

THE GROWTH DURING SUCKLING PERIOD AND CARCASS TRAITS OF KIDS OF THE BALKAN GOAT BREED

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The growth traits of 56 kids (31 male and 25 female) of the Balkan goat breed, reared in karst area of Montenegro during 3 months of the suckling period (birth weight, body weight with 30, 60 and 90 days of growth and corresponding average daily gains) have been investigated. Weight and dressing percentage of warm carcasses, weight and dressing percentage of chilled carcasses, as well as weight and share of the offal and byproducts of slaughtering have been investigated on total of 14 carcasses (7 male and 7 female) and the differences that are manifested between the sexes. The average birth weight of male kids was 3.25 kg and 3.19 kg of female kids, while body weight of male kids with 30, 60 and 90 days were: 7.97, 12.74 and 17.63 kg, and for female kids: 7.78, 11.72 and 16.25 kg, respectively. Male and female kids showed statistically significant differences ($P < 0.01$) for body weight and average daily gain in periods from 30th to 60th day and from 60th to 90th day, but not for birth weight and for ADG from birth to 30th day. The average dressing percentage weight of warm carcasses of male and female slaughtered kids separately were 57.76 and 59.12%, weight of chilled carcasses with head and offal 56.39 and 57.47% and weight of chilled carcasses without head and offal 44.82 and 45.31%, respectively. Significant difference between sexes was determined only for weight and dressing percentage of chilled carcasses with head and giblets ($P < 0.05$). The share of edible and non edible offal of slaughtering (pre-stomach and small intestines + abomasums and large intestines) was 9.87 and rest 8.64% in male and female kids, while the share of skin was 7.6 and 8.2% in average, respectively.

Key words: kids; body weight; carcass; dressing percentage

ПРИРАСТ ВО ТЕКОТ НА ДОЈНИОТ ПЕРИОД И КАРАКТЕРИСТИКИ НА ТРУПОТ КАЈ ЈАРИЊА ОД БАЛКАНСКАТА РАСА КОЗИ

Испитуван е прирастот кај 56 јариња (31 машко и 25 женски) од балканската раса кози одгледувани во карското подрачје на Црна Гора, во период од 3 месеци, во текот на дојниот период (породна маса, телесна маса на 30, 60 и 90 дена, како и просечниот дневен прираст). Кај вкупно 14 трупови (7 машки и 7 женски) беа испитувани масата и рандманот кај топли трупови, масата и рандманот кај изладени трупови, масата на нуспроизводите од колењето, како и разликите кои се манифестираат помеѓу половите. Просечната породна маса кај машките и женските јариња изнесуваше 3,25 kg и 3,19 kg, додека телесната маса на машките јариња на возраст од 30, 60 и 90 дена изнесуваше: 7,97, 12,74 и 17,63 kg, а на женските јариња: 7,78, 11,72 и 16,25 kg, соодветно. Беа утврдени статистички значајни разлики ($P < 0,01$) помеѓу машките и женските јариња во однос на телесната маса и просечниот дневен прираст по периоди, од 30-тиот до 60-иот ден и од 60-тиот до 90-тиот ден, но не и за породната маса и за просечниот дневен прираст од раѓањето до 30-тиот ден. Просечниот рандман кај машки и женски јариња одделно изнесуваше 57,76 и 59,12%, рандманот на изладени трупови со глава и остатоци 56,39 и 57,47%, додека рандманот на изладени трупови без глава и остатоци 44,82 и 45,31%, соодветно. Значителна разлика помеѓу половите беше одредена само во однос на рандманот на изладени трупови со глава и внатрешни органи ($P < 0,05$). Учеството на деловите што се јадат и оние што не се јадат (преджелудочни и тенко црево + абомасус и дебело црево) во колењето изнесуваше 9,87 и остаток 8,64% кај машки и женски јариња, додека учеството на кожа во просек изнесуваше 7,6 и 8,2%, соодветно.

Клучни зборови: јариња; телесна тежина; труп; рандман

1. INTRODUCTION

Goat breeding takes an important role in livestock breeding of Montenegro, especially in its southern part, the area of karst, where the natural conditions are better for rearing goats than for the other ruminants. The second reason for goat breeding importance is vicinity of tourist centers, which allow easy and good placement of the goat produce as unique delicacies and high value products.

In the total goat population of Montenegro, which is estimated at about 50.000 heads, the domestic Balkan breed (Marković et al., 1997; Marković 2004) dominates. This is a quite extensive system of rearing, where main products are goat meat and milk. Milk is further processed into various types of cheese. The place of goat meat to the market is mainly as kids' meat, at the age of 3 to 5 months, carcass weight 8 kg to 15 kg.

The research on the Balkan breed of goats in Montenegro, done in the past, referred mainly to the morphological and milk production traits, while meat production traits have not been investigated.

Bearing in mind the importance of meat as a main product of goat breeding, the objective of this paper was to investigate growth performance of kids during the suckling period and slaughtering characteristics (yield and dressing percentage of warm carcasses, yield and dressing percentage of chilled carcasses, as well as weight and share of the by-products of slaughtering) and the differences that are manifested between the sexes.

According to the findings of many researchers, the production of goat meat, especially kid's meat could be very profitably, due to the fact that there is a good market in most European countries in terms of demand and readiness of buyers to pay high price (Memisi and Bauman, 2007; Trskot and Pavičić, 2007).

The kids' meat has certain advantages in comparison to the other types of meat, less fat content and better digestion (Mioč, 1998), for example.

The yield and quality of kids' meat of different breeds, as well as the impact of various genetic and non genetic factors on the expression of these characteristics, have been investigated by numerous authors. The investigation of yield and carcass quality of kids of domestic Balkan goats breed done by Memisi (2000) and Memisi et al. (2009) showed that dressing percentage of warm carcasses was 58%, while chilled carcasses with and without offal were 55% and 45%, respective-

ly. These results were significantly influenced by different flocks, but not by the sex of kids. The similar investigations were carried out on the domestic white goat breed in Serbia (Žujović et al. 2001, 2007 and 2008). as well as numerous researches on the more productive goats' breeds, as Saanen and Alpine breeds, and on numerous indigenous breeds around the world (B. Mioč 1998; Mavrogenis et al., 1984; Kosumi et al., 2003; Alexander et al., 2009; Daskiran et al., 2006).

2. MATERIAL AND METHODS

For the investigation a flock of breeding goats of the domestic Balkan breed, reared in the area of Podgorica was used. The kidding season of majority of goats in the flock occurred in the period between 20 February and 15 March. For the plot 56 kids (31 male and 25 female) born in the interval from 24 February to 2 March was chosen. During the kidding season the date of birth, birth weight and sex of kids were noted. The growing traits during the suckling period were controlled by measurement of the body weight of the individual kid after 30, 60 and 90 days after birth. The traditional way of growing was applied. The first week after kidding, kids were all time with mothers. After seven days kids were separated, but joined to their mother for suckling three to four times per day. After the third week of life to the kids high quality of hay was available and the last 3 to 4 weeks additional concentrate fed was added.

For investigation of slaughtering traits 7 male and 7 female kids were slaughtered, between 87 and 90 days old. Slaughter was done in the slaughter house of the meat industry "Martinović" in Podgorica.

During slaughtering and preparing carcasses the following parameters were recorded:

- 1) Body weight before slaughtering;
- 2) Weight of warm and prepared carcasses;
- 3) Weight of byproducts of slaughtering (edible and non edible giblets, skin and legs);
- 4) Weight of chilled carcasses;
- 5) Share of the heads and giblets in cooled and prepared carcass.

Body weight of kids during the suckling period and weight before slaughtering were measured by the technical decimal balance. while the masses of warm and cold carcasses and other parts were measured by the digital balance at the slaughterhouse track or on the electronic balance. From the relationship of body weight of kids before

slaughtering and the mass of warm carcasses, then cooled carcasses (with giblets or without giblets) the values of dressing percentage (D1, D2 and D3) were estimated.

Statistical parameters (mean, standard deviation, coefficient of variation and the range of variation) were calculated. The significance of statistical differences of means of the two obtained groups was calculated by t-test.

3. RESULTS AND DISCUSSION

Growth performance of kids during the suckling period

The average birth weight (BW) of male kids was 3.25 kg, and the female kids 3.19 kg. The difference in BW between male and female kids was not significant ($P > 0.5$), Table 1.

A slight advantage in the body weight of male kids was exposed after the first month of the suckling period: the average body weight of males was 7.79 kg and females 7.78 kg. Consequently, the average daily gain (ADG) of male kids was 125.09 g and 123.22 g of female kids.

At the age of 60 days and 90 days, male kids performed significantly better growth parameters ($P < 0.01$). Average body weight of male kids at the age of 60 days was 12.74 kg, while female

11.72 kg. The average daily gain in the 30–60 days' period was 159.21 g for males and 131.18 g for females.

At the age of 90 days, average final body weight was 17.63 kg for male and 16.25 kg for female kids, consequently ADG for males 230.08 g and 208.89 g for females.

Based on comparison of the results with corresponding ones from the literature, the conclusion that the results for BW and for growth performance during the suckling period were greater than those determined by Memiši et al. (1998) and Memiši et al. (2004), as well as greater than results of Marković et al. (1997) achieved for the same breed of goats. The positive difference of these results in comparison to the previous ones can be explained by a carefully performed selection of breeding animals, which had better conditions of rearing, firstly appropriate nutrition. As a conclusion, the domestic Balkan goat breed has a solid genetic potential which can only be exposed in good breeding conditions.

The results were similar to those achieved by Žujović et al. (2001) and Žujović et al. (2007) for kids of the Serbian domestic white goat breed and for the crosses of the Serbian white goat with the Bulgarian Saanen breed. The results were similar to those determined by Mioč (1998) for kids of the Saanen breed, while Mioč's results for kids of the Alpine breed were much better.

Table 1

Growing traits of kids during the suckling period

Traits	Sex	N	\bar{x}	SD	CV, %	min – max
Birth weight, kg	male	31	3.25	0.39	11.96	2.6 – 4.0
	female	25	3.19	0.46	13.45	2.5 – 4.3
Body weight with 30 days	male	31	7.97	1.27	15.78	5.9 – 11
	female	25	7.78	0.97	11.82	6.5 – 10
ADG I – Average daily growth (up to 30 days)	male	31	125.09	27.35	21.37	78.4 – 186.8
	female	25	123.22	18.53	15.04	94.5 – 160.5
Body weight with 60 days	male	31	12.74 ^a	1.85	14.49	9.5 – 17.2
	female	25	11.72 ^b	1.15	9.77	9.8 – 13.4
ADG II – Average daily growth (30 to 60 days)	male	31	159.21 ^a	30.78	19.34	96.7 – 240.0
	female	25	131.18 ^b	25.97	19.72	80.0 – 166.7
Body weight with 90 days	male	31	17.63 ^a	2.12	12.02	14.1 – 24.2
	female	25	16.25 ^b	1.34	8.25	13.0 – 18.1
ADG III – Average daily growth (60 to 90 days)	male	31	230.08 ^a	36.54	15.88	142.8 – 285.7
	female	25	208.89 ^b	23.18	11.10	152.3 – 233.3

^{a,b} Difference letter in the exponent means there is a statistical difference between means values. The same role is in the next tables.

Carcass yield and dressing percentage

Average live weight of kids before slaughtering was 18.60 kg for males and 16.70 kg for

females, with relatively small variation in both of the groups (CV 4.92% and 4.96%, respectively). The difference between averages for male and female kids was significant ($P < 0.01$), Table 2.

Table 2

Yield and dressing percentage of kids carcass

Trait	Sex	N	\bar{x}	SD	CV, %	min – max
Live weight before slaughter, kg	male	7	18.60 ^a	0.89	4.92	16.70 – 19.00
	female	7	16.70 ^b	0.78	4.69	16.00 – 18.10
Weight of warm carcass, kg	male	7	10.74 ^a	0.45	4.26	10.02 – 11.16
	female	7	9.87 ^a	0.52	5.17	9.35 – 10.56
Dressing percentage of warm carcass, % (D1)	male	7	57.76 ^a	1.12	1.98	56.32 – 58.96
	female	7	59.12 ^b	0.93	1.56	58.43 – 60.69
Weight of chilled carcass with the offals, kg	male	7	10.49 ^a	0.48	4.42	9.70 – 10.82
	female	7	9.60 ^b	0.52	5.26	9.05 – 10.26
Dressing percentage of chilled carcass with offal, % (D2)	male	7	56.39 ^a	0.91	1.64	54.91 – 57.15
	female	7	57.47 ^b	0.95	1.67	56.69 – 59.03
Weight of chilled carcass without the offal, kg	male	7	8.33 ^a	0.41	4.65	7.72 – 8.75
	female	7	7.57 ^b	0.41	5.21	7.05 – 8.14
Dressing percentage of chilled carcass without offal, % (D3)	male	7	44.82 ^a	0.99	2.21	43.41 – 45.97
	female	7	45.31 ^a	0.71	1.56	44.12 – 45.81

The average weight of warm carcasses for males was 10.74 kg and for females 9.87 kg, thus the difference between sexes was not significant ($P > 0.05$). However, chilled carcasses with the offal of male kids weighted 10.49 kg, without offal 8.33 kg, while chilled carcasses with the offal of female kids weighted 9.60 kg and without offal 7.57 kg.

Contrary to the live weight traits values, which were better for males, all values for the dressing percentage (D1, D2 and D3) were higher in females. Differences between males and females were significant for D1 and D2 ($P < 0.05$), while not for D3 ($P > 0.05$).

The share of edible parts in offal (head, liver, hearth, lungs, spleen and kidneys) was without significant differences ($P > 0.05$) between sexes. The share of those parts in chilled carcasses of male kids was 16.65%, and female kids 15.94%. Table 3.

Higher share of separable adipose tissue (mesenteries and kidney's fat) in chilled carcasses was determined for female kids (0.28 kg or 2.91%) than for male kids (0.17 kg or 1.61% chilled carcasses). The difference between males and females in relative values is significant ($P < 0.05$).

The results for dressing percentage obtained in this research are very close to those obtained by Žujović et al. (2008), Memiši et al. (2009), as well as to the results of Mioč (1998) for kids of the Saanen breed and to the results of Kosum et al. (2003) for kids of the autochthonous Bornova breed in Turkey.

Higher values of dressing percentage were obtained by Mioč (1998) for kids of the Alpine breed and Kosum et al. (2003) for kids of the Saanen breed.

Values for the share of edible offals in chilled carcasses are in accordance to the results of the previously cited authors.

Table 3

The share of offal and fat tissue chilled carcass

Slaughtering traits	Sex	N	\bar{x}	SD	CV, %	min - max
1. Head, kg	male	7	0.78	0.04	4.99	0.73 – 0.83
	female	7	0.69	0.01	0.78	0.69 – 0.70
2. Liver	male	7	0.39	0.03	6.89	0.37 – 0.43
	female	7	0.33	0.02	7.66	0.30 – 0.37
3. Lungs	male	7	0.32	0.04	11.77	0.27 – 0.36
	female	7	0.28	0.04	15.11	0.29 – 0.34
4. Heart	male	7	0.08	0.007	8.95	0.07 – 0.08
	female	7	0.07	0.004	5.89	0.07 – 0.08
5. Spleen	male	7	0.10	0.03	33.01	0.05 – 0.13
	female	7	0.08	0.02	27.10	0.05 – 0.11
6. Kidneys	male	7	0.07	0.02	25.20	0.04 – 0.09
	female	7	0.07	0.009	11.91	0.06 – 0.08
Total weight of offal, kg (1+2+3+4+5+6)	male	7	1.75^a	0.10	5.71	1.63 – 1.85
	female	7	1.53^a	0.07	4.46	1.44 – 1.64
Total giblets, % of chilled carcass	male	7	16.65^a	0.60	3.63	15.60 – 17.08
	female	7	15.94^a	0.80	5.03	14.91 – 16.96
Fat tissue (mesentery + kidney fat), kg	male	7	0.17 ^a	0.05	28.25	0.02 – 0.23
	female	7	0.28 ^a	0.11	39.77	0.17 – 0.42
Fat tissue (mesentery + kidney fat), %	male	7	1.61 ^a	0.44	8.07	1.08 – 2.14
	female	7	2.91 ^b	1.03	34.39	1.78 – 4.15

Byproducts of slaughtering

Byproducts of slaughtering can be considered as edible offal (pre-stomach and small intestines), non-edible offal (abomasums + large intestines) and the rest of byproducts (skin and legs).

The average weight of empty edible and non edible offal for male kids was 1.84 kg (9.87% of body weight before slaughtering) and for female kids 1.45 kg (8.64% of body weight before slaughtering). These differences between sexes were significant ($P < 0.05$).

The average share of skin in total live weight of kids was 7.65% for male and 8.20% for female kids. The share of legs in total live weight of kids was greater for male (3.86%) than for female (3.66%).

The results for edible and non edible offal are in accordance to the results of Žujović et al. (2008), obtained for kids of the Serbian white breed. However, the values for share of skin and legs in total live weight of kids are greater than those obtained by Žujović et al. (2008) and Mioč (1998) for kids of the Saanen and Alpine breed.

Table 4

Mass and share of byproducts of slaughtering

Traits	Sex	N	\bar{x}	SD	CV, %	min – max
1. Edible offal (pre-stomach and small intestines)	male	7	1.03	0.08	5.13	0.95 – 1.18
	female	7	0.78	0.12	3.90	0.65 – 0.97
2. Other giblets (abomasums + large intestines)	male	7	0.81	0.10	4.05	0.74 – 0.99
	female	7	0.67	0.08	3.38	0.57 – 0.78
Total stomach (1+2), kg	male	7	1.84^a	0.18	9.75	1.70 – 2.18
	female	7	1.45^a	0.18	12.09	1.26 – 1.72
Total stomach (empty), %	male	7	9.87^a	0.86	8.67	9.26 – 11.35
	female	7	8.64^b	1.30	14.87	7.04 – 10.62
Skin, kg	male	7	1.42 ^a	0.06	7.10	1.35 – 1.50
	female	7	1.37 ^a	0.06	6.83	1.30 – 1.43
Skin, %	male	7	7.65 ^a	0.44	5.77	7.11 – 8.24
	female	7	8.20 ^a	0.58	7.09	7.26 – 8.72
Legs, kg	male	7	0.72 ^a	0.07	9.26	0.62 – 0.80
	female	7	0.61 ^a	0.07	12.16	1.30 – 1.43
Legs, %	male	7	3.86 ^a	0.23	5.97	3.65 – 4.24
	female	7	3.66 ^a	0.46	12.51	3.04 – 4.33

4. CONCLUSION

On the basis of results obtained of growth and slaughter traits of kids of the domestic Balkan goat breed it can be concluded:

1) The average birth weight of kids, regarding the sex it was 3.25 for male and 3.19 kg for female, while body weight after 90 days was 17.63 and 16.25 kg, respectively. Average daily gain raised during the investigation period and it was from 125 to 230 g/day for male, and from 123 to 208 g/day for female kids. Differences between sexes were significant ($P < 0.05$) in the period between 30 to 90 days.

2) The dressing percentage of warm and chilled carcass with giblets was significantly higher ($P < 0.05$) in female kids (59.12 and 57.47%) comparing to male kids (57.76 and 56.39%).

3) The share of offal in chilled carcass was 16.65% for male and 15.94% for female kids, and differences were not significant ($P > 0.05$).

4) The total share of edible and non edible offal, significantly differed between male (9.87%) and female kids (8.64%), while the share of skin and legs were 11.51 and 11.86%, respectively, and did not differ significantly ($P > 0.05$).

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