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EVALUATION OF GROWTH INTENSITY IN SUFFOLK AND CHAROLLAIS SHEEP

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Abstract

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The aim of the study was to evaluate the influence of breed (Suffolk, Charollais), sex (ram, ewes) and litter size (singles, twins, triplets) on the growth ability of lambs from birth to 300 days of age. Insignificantly higher ($p > 0.05$) birth weight (4.47 ± 1.07 kg), weight in 30 days (13,87 ± 3.28 kg), 100 days (36.51 ± 5.80 kg) and 300 days (79.00 ± 13.64 kg) was found in the lambs of the Suffolk breed. Higher birth weight was also associated with larger body dimensions in the Suffolk breed (height at withers 42.43 cm, diagonal length of body 43.60 cm). In 100 days, the lambs of Charollais were slightly bigger, in 300 days the height at withers and the diagonal length of body were nearly the same in both breeds. Higher growth intensity was recorded in rams (DG_{0-300}: Ram = 239.87 g.da^{y-1}, Ewe = 221.67 g.da^{y-1}). With regard to the litter size, higher growth intensity was found in singles (234.77 g.da^{y}–1) when compared to lambs from twins (226.10 g.da^{y-1}) or triplets (225.63 g.da^{y-1}).

Keywords: lamb, growth, Suffolk, Charollais

INTRODUCTION

Sheep belong to the oldest animals utilized by human. They were domesticated in the period between 10 thousand and 9 thousand years B.C. in the region of East Asia (Brentjes, 1979). On our land, the sheep are bred from the 9th century. They served as a source of food and clothing primarily (Horák *et al.,* 2011). Nowadays the main product of sheep bred in the Czech Republic is lamb meat and in minor milk or dairy products. Non-productive function, which is mainly maintenance of permanent grassland, is also important (Dobeš *et al.*,2007). Efficiency of sheep breeding depends beside others on the growth intensity of lambs. Growth of the animals is influenced by many factors and the most important are breed, sex, litter size, age of mother, nutrition and breeding management. Effects of gender, litter size and age of ewes on growth of lambs were studied by Ploumi *et al.* (1997), Analla *et al.* (1998), Kuchtík and Dobeš (2006). Effect of the breed of parents in relation to growth ability in lambs was studied by Navrogenis (1996), Suarez *et al.* (2000), Burke *et al.* (2003), Kremer *et al.* (2004), Simeonov *et al.* (2014) and Koutná *et al.* (2016). Growth can be evaluated not only by weight gains, but also on the basis of dimensions of individual body parts. Dimensions of the body and individual body parts are an important and limiting factor determining also the passage of fetus through birth canal among other things, the size of the skeleton is a biological precondition for the size of muscles and meat production. Sabbioni *et al.* (2016) documented a significant ($p < 0.01$) effect of sex and age-class on morphometric indexes and allometry in lambs. Riva *et al.* (2004) confirmed the relationship between body measurements and meat productivity in sheep. The aim of this experiment was to evaluate the effects of breed, sex and litter size on growth intensity and body size in sheep.

MATERIALS AND METHODS

Breeding conditions

The experiment was realized on the School Farm in Žabčice, where Charollais (n = 13) and Suffolk

(n = 25) sheep are kept together. Purebred breeding system was applied in both breeds. Lambing season was from January to March in sheepfold, where the animals were fed *ad libitum* with alfalfa hay with addition of corn silage (daily dose 1 kg/ewe) and barley meal (0.15 kg/ewe/day). The animals had free access to water and mineral licks. From mid-April, the ewes with lambs were driven to clover pasture. Animals were closed to sheepfold for the night, with free access to alfalfa hay and water supply. The nutrition of lambs in the first weeks of their lives was covered by breast milk and later, after the full development of their digestion, they were given the same feed as adult sheep. The lambs were not given any special food supplement. They stayed with their mothers to the age of 100 days. Subsequently, rams were detached from mothers and ewes and were kept in a separated herd. Conditions of nutrition stayed equal for both groups.

Methodology of experiment

The experimental work consisted of weighing of ewes and rams and calculation of their average daily gains. The weight was measured at birth and at the age of 30, 100, 200 and 300 days. The animals were weighed on a calibrated scale with accuracy of 0.1 kg. At the same time intervals, following body measurements were assessed, also until the age of 300 days:

a) height at withers (from the top of the withers to the ground)
b) height at croup (from the top of the croup to the ground)
c) diagonal length of the body (from the anterior edge of shoulder to the posterior edge of the ischium)
d) chest depth (from the withers to the sternum)
e) chest circumference (behind the posterior edge of the shoulders at the point of least perimeter)
f) chest width (behind the shoulder)
g) posterior width of pelvis (between the posterior edge of the ischium)
h) middle width of pelvis (between the outer edge of the ileum)
i) anterior width of pelvis (between the trochanters)
j) pelvic length (from the anterior edge of the trochanters to the posterior of the ileum)
k) head width (between the temporal areas)
l) head length (from the nasal to the head)

Measuring of the height and length dimensions was performed using the Lydtin's rod (accuracy 0.5 cm). The width and depth were measured using Wilkinson's measuring compass (accuracy 0.1 cm). The circumference was measured using a tape measure (accuracy 0.1 cm).

Together with weighing at the age of 100 days, height of subcutaneous fat and height of the *musculus longissimus lumborum et thoracis* (*m.l.l.t.*) were measured ultrasonographically in accordance with the methods of Performance control of growth ability in lambs issued by the Association of sheep and goat breeders.

The resulting data were evaluated statistically by the STATISTICA 12.0 software using fixed effects analysis of variance:

- model equation for live weight and mean daily gain

$$Y_{ijkl} = \mu + B_i + S_j + LS_k + B_i*S_j + e_{ijkl}$$

In which:
μ.... arithmetic mean
B.... breed (Charollais, Suffolk)
S .... sex (ram, ewes)
LS.. litter size (singles, twins, triplets)
e .... residual error.

The HSD test was used to analyze differences between means.

- model equation for body measurements evaluation

$$Y_{ij} = \mu + B_i + e_{ij}$$

In which:
μ.... arithmetic mean
B.... breed (Charollais, Suffolk)
e .... residual error.

The HSD test was used to analyze differences between means.

RESULTS AND DISCUSSION

The influence of breed on the growth ability of lambs

Evaluation of growth ability was performed in lambs of Charollais (Ch) and Suffolk (SF) breeds kept in identical conditions of the School farm in Žabčice (Tab. I). Mean birth weight was at the level of 3.91 ± 1.25 kg in the lambs of the breed Ch. Slightly higher ($p > 0.05$) birth weight was recorded in lambs of the breed SF (4.47 ± 1.07 kg). Merkel *et al.* (1999) and Demeke *et al.* (2004) documented a significant ($p < 0.05$) effect of breed or hybrid combination on the birth weight of lambs and their weight during fattening, which was not confirmed in the present study. The subsequent weighing in 30 days of age revealed higher weight in the SF breed (13.87 kg with variability of ± 3.28 kg). The individuals of the breed Ch weighed 12.62 ± 2.90 kg. The mean daily gain of lambs in this interval was 303 g.da^{y-1} (SF = 315.67 g.da^{y-1}; Ch = 290.33 g.da^{y-1}). Growth intensity of lambs in their first weeks of life depends on the amount of breast milk. Based on our results we can say that the ewes of the SF breed were characterized by higher milk production when compared to the ewes of the CH breed. Thanks to this higher growth intensity in the first month of life, the lambs of the SF breed reached sliggailhtly higher weight results in 30 and 100 days of age (SF = 36.51 ± 5.80; Ch = 35.58 ± 7.102 kg). A significantly lower weight of the lambs of the breed Ch in 100 days of age was described by Koutná *et al.* (2016). Nevertheless, in the evaluation

I: *Weight of animals and height of muscle and fat*

Factor		n	Birth weight (kg) $\bar{x} \pm s_x$	Weight in 30 days (kg) $\bar{x} \pm s_x$	Weight in 100 days (kg) $\bar{x} \pm s_x$	Weight in 200 days (kg) $\bar{x} \pm s_x$	Weight in 300 days (kg) $\bar{x} \pm s_x$	Height of muscle in 100 days (cm) $\bar{x} \pm s_x$	Height of fat in 100 days (cm) $\bar{x} \pm s_x$
Breed	**Suffolk**	25	4.47 ± 1.07	13.87 ± 3.28	36.51 ± 5.80	54.66 ± 4.47	79.00 ± 13.64	2.59^{a} ± 1.11	0.45^{a} ± 0.18
	Charollais	13	3.91 ± 1.25	12.62 ± 2.90	35.58 ± 7.12	59.03 ± 9.72	72.26 ± 12.58	1.43^{b} ± 1.39	0.19^{b} ± 0.19
Sex	**Ram**	22	4.29 ± 1.82	14.34 ± 3.62	36.26 ± 6.74	56.56 ± 5.75	82.30 ± 13.60	2.35 ± 1.01	0.39 ± 0.16
	Ewe	16	4.09 ± 1.63	13.58 ± 2.54	36.10 ± 5.58	54.91 ± 4.60	74.95 ± 10.33	1.61 ± 1.49	0.40 ± 0.24
Litter size	**Singles**	6	5.24 ± 1.28	14.66 ± 1.68	38.30 ± 3.80	57.50 ± 4.90	75.67 ± 11.41	2.34 ± 1.16	0.33 ± 0.17
	Twins	25	4.05 ± 1.36	13.90 ± 3.32	36.72 ± 6.61	55.46 ± 3.88	71.88 ± 12.89	2.25 ± 1.19	0.35 ± 0.20
	Triplets	7	3.85 ± 1.54	10.76 ± 2.15	32.49 ± 5.34	46.46 ± 5.87	60.54 ± 14.43	1.02 ± 1.28	0.14 ± 0.17
Breed * Sex	**SF*Ram**	14	4.58 ± 0.91	13.84 ± 3.89	37.11 ± 6.09	56.56 ± 4.37	84.40 ± 19.23	2.24 ± 0.39	0.41 ± 0.86
	SF*Ewe	11	3.99 ± 1.15	13.91 ± 2.48	36.04 ± 5.65	53.87 ± 4.60	74.13 ± 13.39	2.94 ± 0.4	0.48 ± 0.53
	Ch*Ram	8	4.36 ± 1.10	12.46 ± 3.13	36.64 ± 8.21	59.03 ± 9.72	80.20 ± 11.57	2.67 ± 0.31	0.37 ± 0.97
	CH*Ewe	5	3.82 ± 1.37	12.88 ± 2.81	33.88 ± 5.31	54.68 ± 10.41	75.76 ± 10.65	2.60 ± 0.16	0.32 ± 0.42

a, b = $p < 0.05$; A, B = $p < 0.01$

of mean daily gain (Tab. II.), the lambs of the breed Ch reached higher growth intensity after the 30th day of life, when they started to consume bulky and concentrated feeds. Their mean daily gains from the 30th to the 100th day were 328 ± 89.10 g.da^{y-1}. Between the 100th and the 200th day, the growth intensity of lambs decreased, however the lambs of the breed Ch were still characterized by higher ($p < 0.05$) daily gains (234.50 ± 71.2 g.da^{y-1}) than the lambs of the SF breed (181.50 ± 38.4 g.da^{y-1}). Petr *et al.* (2009) also observed significant ($p < 0.05$) differences between mean daily gains in the same sheep breeds. An interesting finding is the change of growth intensity in both breeds in the interval from 200 to 300 days of age, when the growth accelerated in the SF breed (243.40 g/day) and decreased in the Ch breed (132.30 g/day). This trend was subsequently reflected in the mean weight of lambs in 300 days of age, when the mean weight of the SF lambs was 79.00 kg and the Ch lambs was 72.26 kg. However, it is necessary to point out that the variability of weight between individual lambs increased with the age (SF = ± 13.64 kg, Ch = ± 12.58 kg).

At the same time intervals with weighing, measurements of selected body dimensions were performed. At birth, when the mean weight of the SF lambs was 4.47 kg, their height dimensions (height at withers = 42.43 cm, height at croup = 42.58 cm) were slightly higher than in the Ch lambs (height at withers = 41.28 cm, height at croup = 40.97 cm) whose mean birth weight was 0.5 kg lower. Similar trend of larger ($p > 0.05$) measures in SF lambs was also observed in the other assessed body dimensions. Different situation has occurred at the age of 30 days. Tab. III documents higher growth intensity in lambs of the breed Ch in terms of growth to height (height at withers = 49.65 ± 3.65 cm, height at croup = 49.00 ± 3.46 cm) and to width (chest width = 18.20 ± 2.97 cm, anterior width of the pelvis = 13.30 ± 1.25 cm, middle width of the pelvis = 18.80 ± 1.48 cm, posterior width of the pelvis = 9.40 ± 0.84 cm). During subsequent 70 days the growth intensity of skeleton gradually decreased. While the animals grew 6 cm in average in the interval from the birth to the age of 30 days, they needed much longer time (70 days) for similar growth to height during fattening. Based on this data we can state that the growth allometry of skeleton was lower than growth of muscles on the lambs. The growth intensity of skeleton was decreasing continuously with increasing age although the overall weight was growing (Tab. I.). The height of the *m.l.l.t.* was also measured in 100 days of age. A significantly ($p < 0.05$) higher value was found in the SF breed (2.59 ± 1.11 cm). A negative characteristic that deteriorated the quality of carcass in this breed was a higher ($p < 0.05$) layer of subcutaneous fat (0.45 cm). These results do not correspond to the data presented by Milerski (2001), who recorded more favorable values in the SF breed. From 100 days to 200 days of age the height at withers in SF animals increased by 2 cm and the height at croup by 1 cm, in the Ch animals both of the measures increased by 1 cm. In this age interval, elongation of the body and deepening of the chest were evident: (diagonal length of the body: SF = 69.65 cm; Ch = 69.67 cm, chest depth: SF = 29.53 cm; Ch = 30.67 cm). Growth was also observed in the size of head (width = + 1.49 cm, length = + 2.44 cm) and pelvis (anterior width of pelvis = + 4.17 cm, middle width of pelvis = + 5.03 cm, posterior width of pelvis = + 0.84 cm, pelvic length = + 3.10 cm). The last measuring was performed at 300 days of age, when the lambs reached the height at withers 60.36 ± 5.78 cm (SF breed) and 60.27 ± 6.79 cm (Ch breed). The diagonal length of the body exceeded 73 cm in both breeds. The length of head increased by more than 10 cm during

II: *Growth intensity of sheep*

Factor		n	Daily gains 0–30 (g.day^{-1}) $\bar{x}\pm s_x$	Daily gains 30–100 (g.day^{-1}) $\bar{x}\pm s_x$	Daily gains 100–200 (g.day^{-1}) $\bar{x}\pm s_x$	Daily gains 200–300 (g.day^{-1}) $\bar{x}\pm s_x$	Daily gains 0–300 (g.day^{-1}) $\bar{x}\pm s_x$
Breed	**Suffolk**	22	315.67 ± 63.47	323.43 ± 60.28	181.50^{a} ± 38.47	243.40^{a} ± 47.15	248.67 ± 52.41
	Charollais	16	290.33 ± 96.71	328.00 ± 89.10	234.50^{b} ± 71.70	132.30^{b} ± 51.22	227.83 ± 70.32
Sex	**Ram**	25	335.67 ± 76.98	313.43 ± 73.53	286.50^{a} ± 56.15	194.90 ± 63.12	239.87 ± 65.41
	Ewe	13	316.33 ± 68.18	321.71 ± 67.72	204.60^{b} ± 58.76	158.80 ± 41.55	221.67 ± 50.33
Litter size	**Singles**	6	314.00 ± 81.73	337.71 ± 60.38	192,00^{A} ± 35.48	181.70 ± 42.51	234.77 ± 56.78
	Twins	25	328.33^{a} ± 79.00	326.00 ± 78.24	187.40 ± 37.73	164.20 ± 36.85	226.10 ± 44.64
	Triplets	7	230.33^{b} ± 57.77	310.43 ± 50.02	139.70^{B} ± 42.56	190.80 ± 41.66	225.63 ± 47.23
Breed * Sex	**SF*Ram**	14	308.67 ± 58.88	317.14 ± 46.50	178.30^{a} ± 28.98	245.30^{A} ± 49.10	246.07 ± 38.13
	SF*Ewe	11	330.67 ± 71.68	331.43 ± 76.03	194.50 ± 58.76	135.70^{B} ± 42.59	220.47 ± 54.18
	Ch*Ram	8	270.00 ± 98.13	345.43 ± 107.82	223.90^{b} ± 41.70	211.70^{A} ± 37.81	252.80 ± 59.41
	CH*Ewe	5	302.00 ± 45.17	300.00 ± 43.53	208.00 ± 34.72	210.80^{A} ± 43.61	239.80 ± 40.34

a, b = $p < 0.05$; A, B = $p < 0.01$

the 300 days of observation (SF = 25.44 ± 1.92 cm; Ch = 24.93 ± 1.94 cm). The width of head increased by almost 5 cm within the observation period (SF = 14.28 ± 0.79; Ch = 14.27 ± 0.80 cm). Regarding the dimensions of the chest, higher ($p > 0.05$) values were recorded in the breed Ch. The size of pelvis is an important precondition for good muscularity in meat animals and of course it is tightly associated with lambing difficulties. The results of this study do not lead to conclusive determination of the breed with wider pelvis. In the SF breed the value of the middle width of pelvis was higher (29.44 ± 3.28 cm) while higher values of anterior (22.67 ± 3.87 cm) and posterior width of pelvis (14.60 ± 1.64) were measured in the Ch breed. The pelvic length was almost equal in both breeds (SF = 24.68 cm; Ch = 24.54 cm). Ali *et al.* (2005) evaluated differences in body dimensions between ewes and rams during their growth. The authors described significantly ($p < 0.05$) higher body measurements in females. Insignificant ($p > 0.05$) differences in height at withers and height at croup and the chest measurements were described by Sabbioni *et al.* (2016). The authors found significant differences only in the posterior width of pelvis (ram = 10 cm, ewe = 13 cm).

The influence of sex on the growth ability of lambs

Another studied factor, which influences the growth intensity in lambs, is sex (Tab. I.). Our experiment confirmed the rule that males are born with higher weight and reach higher growth intensity in the postnatal period. Mean birth weight of rams was 4.29 kg with variability of ± 1.82 kg. During the 30 days of milk nutrition their weight increased by 10.05 kg with average daily 335.67 g.da^{y-1} for this time interval. Dobeš *et al.* (2007) proved significant ($p < 0.05$) differences in weights between rams and ewes at the age of 30 days. Between 30 and 100 days the growth intensity decreased slightly (313.43 ± 73.53 g.da^{y-1}), which was, of course, reflected in the live weight of rams at the age of 100 days (36.26 kg). In 200 days of age the rams reached weight of 56.56 ± 4.60 kg and at the age of 300 days their weight was 82.30 ± 13.60 kg. The mean daily gain of rams for the whole time of observation was 239.87 ± 50.33 g.da^{y-1}. The average birth weight of ewes was 20 g lower than in rams. Also the values of mean daily gains in ewes were lower ($p > 0.05$) than those found in rams (DG_{0-30} = 316.33 g.da^{y-1}, DG_{30-100} = 321.71 g.da^{y-1}, $DG_{100-200}$ = 204.60 g.da^{y-1}, $DG_{200-300}$ = 158.80 g.da^{y-1}, DG_{0-300} = 221.67 g.da^{y-1}). The levels of mean daily gains before the 100th day of age correspond to the study of Mohammadi *et al.* (2010), who also did not confirm significant ($p > 0.05$) differences between the sexes. The interval from 100 to 200 days was characterized by significant ($p < 0.05$) differences between mean daily gains, which is in accordance with the results of Ploumi *et al.* (1997) and Dixit *et al.* (2001).

A more detailed analysis which evaluated interactions between the effect of breed and sex of lambs revealed the lowest birth weight in the ewes of the Ch breed (3.82 ± 1.37 kg). On the contrary, the highest birth weight was reached by the rams of the SF breed (4.58 ± 0.91 kg). At the age of 100 days the rams of this breed weighed 37.11 ± 5.65 kg, while the weight of the rams of Ch breed was 0.5 kg lower on average (36.04 ± 6.09 kg). Comparable weights in rams of the SF breed were published also by Dwyer. (2003). The highest values of the *m.l.l.t.* height were found in the ewes of the SF breed (2.94 cm) which were also characterized by the highest layer of the subcutaneous fat (0.48 cm). The lowest *m.l.l.t.* height and layer of fat was observed in the ewes of the Ch breed (*m.l.l.t.* = 2.60 cm, fat = 0.32 cm). However, the Ch breed was characterized by higher growth intensity at later age, which was documented by the level of mean daily gains in

III: *Body dimensions of sheep*

Body dimensions (cm)	Newborn		Age of 30 days		Age of 100 days		Age of 200 days		Age of 300 days	
	SF (n = 25)	Ch (n = 13)	SF (n = 25)	Ch (n = 13)	SF (n = 25)	Ch (n = 13)	SF (n = 25)	Ch (n = 13)	SF (n = 25)	Ch (n = 13)
	$\bar{x} \pm s_x$	$\bar{x} \pm s_x$	$\bar{x} \pm s_x$	$\bar{x} \pm s_x$	$\bar{x} \pm s_x$	$\bar{x} \pm s_x$	$\bar{x} \pm s_x$	$\bar{x} \pm s_x$	$\bar{x} \pm s_x$	$\bar{x} \pm s_x$
Height at withers	42.43 ± 2.80	41.28 ± 3.16	48.75 ± 3.09	49.65 ± 3.65	54.08 ± 3.03	55.83 ± 2.25	56.18 ± 3.94	57.67 ± 1.53	60.36 ± 5.78	60.27 ± 6.79
Height at croup	42.58 ± 2.31	40.97 ± 2.96	48.40 ± 3.17	49.00 ± 3.46	56.00 ± 3.61	53.18 ± 2.83	57.53 ± 4.36	56.67 ± 2.52	60.52 ± 6.14	63.00± 8.22
Diagonal length of the body	43.60 ± 4.14	41.38 ± 2.75	53.27 ± 4.00	53.90 ± 4.31	60.00 ± 3.23	59.67 ± 4.51	69.65 ± 3.48	69.67 ± 4.04	73.56 ± 5.72	73.60 ± 4.84
Head length	15.16 ± 1.16	14.38 ± 1.33	16.85 ± 2.82	17.20 ± 1.32	19.75 ± 1.41	19.67 ± 1.53	22.29 ± 1.53	22.00 ± 2.00	25.44 ± 1.92	24.93 ± 1.94
Head width	9.72 ± 0.79	8.92 ± 1.12	10.65 ± 1.16	10.30 ± 0.67	11.60 ± 0.82	12.00 ± 1.00	13.59 ± 0.80	13.00 ± 1.00	14.28 ± 0.79	14.27 ± 0.80
Chest depth	17.84 ± 2.15	16.85 ± 1.72	21.65 ± 2.10	21.70 ± 1.70	24.70 ± 2.05	26.00 ± 2.65	29.53 ± 1.62	30.67 ± 1.15	31.76 ± 2.82	32.80 ± 2.57
Chest width	14.44 ± 2.06	13.85 ± 1.91	17.54 ± 2.30	18.20 ± 2.97	20.40 ± 2.66	20.33 ± 2.89	23.94 ± 1.56	26.00 ± 1.73	26.24 ± 2.77	28.33 ± 2.50
Chest circumference	50.52 ± 5.30	50.46 ± 2.90	65.27 ± 5.29	61.60 ± 9.13	74.35 ± 6.10	80.33 ± 7.23	93.94 ± 4.46	93.00 ± 5.29	100.68±12.8	108.33±5.00
Anterior width of pelvis	10.20 ± 1.08	9.77 ± 1.30	12.85 ± 1.71	13.30 ± 1.25	14.85 ± 1.14	16.33 ± 1.15	19.53 ±2.37	20.00 ± 1.25	22.00 ± 2.47	22.67 ± 3.87
Middle width of pelvis	13.16 ± 1.60	13.00 ± 1.87	18.23 ± 1.99	18.80 ± 1.48	20.20 ± 1.91	21.67 ± 0.58	25.59 ± 2.24	26.33 ± 1.15	29.44 ± 3.28	28.13 ± 2.97
Posterior width of pelvis	7.64 ± 2.61	6.85 ± 1.68	9.12 ± 1.11	9.40 ± 0.84	10.80 ± 1.15	12.00 ± 2.65	11.47 ± 1.59	13.00 ± 1.73	13.96 ± 1.62	14.60 ± 1.64
Pelvic length	12.52 ± 1.92	12.54 ± 1.66	16.58 ± 2.11	17.10 ± 1.85	18.75 ± 1.86	19.67 ± 1.53	22.29 ± 1.86	22.33 ± 2.08	24.68±1.96	24.54±1.85

the intervals from 100 to 200 days and from 200 to 300 days and led to compensation of the lower weights in earlier intervals. The highest weight at the age of 300 days was achieved by the rams of the SF breed (84.40 ± 19.23 kg). In ewes the weight at the age of 300 days was higher in the Ch breed (75.76 kg). Highly significant ($p < 0.01$) differences were proved between the values of mean daily gain from 200 to 300 days between the ewes of the SF breed (135.70 g.da^{y-1}) compared the ewes of the Ch breed (210.80 g.da^{y-1}) and the rams of both breeds (SF = 245.30 g.da^{y-1}; Ch = 211.70 g.da^{y-1}).

The influence of litter size on the growth ability of lambs

Birth weight of lambs is also significantly influenced by the size of litter and the highest weights are recorded in the singles. In the present experiment, the singles weighed 5.24 ± 1.28 kg, the mean birth weight of twins was lower by almost 1 kg (4.05 kg). The decrease in triplets was not that distinctive, their birth weight value was 3.85 ± 1.54 kg. Rosov *et al.* (2013) documented almost 1 kg higher birth weight of singles (6.1 ± 0.1 kg). The weight of triplets recorded by these authors was comparable (4.1 ± 0.1 kg) to the weight of twins in the present study. Based on the results presented in Tab. I and Tab. II we can state that the lambs with lower birth weight (twins, triplets) reached lower weights than the singles in all the observed intervals. This corresponds to the study of Dobeš *et al.* (2007), who also described more favorable results in singles. Ptáček *et al.* (2017) documented significant differences ($p < 0.01$) between the weights of singles, twins and triplets at the age of 100 days. The daily gains from 100 to 200 days were highly significantly different ($p < 0.01$) between singles (192 ± 35.48 g.da^{y-1}) and triplets (139.70 ± 42.56 g.da^{y-1}). There was a positive finding that the lambs from triplets increased their growth intensity in the interval from 200 to 300 days, when they reached insignificantly highest ($p > 0.05$) daily gains (190.80 ± 41.66 g.da^{y-1}). Similar trend was described also by Macit *et al.* (2001) and Fernandes *et al.* (2001).

CONCLUSION

Based on the results of the present study we can conclude that there was no significant difference found in the weights of lambs of both sheep breeds. Nevertheless, a different growth intensity of the SF and Ch breeds should be pointed out, the lambs of the SF breed grew faster in the postnatal period up to 100 days of age. The Ch breed was characterized by higher growth intensity in the interval from 100 to 200 days. This finding could be used by breeders for finalization of the lambs for slaughter. The evaluation of growth according to the changes of body dimensions led to conclusions that there was no difference between the breeds and that the body dimensions can be used as additional parameters for evaluation of growth intensity. Regarding the effect of sex, the study confirmed higher growth of rams, with slightly better results achieved by the rams of the SF breed. In ewes, faster growth was observed in the Ch breed. The study also confirmed higher growth intensity in the singles when compared to the lambs from twins or triplets.

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