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INFLUENCE OF SEX AND AGE AT SLAUGHTER ON GROWTH PERFORMANCE AND CARCASS TRAITS OF BOER KIDS

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ABSTRACT

The aim of the study was to evaluate growth performance and carcass traits of the Boer kids. A total of thirty-four kids were used. The animals were divided into two groups based on sex (17 male and 17 female) and slaughter age (85 ± 10.14 days (Group 1) and 139 ± 17.55 days (Group 2)). In comparison to female kids, male kids had significantly higher average birth weight (3.3 kg : 3.7 kg) and significantly higher average daily gain (163 g : 203 g). Due to greater birth weight and average daily gain, male kids reached higher slaughter weight than female kids. Although mean values of dressing percentage between sexes were not significant ($P > 0.05$), females (47.1%) had slightly higher values than male kids (45.2%). The increased slaughter weight accompanied the feeding period from 83 to 139 days and, although not significant ($P > 0.05$), showed slight increase in dressing percentage between groups. Age had positive and significant ($P \leq 0.001$) influence on deposition of subcutaneous fatness. Male kids had more developed carcasses than females. Carcass length, hind leg width and shoulder width differed significantly and increased with slaughter age. Sex did not significantly affected proportions of liver, lungs, head and skin. Female kids had higher proportion of hearth ($P \leq 0.05$) and spleen ($P \leq 0.001$). Proportions of heart, spleen and skin at two different ages at slaughter were not significant.

Key words: goats / breeds / Boer breed / kids / slaughter age / sex / carcass traits / growth

1 INTRODUCTION

The Boer goat is a famous meat purpose breed well known for its rapid growth, excellent meat quality and high fertility (Greyling, 2000; Malan, 2000). The breed originates from South Africa. First animals were imported in Slovenia in 1997 and since then the breed has spread rapidly throughout whole Slovenia. Today, it represents the most numerous Slovenian goat population with a total of 3300 goats (Kompan *et al.*, 2011). The breed is included into breeding programme whose aim is to keep the Boer goat in a meat type and to improve fattening and carcass traits and meat quality (Cividini *et al.*, 2010). Today, when consumer demands are in search of low-fat, low-calorie, healthy and a new meat sources, goat meat has been gaining popularity (Korlie *et al.,* 2000; Carlucci *et al.,* 1998; Potchoiba *et al.,* 1990). The market of goat meat varies according to the demands of the societies. Meat of the kids slaughtered at very early age (30–65 days old and 6–11 kg live weight; Arias and Alonso, 2002) is favoured in the Mediterranean countries where is considered as a delicacy while meat from mature goats is more accepted in African and South Asian countries (Naude and Hofmeyr, 1981). However, according to Sormunen-Cristian and Kangasmäki (2000) the best goat meat is nearly fatless, light in colour and produced by 3–6 month old kids. A few researches which have studied carcass value of goat kids slaughtered at different body weights/age at slaughter have yielded varying results (Pieniak-Lendzion *et al.,* 2010). Therefore, the objective of this study was to evaluate growth performance and carcass traits of male and female Boer kids slaughtered at two different ages.

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2 MATERIALS AND METHODS

2.1 ANIMALS

Thirty-four kids (17 male and 17 female) of the Boer breed were used in the study. The kids were chosen from three controlled farms where they were reared with their does and under similar feeding conditions. Apart from doe's milk, the kids had access to commercial concentrate (18% crude protein, 2.2% crude fat, 7.9% crude fibre, 7.8% ash) and hay *ad libitum*. Water and salt blocks were also available *ad libitum*. The animals were divided into two Groups according to sex (male and female) and average slaughter age (85 ± 10.14 days and 139 ± 17.55 days). Minimum slaughter age in Group 1 was 64 days and maximum 103 days, while for Group 2 minimum was 115 days and maximum 170 days. The Group 1 comprised of 9 male and 8 female kids and the Group 2 of 8 male and 9 female kids.

2.2 SLAUGHTERING AND CARCASS CHARACTERISTICS

The kids were weighed on the slaughter day, before transportation to the experimental abattoir at Zootechnical Department of Biotechnical Faculty in Domžale. After fasting for 12 h with free access to water kids were slaughtered and carcasses processed according to standards (Colomer-Rocher *et al.,* 1987). Removed skin, head, liver, lungs, hearth and spleen from carcasses and hot carcass weight (HCW) were determined. Hot carcass weight (HCW) was defined as a weight of whole carcass with kidney and knob channel fat after bleeding and removing skin, carpal and tarsal joints, head, tail, abdominal and thoracic cavity organs. Dressing percentage (DP) was defined as a ratio of hot carcass weight (HCW) to slaughter weight (SLW). Carcass conformation (1 = low... up to 15 = great) and fatness classes (1 = low... up to 15 = very high) were subjectively scored according to the Slovenian regulation for grading and classifying carcasses of sheep and lambs (Pravilnik …, 2001), which is in agreement with the European regulations (European Union, 1992, 1994). Carcasses were kept at room temperature for 2 h, and then chilled at 4 °C for 24 h in conventional chiller. After chilling carcass length (CL), hind leg width (HLW) and shoulder width (SW) were measured. CL was measured from anterior edge of the *symphysis pubis* to the anterior edge of the first rib; HLW and SW were measured at the greatest width of hind leg, i.e. shoulder.

2.3 STATISTICAL ANALYSIS

Growth performance and carcass traits were analyzed using MIXED procedures of SAS/STAT software package (SAS Institute, 2008). The analysis was performed according to the following linear model: $y_{ijk} = \mu + S_i + G_j + f_k + e_{ijk}$, where: y_{ijk} = dependent variable; μ = overall mean; S_i = fixed effect of sex (i = male, female); G_j = fixed effect of group (j = 1, 2); f_k = random effect of farm (k = 1, 2, 3); e_{ijk} = residual error. Included random effect of farm was analysed and there were no significant differences found for the parameters evalu-

Table 1: *Least-squares means (± SE) of growth performance and carcass traits of Boer kids*

Trait	Male (n = 17)	Female (n = 17)	SE	Sig.	Group1 (n = 17)	Group2 (n = 17)	SE	Sig.
BW, kg	3.76	3.31	0.211	**	-	-	-	-
ADG, g	203.90	163.13	14.309	***	181.83	185.20	14.298	ns
SLW, kg	25.50	22.41	0.814	**	18.86	29.04	0.813	***
HCW, kg	12.04	10.96	0.658	**	9.18	13.82	0.657	***
DP, %	45.29	47.19	1.168	ns	45.76	46.72	1.166	ns
CF	8.51	8.24	0.275	ns	8.30	8.46	0.275	ns
IF	8.00	8.29	0.415	ns	7.61	8.68	0.419	ns
SF	7.39	6.89	0.266	ns	6.09	8.18	0.266	***
CL, cm	56.54	54.31	0.835	**	52.17	58.68	0.833	***
HLW, cm	15.38	13.93	0.595	**	13.76	15.55	0.594	***
SW, cm	17.08	15.63	0.767	**	15.11	17.60	0.767	***

Sig.: level of significance, ns: not significant, *P ≤ 0.05, **P ≤ 0.01, ***P ≤ 0.001; BW: birth weight, ADG: average daily gain; SLW: slaughter weight; HCW: hot carcass weight; DP: dressing percentage; CF: carcass conformation; IF: internal fatness; SF: subcutaneous fatness; CL: carcass length; HLW: hind leg width; SW: shoulder width

ated in the present study. Therefore, only the fixed sex and group effects are presented and discussed. Least squares means of growth performance and carcass traits were computed and tested for differences using student's *t*-test. Differences detected at the 0.05 level or less were considered statistically significant.

3 RESULTS AND DISCUSSION

Growth performance and carcass traits of male and female Boer kids slaughtered at two different ages are presented in Table 1. The male kids had significantly higher ($P \leq 0.01$) average birth weight than females for 0.4 kg. Higher birth weight of male kids and significant effect of sex has also been reported by Koratkar *et al.* (1998) of Osmanabadi kids and Karna *et al.* (2001) of Cheghu kids. This could be explained with the fact that the male foetus grows faster during prenatal development (Soundararajan and Sivakumar, 2011). In the present study male kids had significantly higher ($P \leq 0.001$) average daily gain than female kids (203 g : 163 g). Significant influence of sex on the average daily gain was also reported by Çağraş *et al.* (1999) of Saanen kids, Browning *et al.* (2004) of Boer and Kiko kids, and Ugur *et al.* (2004) of Turkish Saanen kids. Although older animals (Group 2) had slightly higher average daily gain than the younger ones (Group 1), these differences were not significant. Due to greater birth weight and average daily gain male kids reached higher slaughter weight than female kids (Table 1). Mioč *et al.* (2011) also reported that kids with higher birth weight had significantly higher average daily gain, what is in agreement with our results. Due to the higher slaughter weights male kids had also significantly ($P \leq 0.01$) higher hot carcass weights in comparison to female kids. As we expected, an average values for slaughter weight of kids in Group 1 and Group 2 were significantly different ($P \leq 0.001$). Consequently these differences influenced on the average values for hot carcass weights (Table 1). Literature reports indicated that dressing percentage in goats varies between 38 and 56% and it dependents on breed, sex, age, weight and conformation (Anjaneyulu and Joshi, 1995; El Hag and El Shargi, 1996; Dhanda *et al.,* 1999a; Getahun, 2001). According to the above mentioned an average values for dressing percentage in our study were within range for goats. Although mean values of dressing percentage between sexes were not significant, female kids (47.1%) had slightly higher values than male kids (45.2%) which could be explained by their tendency to have a higher fat deposition in the carcasses. The increased slaughter weight accompanied the feeding period from 83 to 139 days and, although not significant, showed slight increase in dressing percentage between groups. These results are in agreement with results of Mayi and Alkass (2010) of Meriz and Black goat kids who pointed out that dressing percentage of goat increased with body weight and age. Differences in conformation, internal fatness and subcutaneous fatness between male and female kids were not significant. These results are in agreement with Peña *et al.* (1994) who found a significant effect of slaughter weight on fatness but not of sex. Contrary to these results, Bonvillani *et al.* (2010a) found higher mean scores for subcutaneous and internal fatness in female kids. Although older animals had slightly higher values for conformation and internal fatness they were not significantly different (Table 1). As expected, goat carcasses had a thin subcutaneous fat cover, which increased significantly ($P \leq 0.001$) with the progress of age. These results are in agreement with Bonvillani *et al.* (2010b) of Criollo Cordobes and Anglonubian kids who reported that conformation, internal and subcutaneous fatness increased with slaughter weight and age. Compared fatness (internal fatness vs. subcutaneous fatness) degree it could be concluded that with increase in age and slaughter weight kids in our research tends to store a slightly higher portion of their fat internally, rather than in subcutaneous sites. These results are in agreement with ones reported by Gibb *et al.* (1993) of British Saanen and Anglo-Nubian kids and Boer × British Saanen crossbreeds, and Dhanda *et al.* (1999b) of Boer ×

Table 2: *Least-squares means (± SE) of non-carcass components (% on empty body weight) of Boer kids*

Trait	Male (n = 17)	Female (n = 17)	SE	Sig.	Group1 (n = 17)	Group2 (n = 17)	SE	Sig.
Liver	4.02	4.28	0.123	ns	4.40	3.89	0.123	**
Lungs	2.74	2.92	0.146	ns	3.06	2.61	0.145	**
Hearth	0.89	0.97	0.029	*	0.95	0.92	0.029	ns
Spleen	0.36	0.48	0.028	***	0.43	0.41	0.028	ns
Head	13.46	12.13	0.527	ns	13.78	11.81	0.537	*
Skin	15.12	16.04	0.333	ns	15.37	15.78	0.334	ns

Sig.: level of significance, ns: not significant,*P ≤ 0.05, **P ≤ 0.01, ***P ≤ 0.001

Angora, Boer × Saanen, Feral × Feral, Saanen × Angora and Saanen × Feral crossbreed kids. Male kids had more developed carcasses than females (Table 1). The carcasses derived from male kids were longer and had higher hind leg and shoulder width than those derived from female kids. Contrary to these results, Bonvillani *et al.* (2010a) reported no differences in carcass measurements between male and female Criollo Cordobés kids. Peña *et al.* (2007), although at lower slaughter age, also did not find significant differences between male and female Florida goat kids. Carcass length, hind leg width and shoulder width increased with progression of slaughter age (Table 1) which is consistent with reports of Zimerman *et al.* (2008).

Proportions of non carcass components of male and female Boer kids slaughtered at two different ages are presented in Table 2. Sex did not significantly affected proportions of liver, lungs, head and skin. Female kids had higher proportion of hearth ($P \leq 0.05$) and spleen ($P \leq 0.001$). A significant decrease in the proportions of liver, lungs and head at higher slaughter age was found. These results are partially in agreement with the ones reported by Marichal *et al.* (2003) and Peña *et al.* (2007) where a significant decrease in the proportions of non-carcass components and internal organs with increase of age and weight at slaughter was found. In the present study proportions of heart, spleen and skin at different age at slaughter were not significant.

4 CONCLUSIONS

The birth weight, average daily gain, slaughter weight, hot carcass weight and carcass measurements were higher in male kids indicating that males grow faster and had more developed carcasses than females. As expected, subcutaneous fatness, slaughter weight and consequently hot carcass weight increased significantly with the progress of age. Considering the above mentioned and the fact that dressing percentage was not influenced by sex and age it could be concluded that the Boer kids could be better used also at higher slaughter ages. The findings of this study also suggest that it is necessary to conduct more detailed studies and investigate influence of longer fattening time on meat quality traits, sensory evaluation of goat meat and their acceptance by consumers.

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