed high level of variability (Table 3). For example, shear force varied between 9.22 kg and 1.61 kg with average of 3.98 kg, what means that one piece of meat was very tender and the other one was too tough. For beef meat, acceptable level is between 4 kg and 6 kg. It could be said that our sample of heavy Tsigai lambs showed better results than those required for cattle, even slightly higher than light lambs` meat. It is probably related to the age of analysed lambs, which varied within 25 days, and live weight before slaughter (Table 4). In our opinion in the future we should focus on intramuscular fat level, level of daily gain and body/carcass conformation.

It is very difficult to compare our results with results of other authors due to differences in breeds, sex, and age at slaughter or fattening strategies (Dickerson *et al.,* 1972; Salomon *et al*., 1980; Nottern *et al.*, 1991; Ochodnický *et al*., 1994; Brady *et al*., 2003; Daraban, 2008; Santos *et al*., 2008). Those authors, who analysed younger lambs (Ghita *et al*., 2009), lighter ones refer results about quality of very young lamb meat. As a

Table 1: Basic statistics of fattening performance of 20 Tsigai heavy lambs

Variable	Unit	Mean	Minimum	Maximum	Std Dev
Live weight before slaughter	kg	32.95	29.00	42.00	3.10
Age at slaughter	days	137.40	123.00	151.00	8.27
Average daily gain	g	240.69	207.14	289.66	27.5
Weight of hot carcass	kg	12.35	9.70	17.00	1.54
Dressing percentage	%	37.63	29.39	46.67	4.56
Lean meat yield per day	g	36.05	26.79	50.45	5.10

conclusion, it is possible to say that water content was higher and content of basic organic matter in the muscle was lower. Also shear force was lower for younger lamb meat. Apolen *et al.* (2002) refer similar results of carcass quality in their work; the only exception was fat content in carcass, which was slightly higher. It is because they worked with a similar genotype; the only difference was the system of fattening. They applied common fattening based on conserved roughage and concentrates.

Table 2: Basic statistics of carcass quality characteristics of 20 Tsigai heavy lambs

Variable	Unit	Mean	Minimum	Maximum	Std Dev
Weight of meat in carcass	kg	4.93	3.75	6.66	0.61
Weight of valuable cuts in carcass	kg	2.90	2.25	4.12	0.38
Proportion of meat in carcass	%	70.44	68.16	75.40	2.4
Proportion of valuable cuts in carcass	%	41.45	38.58	44.69	1.30
Proportion of valuable cuts in meat	%	58.86	55.81	61.86	1.60
Proportion of bones in carcass	%	26.85	21.93	30.51	1.95
Proportion of fat in carcass	%	2.42	0.55	4.17	0.89

Table 3: Basic statistics of lamb meat quality characteristics of 20 Tsigai heavy lambs

Variable	Unit	Mean	Minimum	Maximum	Std Dev
Total water content	(g/100g)	76.24	74.80	77.90	0.75
Content of proteins	(g/100g)	20.65	20.10	21.30	0.33
Content of fat	(g/100g)	2.12	1.00	3.20	0.65
Energetic value	(KJ/100g)	425.68	374.35	472.33	25.40
pH after 48 hours		5.49	5.38	5.78	0.11
Electrical conductivity	(μS)	1.40	0.46	3.12	0.67
Colour L		40.77	35.98	44.45	2.03
a		7.57	5.81	9.19	0.98
b		8.51	5.94	9.97	1.01
Water holding capacity	(g/100g)	36.67	25.27	44.97	6.06
Grilling losses	(g/100g)	4.25	2.23	7.22	1.42
Shear force after 7 days	(kg)	3.98	1.61	9.22	2.00

Table 4: Correlation coefficients between selected characteristics of carcass and meat quality

	Intramuscular fat content	Grilling losses	Shear force after 7 days
Live weight before slaughter	0.36973	0.00350	0.40988
Age at slaughter	-0.10665	-0.12357	0.39630
Dressing percentage	-0.42331	0.11585	-0.41175
Proportion of fat in carcass	-0.20166	-0.19955	0.01295

CONCLUSIONS

Despite of limited number of analysed animals in this preliminary study, these findings indicate that dual purpose breed Tsigai in the ewe-lamb production system is able to produce heavy lambs with good meat quality. Results also showed high variability of carcass and meat production traits within group of purebred Tsigai animals. Correlation analysis showed that shear force with age and weight at slaughter were almost the same r = 0.40. It means that shear force increasing with increase in slaughter age and weight at slaughter but decreases with increase in dressing percentage. In our opinion, we should focus to increase level of daily gain and body/carcass conformation in order to produce lamb meet with better consumer quality expressed in shear force of grilled meat.

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