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Fattening Performance, Slaughter and Carcass Characteristics of Male Kids of Coloured Mohair Goats and Angora Goats × Coloured Mohair Goats Cross-Breed F_1

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Abstract: The aim of this experiment was to determine the fattening performance and carcass characteristics of Angora goat x Coloured mohair goat cross-breed F_1 male kids (genotype I) and male Coloured mohair kids (genotype II). Genotype groups were divided into two sub-groups. Total daily feed intakes of kids in genotype Ia (n = 5) and IIa (n = 9) were 40% concentrate and 60% forage whereas total feed intake of kids in genotype Ib (n = 5) and IIb (n = 9) were 60% concentrate and 40% forage. Fattening lasted 90 days. Daily live weight gains and feed efficiencies (1 kg live weight gain/feed intake) of genotype Ia and Ib were 39.20 and 56.20 g; 8.01 and 7.41 kg, respectively. Daily live weight gains and feed efficiencies of genotype IIa and IIb were 53.33 and 79.00 g; 6.64 and 7.41 kg, respectively. Cold dressing percentages, percentages of leg, back, loin and fat on kidney were 40.8, 41.9, 43.3 and 45.5% ($p<0.05$); 29.2, 31.5, 32.1 and 31.9% ($p<0.05$); 5.5, 6.0, 6.8 and 6.7% ($p<0.05$); 5.6, 6.5, 6.1 and 6.4%; 1.6, 3.7, 2.2 and 3.0% ($p<0.001$) for genotype Ia, Ib, IIa and IIb respectively. It can be concluded that Coloured mohair kids had better daily and total gains and kids fed 60% concentrate had the higher performance compared with others.

Key words: Angora goat, coloured mohair goat, fattening performance

INTRODOCTION

Goats are becoming important meat animals worldwide, yet very little is known about their growth and body composition. Their carcass composition and individual tissue distribution in the carcass is not well studied unlike the other two well known meat animal species, such as beef cattle and sheep (Butterfield, 1988). There are many different types of goats in the world used for a variety of purposes. The world goat population was around 807 million in 2005, with annual meat production of around 4.5 million metric tons (FAO, 2007). There are 102 described breeds of goats around the world (Acharya, 1992).

Goats had an important place in the economics of animal production of Turkey and in the nutrition of its population. The number of goats in Turkey is about 6.7 million. According to FAOSTAT in 2004 (FAO, 2007), out of 1.582 million tons of total meat produced in Turkey in 2004, 45 thousand tons came from ordinary goats and kids including Angora.

Perceptions of meat quality vary from country to country, between ethnic groups, between age groups and importantly over time (Dhanda *et al*., 1999b). Meat quality of goats is influenced by several factors, such as genetic type, age, sex and nutritional conditions (Dhanda *et al*., 1999a). Genetic differences between breeds and type of goats in terms of growth and production potential are obvious as reported by various authors (Johnson *et al*., 1995; Warmington and Kirton, 1990). Goats contribute to the meat supply of mainly less developed countries, where much of the marketed goat meat is butchered and sold at local markets, but there is also a worldwide tendency for rapid increase in demand for goat meat (Gipson, 1998).

For improvement of carcass quality, the relative proportions of leg, shoulder, back, loin and others should be compared with carcass of goat in similar carcass weight. There are few reports regarding comparisons of body composition between goat breeds.

Therefore, objectives of this experiment were to determine the fattening performance and carcass characteristics in male coloured mohair male kids and Angora goat x Coloured mohair cross-breed F_1 male kids.

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MATERIALS AND METHODS

The study was conducted in the Experimental and Research Farm in Faculty of Veterinary Medicine, University of Yuzuncu Yil, Turkey. Kids housed indoors in boxes for fattening. Genotype groups were divided into two sub-groups. Total daily feed intakes of kids in genotype Ia (n = 5) and IIa (n = 9) were 40% concentrate and 60% forage whereas total feed intake of kids in genotype Ib (n = 5) and IIb (n = 9) were 60% concentrate and 40% forage. Kids were weighed at the initiation of experiment and then, every 15 days until the end of the experiment.

After a 12 h fasting with free access to water, all of kids slaughtered and dressed at the Van Municipal Slaughterhouse to both determine their slaughter and carcass characteristics reported by Akçapınar (1981) and to find out their final fattening and slaughter weights. Hot carcass weight and weights of head, skin, some visceral organs (heart, liver, lungs and kidneys) and omental fat were recorded. Dressing percentage was calculated based on slaughter weight. Kidney and kidney knob and channel fat percentages were calculated based on carcass weight.

The effects of genotype and feed were analyzed using the General Linear Model (GLM) procedures of the SPSS 13.0 statistical package. The effect of genotype x feed interaction was analyzed and there was no significant interaction among the parameters evaluated in the present study, therefore the effect of feed within genotype has been presented and discussed.

RESULTS AND DISCUSSION

Initial body weights of genotype Ia, genotype Ib and genotype IIa, genotype IIb were 20.40, 20.02 and 19.51, 19.44 kg and final body weights were 23.92, 25.06 and 24.32 26.54 kg, respectively (Table 1). There were no significant differences for initial and finally body live weight among all groups. Average daily gain in kids fed 60% concentrate (68 g day^{-1}) were significantly ($p<0.01$) higher than those fed 40% (46 g day^{-1}) concentrate diet. Average daily gain was 39, 56, 53 and 79 g day^{-1} for genotype Ia, genotype Ib, genotype IIa and genotype IIb, respectively.

In the study average daily gains of genotype II (66 g day^{-1}) were higher compared with genotype I (48 g day^{-1}) at fattening period. In fact, it has been reported that average daily weight gains of Angora goats (72 g day^{-1}) were higher than Alpine and Spanish (68 and 62 g day^{-1}), but lower than Boer (91 g day^{-1}) fed 75% concentrate diet; daily average gains in Angora goats (46 g day^{-1}) were higher than Saanen (161 g day^{-1}) and Bornova (132 g day^{-1}) (Koşum *et al*., 2003) and Spanish (36 g day^{-1}), but were lower than Alpine and Boer (50 and 90 g day^{-1}) goats fed 50% concentrate ration at first 12 weeks of fattening period (Urge *et al*., 2004). The average daily gain obtained in the present study was comparable to those reported by Yertürk (1998) (at Angora goat, 43 g day^{-1}), but was lower than those reported for Angora goat and other breeds by Öztürk and Goncagül (1992) (at Angora goat, 82 g day^{-1}). One of the major influences on average daily gain of goats is genotype. Results in the present study indicated that pure kids had higher average daily gain than cross-breed kid at fattening, but average daily gains of Coloured mohair goats could be increased by cross-breeding.

Mean average daily gain of kids fed 75% concentrate (73 g day^{-1}) were higher than those fed 50% concentrate (55 g day^{-1}) group at first 12 week in fattening, but the trend was reverse (49 and 65 g day^{-1}) at second fattening period (Urge *et al*., 2004). The average daily gain obtained in the present study was lower than those reported by Haddad (2005), but were higher than those reported by Yertürk (1998) in the similar studies. Results in the present study and other studies indicated that high concentrate feed ration resulted in higher average daily gain than low concentrate feed ration at fattening.

Genotype IIb had the highest average daily gain among all groups regardless of genotype and feeding level but in contrast, Küçük *et al*. (2002) and Ünal *et al*. (2006) reported that average daily gain of cross-breed sheep were higher than pure.

While daily concentrate feed consumptions were 313, 415 and 355, 487 g, daily forage consumptions were 444, 455 and 488, 488 g in genotype Ia, genotype Ib and genotype IIa, genotype IIb, respectively (Table 2). The performance of kids in terms of feed efficiencies were (total feed intake/total body weight gain during the experiment) 8.01, 7.41 and 6.64, 6.17 kg, respectively (Table 2).

Concentrate feed intakes obtained in the study were lower than the values reported by Koşum *et al*. (2003) (for Saanen and Bornova) Koyuncu (1994), Yertürk (1998) and Urge *et al*. (2004) (for Angora goats fed 75 and 50% concentrate feed were 851, 725, 1268, 797, 558 and 422 g per day, respectively). There was no interaction among all groups for average daily and total gains. The feed efficiencies reported in the present study were similar to those reported by Koyuncu (1994), Yertürk (1998) for same breeds and other breeds Haddad (2005); 60:40 forage: concentrate feed and Urge *et al*. (2004) at Alpine

Table 1: Fattening performance from kids of two diet groups from two genotypes groups

		Live weight				Average total gain (kg)		Average daily gain (g)	
		Initial fattening		Finally fattening		0-90 day		0-90 day	
Parameters	n	$\bar{X}$	SX	$\bar{X}$	SX	$\bar{X}$	SX	$\bar{X}$	SX
Genotype						**		*	
Genotype I	10	20.21	1.102	24.49	1.282	4.28	0.485	48	5.4
Genotype II	18	19.47	0.821	25.43	0.955	5.96	0.361	66	4.0
Fed proportion						**		**	
40 (%)	14	19.95	0.972	24.12	1.130	4.17	0.428	46	4.7
60 (%)	14	19.73	0.972	25.80	1.130	6.07	0.428	68	4.7
Genotype*Feed									
Genotype Ia	5	20.40	1.558	23.92	1.813	3.52	0.686	39	7.6
Genotype Ib	5	20.02	1.558	25.06	1.813	5.04	0.686	56	7.6
Genotype IIa	9	19.51	1.161	24.32	1.351	4.81	0.511	53	5.7
Genotype IIb	9	19.44	1.161	26.54	1.351	7.10	0.511	79	5.7

*p<0.05, **p<0.01

Table 2: Feed intake and feed efficiency (total feed intake/total body weight gain)

	Genotype I				Genotype II			
	Genotype Ia		Genotype Ib		Genotype Iia		Genotype Iib	
Parameters	Concentrate Feed	Clover straw	Concentrate Feed	Clover straw	Concentrate Feed	Clover straw	Concentrate Feed	Clover straw
Feed intake (g)	313	444	415	455	355	488	487	488
Feed efficiency (kg)	8.01	11.34	7.41	8.13	6.64	9.12	6.17	6.18

Table 3: Effect of genotype and type of feed on weights of non-carcass component (kg)

	Genotype I				Genotype II				
	Genotype Ia		Genotype Ib		Genotype Iia		Genotype Iib		
Components (kg)	$\bar{X}$	SX	$\bar{X}$	SX	$\bar{X}$	SX	$\bar{X}$	SX	p-value
Skin	3.29	0.286	3.01	0.171	2.76	0.319	2.80	0.170	
head and feet	2.42	0.187	2.44	0.129	2.32	0.114	2.25	0.224	
Team[1]	0.95	0.064	1.02	0.033	1.01	0.053	1.12	0.055	
Spleen	0.03	0.004	0.05	0.007	0.04	0.002	0.05	0.005	
Testis	0.14	0.035	0.19	0.012	0.19	0.016	0.19	0.013	
Internal fat	0.24^{b}	0.105	0.44^{ab}	0.079	0.31^{ab}	0.033	0.53^{a}	0.820	*
Kidney	0.07	0.005	0.07	0.008	0.07	0.003	0.08	0.003	
Kidney knob and channel fat	0.18^{b}	0.074	0.39^{b}	0.046	0.23^{a}	0.011	0.36^{a}	0.034	**

a, b, c: Superscripts within same row with different letters significantly differ; [1] Team: Heart, liver, lungs

and Spanish goats) but were lower than the values reported by Urge *et al*. (2004) for Angora goats. Genotypes and diets could be the reason for variation in the feed efficiency of the kids.

There were no significant differences in head and feet (four feet), skin, team (heart, liver and lung) and kidney weights, but were significant differences in internal fat and kidney knob and channel fat weight among all groups (Table 3). There were no significant differences in the percentages of head and feet, team, spleen and internal fat proportions, but were significant differences in skin, testis, kidney and kidney knob and channel fat proportions for among groups (Table 4). The findings of the present study confirmed that genotype had no significant effect on percent of visceral organs, but Genotype I had higher percentages of skin than Genotype II. However, Gibb *et al*. (1993) and Koşum *et al*. (2003) found a significant effect of breed type on the weights of visceral organs.

The percentages of kidney knob and channel fat in kids fed 60% concentrate diets (3.7 and 3.0%) were significantly higher than kids fed 40% concentrate diets (genotype Ia 1.6 and 2.2%, at cross-breed and pure, respectively. In the present study percentages of kidney knob and channel fat were similar to the findings of Todaro *et al*. (2004), but higher than those reported by Yertürk (1998), for kids fed 60% concentrate diets; and lower than Koyuncu *et al*. (1996).

The carcass characteristics of groups are given in the Table 5. Dressing percentages (based on full live weights) were in the range of 40-45% and it varied significantly among groups. There were significant differences

Table 4: Effect of genotype and type of feed on percentages of non-carcass component (%)

	Genotype I				Genotype II				
	Genotype Ia		Genotype Ib		Genotype Iia		Genotype Iib		
Components (%)	$\bar{X}$	SX	$\bar{X}$	SX	$\bar{X}$	SX	$\bar{X}$	SX	p-value
Skin	13.9^{a}	0.87	12.1^{ab}	0.75	11.2^{b}	0.77	10.6^{b}	0.20	*
head and feet	10.2	0.30	9.8	0.24	9.6	0.10	8.6	0.83	
Team[1]	4.0	0.16	4.1	0.17	4.2	0.12	4.2	0.09	
Spleen	0.1	0.01	0.2	0.02	0.2	0.01	0.2	0.1	
Testis	0.6^{b}	0.10	0.8^{a}	0.03	0.8^{a}	0.04	0.7^{a}	0.03	*
Internal fat	0.9	0.32	1.7	0.20	1.3	0.13	1.9	0.25	
Kidney (% of C^2)	0.7	0.04	0.7	0.06	0.7	0.04	0.7	0.04	**
Kidney knob and channel fat (% of C^2)	1.6^{b}	0.43	3.7^{a}	0.28	2.2^{b}	0.11	3.0^{a}	2.34	***

a, b, c: Superscripts within same row with different letters significantly differ; ^{2}C; Cold carcass; [1] Team: Heart, liver, lungs; *p<0.05, **p<0.01, ***p< 0.001

Table 5: Carcass characteristics form kids of different genotypes from two feed percentages

	Genotype I				Genotype II				
	Genotype Ia		Genotype Ib		Genotype Iia		Genotype Iib		
Parameters	$\bar{X}$	SX	$\bar{X}$	SX	$\bar{X}$	SX	$\bar{X}$	SX	p-valus
Full live weight									
(at slaughter)	23.92	1.813	25.06	1.813	24.32	1.351	26.54	1.351	
Hot carcass weight (kg)	10.11	1.294	10.73	0.929	11.04	0.718	12.27	0.670	
Cold carcass weight (kg)	9.86	1.271	10.51	0.899	10.79	0.692	12.04	0.651	
Dressing percentage (%)									
(based on full live weight)	40.8^{c}	1.74	41.9^{bc}	1.31	44.3^{ab}	0.79	45.5^{a}	0.65	*
Leg percentage (%)	29.2^{b}	1.39	31.5^{a}	0.47	32.1^{a}	0.27	31.9^{a}	0.45	*
Shoulder percentage (%)	18.8	0.07	19.1	0.17	19.8	0.38	19.7	0.32	
Back percentage (%)	5.5^{b}	0.47	6.0^{ab}	0.17	6.8^{a}	0.15	6.7^{ab}	0.22	*
Loin percentage (%)	5.6	0.38	6.5	0.15	6.1	2.49	6.4	0.27	
Others percentage (%)	37.8^{a}	1.82	32.5^{b}	0.80	33.2^{a}	0.68	32.2^{a}	0.53	**
Kidney (%)	0.7	0.04	0.7	0.06	0.7	0.04	0.7	0.04	**
Kidney knob and channel fat (%)	1.6^{b}	0.43	3.7^{a}	0.28	2.2^{b}	0.11	3.0^{a}	2.34	***

a, b, c: Superscripts within same row with different letters significantly differ; *p<0.05, **p<0.01, ***p<0.001

between genotypes for dressing percentage based on full live weight for present study. Coloured mohair (44.25 and 45.46%, respectively) had significantly higher dressing percentage than cross-breed (40.78 and 41.88%, respectively). Dressing percentages of genotype I were similar with those of Dhanda *et al.* (1999a) (41.3% at Saanen x Angora goat) and Yertürk (26) (40.93% at Mohair Goats), were lower than the values reported by Sormunen-Cristian and Kangasmäki (2000) (48.2% at Finnish Landrace kids), Gallo *et al.* (1996) (51% at Criolla kids) and Koşum *et al.* (2003) (50.88% for Saanen and 53.78% Bornova kids, but higher than those reported by Öztürk *et al.* (1993) (at 34.2 at Angora goat kids). Dressing percentage of genotype II were a similar to the findings of Dhanda *et al.* (1999a) (45.1% at Feral x Feral), but higher than those reported by Dhanda *et al.* (1999b) (41.3%, 42.8, 42.4 and 43.7 at Saanen x Angora goat, Boer x Angora goat, Boer x Saanen and Saanen x Feral, respectively) and Marichal *et al.* (2003) (40.8% at 25 kg slaughter weight) and lower than those reported by Marichal *et al.* (2003) (46.0 and 47.2% at 6 and 10 kg slaughter weight, respectively), Sormunen-Cristian and Kangasmäki (2000) and Koşum *et al.* (2003). The dressing percentage of genotype IIb was the highest among all groups in the study. According to studies, genotype and diet had an important effect on dressing percentage in goats. Based on this study, kids may fed with 60% concentrate feed to improve dressing percentages.

Leg percentages in the present study were 29.2 and 31.5%; 32.1 and 31.9% for cross-breed (feed ration 40 and 60%) and pure breeds (feed ration 40 and 60%), respectively. The leg percentages of genotype Ia was the lowest among all groups. Similar results had been reported by Yertürk (1998) (30% at Angora goat). However, these values were lower than the values reported by Aydın (1999) (30.9 at intensive condition for hair kids), they were higher than those reported by Gallo *et al.* (1996) (28.3% at Criolla male kids).

Back percentages of coloured mohair kids (6.8%) fed 40% concentrate diet were significantly higher than other groups (5.5, 6.0 and 6.7% fed 40, 60% concentrate for cross-breed male kids and fed 60% concentrate for coloured mohair kids).

Daily and total live weight gains of genotype II were higher than genotype I and daily and total live weight gain of kids fed 60% group were higher than those of kids fed 40% concentrate diets. This experiment indicated that breed and concentrate feed influenced the fattening performance, non-carcass components and carcass characteristics of kids. Kids fed 60% concentrate diet deposited more fat as kidney knob and channel fat and internal fat compared to kids fed 40% concentrate diet. The genotype had no significant influence on dressing percentage but the dressing percentage was significantly influenced by diet used in the present study.

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