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EFFECT OF GENOTYPE ON GROWTH AND BASIC CARCASS CHARACTERISTICS IN MALE LAMBS

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Abstract

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The aim of the study was to evaluate the effect of a genotype on growth and basic carcass characteristics in male lambs. The experiment was carried out at an organic farm in Proseč and four different genotypes were included in the experiment: Šumavská sheep (S) 100, n = 8; S 50 Texel (T) 50, n = 11; T 75 S 25, n = 13 and S 75 T 25, n = 11. The genotype had no significant effect on most of the monitored growth parameters. The highest daily gain (DG) in the interval from birth to 100 days of age was found out in S 75 T 25 (327 g) but the highest DG from birth until the end of the experiment was found in S 50 T 50 (199 g). By contrast, the lowest DGs in both above mentioned intervals were found out in S 100 (265 and 147 g, respectively). With regards to basic carcass characteristics, the genotype had a significant effect only on proportion of kidney. The highest carcass yield (44.80%) was found in S 50 T 50 and the lowest (37.66%) in S 100. The best conformation score was found in S 75 T 25 (3.18) and the lowest fatness score in S 50 T 50. To conclude, it is possible to state that use of the Texel rams in crossing with the Šumavská ewes had a positive effect on both growth and basic carcass characteristics.

Keywords: lamb, males, growth, carcass characteristics, Šumavská breed, Texel, crossbreds

INTRODUCTION

So called "heavy lambs" are currently the main product in the Czech sheep breeding. These lambs have carcass weight higher than 13 kg. Lambs of meat type breeds and lambs originating from commercial crossing are mainly used for this production. In dairy breeds and in the Romanov breed so called „light lambs" are produced, these are lambs whose carcass weight is below 13 kg. However, the production of these lambs is limited due to the small number of dairy and Romanov sheep in the Czech Republic (CR).

The Šumavská sheep (S) is an autochthonous breed and currently is included amongst European animal genetic resources. Due to its adaptability to unfavourable climatic conditions this breed is primarily reared in submoutainous and mountainous areas. Easy lambing, good maternal properties and relatively good milk production are also typical of this breed. On the other hand, relatively lower growth rate and poorer carcass quality compared to meat type breeds or most of mixed breeds are specific to this breed. The fastest and the simplest way of improving the growth and carcass quality in lambs consists of using commercial crossing with the meat type breeds. In this regard the Šumavská ewes are the most frequently crossed with Suffolk (SF) sires in the CR. Other sire breeds used in commercial crossing with Šumavská ewes are the Oxford down (OD) and Texel (T).

Lamb growth is one of the most important factors that influences both the level of rearing and its economy. The growth is affected by many factors where the most important are the breed, nutrition, sex, litter size, management, health and age of mothers. The effect of sheep genotype on growth was evaluated by Burke *et al.* (2003), Kremer *et al.* (2004) and Simeonov *et al.* (2014). Also a carcass value of lambs is affected by a great number of different factors where the most important are the breed, nutrition, sex, management and health. The effect of sheep genotype on carcass characteristics was evaluated by Shaker *et al.* (2002), Hernández-Cruz *et al.* (2009) and Komprda *et al.* (2012).

The aim of our study was to evaluate the effect of genotype on the growth and basic carcass characteristics of male lambs, while four different genotypes were included in the experiment.

MATERIAL AND METHODS

Assessment of the genotype effect on growth and basic carcass characteristics in male lambs was carried out at an organic farm in Proseč in the Pardubice region (altitude 520 m, average annual temperature 6.1 °C, precipitation 820 mm). The experiment was carried out in 2013 and four different genotypes were included in the experiment: S 100, n = 8; S 50 T 50, n = 11; T 75 S 25, n = 13 and S 75 T 25, n = 11. All lambs were born indoors, during March and April 2013. The daily feed ration (DFR) of the ewes in the period from parturition until the end of April consisted of meadow hay (*ad libitum*), haylage (2.5 kg/ewe) and organic mineral lick (*ad libitum*). The DFR of the male lambs during the same period consisted of mother's milk (*ad libitum*) and organic mineral lick (*ad libitum*), the lambs had also free access to the feedstuff of their mothers. From the beginning of May until the end of the experiment the DFR of ewes consisted of grazing on permanent pasture (*ad libitum*) and mineral lick (*ad libitum*). In the same period the DFR of male lambs consisted of mother's milk (*ad libitum*), grazing on permanent pasture (*ad libitum*) and mineral lick (*ad libitum*), while the weaning of male lambs was carried out at the age of about 5 months. All animals were reared in one flock under identical conditions without any discernible differences regarding nutrition or management.

All male lambs were weighed for the first time at birth (LW 0) and at regular monthly intervals thereafter. All determinations of weight were rounded to the nearest 0.1 kg. On the basis of the weighing results, live weights (LW) were adjusted to average age 70 (LW 70) and 100 days (LW 100) by using a linear interpolation method. Last weighing took place before slaughter (LWS).

The average live weights at slaughter were 37.75 kg in S 100, 40.95 kg in S 50 T 50, 37.58 kg in T 75 S 25, and 42.18 kg in S 75 T 25. The average ages of male lambs at the slaughter were 257 (S 100), 193 (S 50 T 50), 236 (T 75 S 25) and 204 days (S 75 T 25).

Daily gains (DG) were calculated in grams (g) for the following intervals:

- DG 1 = DG between LW 0 and LW 70.
- DG 2 = DG between LW 70 and LW 100.
- DG 3 = DG between LW 0 and LW 100.
- DG 4 = DG between LW 100 and LWS.
- DG 5 = DG between LW 0 and LWS.

At the end of the experiment, after 24 hours of starvation, the slaughter of male lambs was carried out. On the day of slaughter the live weight and age of lambs were recorded. After 24 h of refrigeration (+4 °C) cold carcass weight, kidney weight and kidney fat weight were recorded and carcass yield, proportion of kidney and proportion of kidney fat were calculated from the above mentioned values. On the day of slaughter the weight of skin and its proportion was also ascertained. All determinations of weight were rounded to the nearest 0.1 kg. The conformation score (an extent of the scale from S = exceptional to P = poor conformation) and fatness score (the scale from 1 = very low to 5 = very high fatness) were assessed according to the S.E.U.R.O.P. (Commission Regulation EEC 461/93). For the purpose of statistical analysis (Tab. III), the scale of the conformation score was quantified from the grade S = 1 to the grade P = 6.

Statistical results were obtained by means of analysis of variance using STATISTICA CZ version 10, according to following model:

$$Y_{ij} = \mu + G_i(1..4) + e_{ij}.$$

In which
μ.... arithmetic mean,
G_i... effect of genotype,
e_{ij}... residual error.

The HSD test was used to analyse differences between means.

RESULTS AND DISCUSSION

Effect of genotype on live weights (LWs) and daily gains (DGs) is presented in Tabs. I and II. The genotype had no significant effect on most of the monitored growth parameters. In contrast, Shaker *et al.* (2002) and Burke *et al.* (2003) reported a significant effect of this factor on growth while Petr *et al.* (2009) discovered significant effect of this factor on LW 0 and DG 0–100 only. In terms of the individual genotypes the LW 0 ranged from 3.51 to 4.19 kg, while the lowest was found out in S 100 and the highest in S 50 T 50. The second highest LW 0 was found out in S 75 T 25. The most important indicator for the evaluation of growth in lambs in the CR is live weight at 100 days. In this age the highest LWs in S 75 T 25 and S 50 T 50 were found out, the lowest one was monitored in S 100. In the context of the above mentioned facts it is necessary to point out that the LW recorded at 100 days in S 100 males in our experiment was significantly higher than that reported by Bucek *et al.* (2013) for the whole population of this breed in the CR. Also in all crossbreds with the Texel breed higher LWs at 100 days of age were found out compared to data published by Bucek *et al.* (2013) for the whole population of the Texel lambs in the CR.

The highest daily gains in all groups of lambs were found in the interval from birth to 70 days of age. The aforementioned results can be explained by relatively good milk production of mothers and good pasture quality in this period. However, after reaching 100 days of age in all groups of lambs a decrease in growth was monitored. This fact can be explained by weaning of lambs and the gradual

I: *Effect of genotype on live weights of lambs (in kg)*

Genotype	LW 0			LW 70			LW 100			LW S		
	L.S.M.	S.E.M.	Sign.	L.S.M.	S.E.M.	Sign.	L.S.M.	S.E.M.	Sign.	L.S.M.	S.E.M.	Sign.
S100 (A)	3.51	0.79		24.62	5.22		30.01	5.20		37.75	6.32	
S50T50 (B)	4.19	0.79		30.13	4.47		36.00	5.00		40.95	5.86	
T75S25 (C)	3.74	0.97		30.10	5.98		33.08	6.30		37.58	6.35	
S75T25 (D)	4.07	0.58		29.97	4.87		36.79	4.44		42.18	4.82	

II: *Effect of genotype on daily gains of lambs (in g)*

Genotype	DG 1			DG 2			DG 3			DG 4			DG 5		
	L.S.M.	S.E.M.	Sign.	L.S.M.	S.E.M.	Sign.	L.S.M.	S.E.M.	Sign.	L.S.M.	S.E.M.	Sign.	L.S.M.	S.E.M.	Sign.
						*			*						
S100 (A)	302	68.91		180	46.04		265	46.53	d	70	57.77		147	59.20	
S50T50 (B)	371	56.73		196	55.94		318	44.25		63	34.15		199	52.54	
T75S25 (C)	377	80.77		99	168.27	d	293	55.20		43	31.39		157	61.80	
S75T25 (D)	370	63.21		228	41.87	c	327	40.64	a	61	36.25		197	53.63	

a, c, d - * - $P \leq 0.05$

III: *Effect of genotype on basic carcass characteristics*

Trait	Sign.	Genotype											
		S 100 (A)			S 50 T 50 (B)			T 75 S 25 (C)			S 75 T 25 (D)		
		L.S.M.	S.E.M.	Sign.	L.S.M.	S.E.M.	Sign.	L.S.M.	S.E.M.	Sign.	L.S.M.	S.E.M.	Sign.
LWS (kg)		37.75	6.32		40.95	5.86		37.58	6.35		42.18	4.82	
AS (days)		257	70.88		193	48.04		236	60.90		204	47.32	
CCW (kg)		14.50	4.26		18.55	4.37		16.27	4.30		18.59	4.04	
CY (%)		37.66	5.76		44.80	5.49		42.65	4.75		43.65	5.08	
Skin (kg)		5.00	1.22		4.73	0.93		4.38	0.46		4.66	0.76	
Skin (%)		13.21	2.20		11.61	1.85		11.91	1.97		11.11	1.72	
Kidney (kg)		0.05	0.03		0.04	0.01		0.05	0.04		0.06	0.07	
Kidney (%)	*	0.34	0.19	b	0.22	0.06	a	0.32	0.30		0.41	0.56	
Kidney fat (kg)		0.09	0.01		0.09	0.01		0.09	0.01		0.10	0.01	
Kidney fat (%)		0.68	0.16		0.51	0.11		0.55	0.11		0.54	0.10	
CS		3.88	0.64		3.27	0.65		3.77	0.83		3.18	0.40	
Fatness score		3.00	0.76		2.55	0.52		2.69	0.95		3.00	1.10	

LWS = live weight at slaughter, AS = Age at slaughter, CCW = cold carcass weight, CY = carcass yield, CS = conformation score, a, b - * - $P \leq 0.05$

deterioration of the pasture quality while the above mentioned result is consistent with conclusions published by Simeonov *et al.* (2014). In conclusion to the evaluation of growth it must be noted that the highest daily gains for the whole period of the experiment were found out in S 50 T 50 and S 75 T 25. In contrast, the lowest daily gain in the same interval was found out in S 100.

Genotype effect evaluation on basic carcass characteristics is presented in Tab. III. The genotype had a significant effect only on the proportion of kidney. On the other hand, Barone *et al.* (2007) and Komprda *et al.* (2012) recorded a significant effect of genotype on most of basic carcass characteristics. The highest carcass yield (CY) in our experiment was found in S 50 T 50 and the lowest in S 100. However, all values of CY in our experiment were significantly lower than those published by Abdullah *et al.* (2010) and Komprda *et al.* (2012). On the other hand, in all crossbreds were found comparable values of CYs with data published by Kremer *et al.* (2004) and Cividini *et al.* (2005). The lowest CY in our experiment was found out in S 100 lambs but this CY is comparable with result reported by Polák *et al.* (2013) in Tsigaia lambs, this breed is also autochthonous like the Šumavská sheep. The CY in sheep is very influenced by the weight or the proportion of skin. In our experiment the highest proportion of skin was found in S 100 and the lowest in S 75 T 25 when both these proportions are comparable with data published by Kuchtík and Horák (2001) and Hernández-Cruz *et al.* (2009).

The genotype had no sigificant effect on either conformation score or the fatness score which is not

in line with Cividini *et al.* (2005) and Komprda *et al.* (2012). Nevertheless the best overall evaluation of both indicators in our experiment was found in S 50 T 50 male lambs while their conformation score was slightly worse than in S 75 T 25, whereas their fatness score was the lowest. In conclusion to the evaluation of basic carcass characteristics it can be stated that the crossing Texel rams with Šumavská ewes had a positive effect on most of monitored characteristics.

CONCLUSION

The evaluation of the effect of genotype on growth and basic carcass characteristics of male lambs above all shows that the genotype had no significant effect on most of the monitored growth parameters and carcass traits. The genotype had a significant effect only on the daily gains from birth to 100 days of age, daily gains from 70 days to 100 days of age and kidney proportion. Our experiment also showed that the crossbreeding of the ewes of Šumavská breed with Texel rams had a positive effect on growth and basic carcass traits in male lambs.

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