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Growth, slaughter, and carcass characteristics of Honamlı, Hair, and Honamlı × Hair (F1) male goat kids bred under extensive conditions

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Abstract: Growth and carcass characteristics of Honamlı, Hair, and Honamlı × Hair crossbred goat kids were investigated in this study. Seven kids, having live weights between 25 and 30 kg, were slaughtered. It was found that the live weights of Honamlı, Hair, and Honamlı × Hair kids were 3.90 kg and 27.50 kg, 3.04 kg and 16.91 kg, and 3.58 kg and 22.07 kg at birth and on the 120th day, respectively. Honamlı kids had higher body measurements, as well as birth and live weights, when compared to the other genotypes. While flocks had an important effect ($P < 0.001$) on all growth periods, the effect of dam age on body measurements was also significant ($P > 0.05$), except on the 30th day of age. While cold carcass weight was 12.38 kg, 11.41 kg, and 11.81 kg, respectively, for Honamlı, Hair, and Honamlı × Hair (F_1) kids, cold dressing percentage based on empty body weight was 44.72%, 43.71%, and 44.08%, respectively, for Honamlı, Hair, and Honamlı × Hair (F_1) kids. Weights and percentages of long leg, ribs, and shoulders did not have any significant differences between the genotypes ($P > 0.05$). Fast-growing animals with high meat production could be bred based on the results of this study.

Key words: Carcass, growth, kid

1. Introduction

Being one of the first domesticated farm animals, goats provide good products due to their low metabolic requirements, high digestion activity, and the ability of reducing metabolism although they live in adverse environmental conditions. Having an important place in Anatolian cultural and social life, goat breeding also takes place on land generally unsuitable for agriculture and livestock and in forestlands (1). Although Turkey is an important goat breeding country of Europe, it has had a rapid decline in the number of goats, especially in the last 20 years. This decline has mostly been caused by reasons such as social and economic problems in rural areas, voluntary or involuntary migrations to urban areas, a traditional farming system that has not changed for years, inadequate government support, lack of cooperation among breeders, reluctance of young people to sustain traditional goat farming, lack of demand for goat products, and difficulties in finding shepherds (2).

The Hair goat (Anatolian Black) is spreading in all the regions of Turkey but especially in the Mediterranean, Southeastern Anatolia, and Southwestern Anatolia regions. Hair goats generally have a middle-sized body; however, there are also remarkable differences in their body sizes. They are bred mainly for meat and milk. They are well adapted to all climatic and rangeland conditions in Turkey. However, they use lands covered with heath and scrubs (3). Furthermore, Honamlı goats, which are named after the Honamlı nomads, are reared for their meat, milk, and wool (4). Their bodies are massive, high, and large. Their tail is different from the tail of the Hair goat in terms of its length and tassel appearance. However, the most remarkable feature of the Honamlı goat is its arched nose (5).

The efficiency of animal husbandry is related to rearing healthy offspring and their growth in a year. Growth features are very important in terms of meat production systems. Goat enterprises encounter maximum economic losses during the growth period of kids due to deaths of kids. Correct planning programs should be applied in order to prevent these negative conditions (6). Therefore, it is very important to determine the growth performance of kids adapted to the region. The breeders in the Teke region, where this study was conducted, have specifically maintained traditional production methods, along with a lack of health, care, and management conditions. This situation leads to low production levels. For this reason, breeders tend to use crossbreeding as a method in order to increase production.

The importance of goats as meat-producing animals is increasing as their meat has been accepted in many

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new markets (7). A similar situation is seen in the Teke region. For this reason, studies are needed to determine the growth and carcass performance of local breeds. The purpose of this study was to compare growth and carcass characteristics of Honamlı (Ho), Hair (H), and Honamlı × Hair crossbred (Ho × H) goats. It is thought that the results of this study will contribute to the improvement of the animals' characteristics of fast growth, high meat production, and adaptability for slaughter.

2. Materials and methods

2.1. Location of the study, animals, and data collection

The study was conducted in the provinces of Burdur (36°53′N to 37°50′N, 29°24′E to 30°53′E) and Antalya (36°07′N to 37°29′N, 29°20′E to 32°35′E).

The experimental kids were from purebred Hair (H) and Honamlı (Ho) goats and the crossbreds at the F_1 level of these 2 genotypes, Honamlı × Hair (Ho × H). Five flocks for each genotype (in total 157, 146, and 151 kids for H, Ho, and Ho × H (F_1), respectively) were identified under the health control of the Directorate of Provincial Food Agriculture and Livestock, which included vaccination for all the known diseases in the region. As an indicator of growth performance, experimental measurements were performed on the goat flocks. Moreover, no additional care or feeding conditions were provided to the kids.

A certain number of kids were identified for each genotype in the goat flocks. They were weighed within 24 h of birth and numbered using ear tags. The kids were kept with their mothers at morning and night until the 90th day of age during the suckling period. The kids then started to graze together with their mothers in the rangelands. Even though these rangelands were poor in terms of the amount and quality of pasture, they contained a significant woody component and involved shrubland, woodland, and maquis shrubland. Live weights of the kids were measured by using a precision scale, accurate to 50 g, in the mornings when they were hungry. Similarly, some body measurements (withers height, rump height, body length, and chest girth) of the kids were performed for periods of 30 days up until the 120th day of age as described by Adebayo (8).

The first 7 kids reaching a preslaughter live weight of 25–30 kg were separated from the flocks of each genotype in order to determine slaughter and carcass traits. The large slaughter weight intervals were determined based on the differences between breeding conditions and improvement status. Therefore, it was very difficult to use narrow slaughter weight intervals based on their preslaughter live weights. The kids were purchased from the breeders and transferred to a commercial slaughterhouse in the province of Burdur without causing unnecessary distress to them by ensuring good welfare conditions. On the day of slaughter, their preslaughter live weights were recorded after they were deprived of food for 12 h but allowed free access to water. After noncarcass components (head, skin, feet, lungs and trachea, liver, heart, spleen) were recorded, hot carcass weights were determined. The full and empty gastrointestinal tracts were weighed. Thus, the empty body weight (EBW) was also determined. The carcasses were chilled at 4 °C for 24 h. At the end of this process, cold carcass weights were determined. Cold dressing percentage was found based on full live weight and EBW.

Some carcass measurements including carcass length (from the caudal edge of the last sacral vertebra to the dorsocranial edge of the atlas), leg length (from the center of the tuberosity on the proximal end of the tibia to the distal edge of the tarsus), and buttock width (the greatest buttock width in a horizontal plane) were determined on the hanging carcass as described by Fisher and De Boer (9). The testes, kidneys, pelvic fat, and tail were excluded and weighed. Then chilled carcasses were split into left and right halves along the vertebral column. After the left half was divided into 5 primary parts (neck, flank, ribs, shoulder, and long leg) as described by Colomer-Rocher et al. (10), they were weighed. The fat thickness over the 12th rib was determined using a digital plot. The surface area of the *M. longissimus dorsi* (MLD) between the 12th and 13th ribs was found through a new procedure applied in this study. In this procedure, the surface area of the MLD was traced onto acetate papers and then transferred to a computer by scanning. The AutoCAD software program (11) was used to calculate the area of the MLD. Carcass compactness was calculated with the formula "cold carcass weight / carcass internal length".

The approval of the Süleyman Demirel University Local Ethics Committee on Animal Experiments (23.02.2012, meeting number: 06, resolution number: 07) was received before conducting the study.

2.2. Statistical analysis

All statistical analyses were carried out by using the Minitab 16 statistical package (12). The effects of genotype, dam age, sex, and birth type on growth performance were analyzed by using the analysis of variance (ANOVA) generalized linear model (GLM) procedure with birth weight as a linear covariate. Tukey analysis was used to control for significance of differences between subgroups ($P < 0.05$). One-way ANOVA was used to determine the effect of genotype on slaughter and carcass traits.

3. Results

3.1. Growth characteristics

Growth performance of the kids was determined from birth until 4 months of age in this study. Table 1 shows the birth weight and 30th, 60th, 90th, and 120th day weights of Honamlı (Ho), Hair (H), and Honamlı × Hair

Table 1. Least squares for the effects of genotype, dam age, sex, and birth type on growth characteristics of Honamlı (Ho), Hair (H), and Honamlı × Hair (Ho × H) (F_1) kids ($\bar{x} \pm S_{\bar{x}}$).

	n	Birth weight	n	30th day	n	60th day	n	90th day	n	120th day
Genotype										
Ho	146	$3.90^{a} \pm 0.05$	144	$9.32^{a} \pm 0.13$	144	$14.02^{a} \pm 0.20$	144	$20.74^{a} \pm 0.28$	142	$27.50^{a} \pm 0.35$
H	157	$3.04^{c} \pm 0.06$	154	$6.15^{c} \pm 0.14$	149	$9.26^{c} \pm 0.22$	149	$12.95^{c} \pm 0.29$	149	$16.91^{c} \pm 0.37$
Ho × H	151	$3.58^{b} \pm 0.06$	150	$7.80^{b} \pm 0.12$	150	$11.83^{b} \pm 0.19$	150	$16.60^{b} \pm 0.27$	150	$22.07^{b} \pm 0.33$
P		0.000***		0.000***		0.000***		0.000***		0.000***
Dam age										
2	54	3.52 ± 0.07	54	$7.31^{b} \pm 0.18$	53	11.55 ± 0.29	53	$16.66^{ab} \pm 0.39$	53	22.00 ± 0.49
3	139	3.55 ± 0.05	136	$7.77^{ab} \pm 0.12$	135	12.05 ± 0.19	135	$17.23^{ab} \pm 0.25$	133	22.94 ± 0.32
4	127	3.64 ± 0.08	127	$8.02^{a} \pm 0.13$	127	12.27 ± 0.20	127	$17.49^{a} \pm 0.26$	127	22.62 ± 0.33
5^{+}	134	3.51 ± 0.06	108	$7.86^{ab} \pm 0.14$	107	11.63 ± 0.21	107	$16.29^{b} \pm 0.27$	107	21.77 ± 0.34
P		0.114^{ns}		0.036*		0.046*		0.012*		0.075^{ns}
Sex										
Male	228	$3.69^{a} \pm 0.09$	225	$7.90^{a} \pm 0.10$	225	$12.03^{a} \pm 0.16$	225	$17.42^{a} \pm 0.22$	223	$23.24^{a} \pm 0.27$
Female	226	$3.33^{b} \pm 0.05$	223	$7.61^{b} \pm 0.11$	218	$11.38^{b} \pm 0.17$	218	$16.10^{b} \pm 0.23$	218	$21.08^{b} \pm 0.29$
P		0.000***		0.032*		0.002**		0.000***		0.000***
Birth type										
Single birth	287	$3.74^{a} \pm 0.06$	284	$8.03^{a} \pm 0.10$	279	$11.95^{a} \pm 0.15$	279	$17.08^{a} \pm 0.21$	277	$22.69^{a} \pm 0.27$
Twin birth	167	$3.27^{b} \pm 0.02$	164	$7.48^{b} \pm 0.12$	164	$11.46^{b} \pm 0.19$	164	$16.45^{b} \pm 0.26$	164	$21.63^{b} \pm 0.32$
P		0.000***		0.000***		0.043*		0.048*		0.010*

^{a,b,c}: Values in the same column with different superscripts are statistically different ($P < 0.05$). ^{ns}: nonsignificant ($P > 0.05$).
*: $P < 0.05$, **: $P < 0.01$, ***: $P < 0.001$.

first crossbred kids (Ho × H (F_1)). The birth weight and live weights at the 30th, 60th, 90th, and 120th days of age were 3.58 kg, 7.80 kg, 11.83 kg, 16.60 kg, and 22.07 kg for Honamlı × Hair (F_1) kids. As is seen from Table 1, the Ho kids had higher growth performance than H and Ho × H (F_1) kids ($P < 0.001$). In addition, Table 1 shows the effects of some factors such as genotype, dam age, sex, and birth type. On the other hand, Table 2 shows some body measurements of the kids for each genotype. Withers height, rump height, body length, and chest girth values on the 120th day of age were 67.53 cm, 68.01 cm, 66.70 cm, and 66.61 cm for the Ho kids. These values were respectively 57.58 cm, 58.09 cm, 56.16 cm, and 56.89 cm for the H kids and 63.14 cm, 63.56 cm, 62.93 cm, and 62.06 cm for the Ho × H (F_1) kids, respectively. The differences between the genotypes were significant in terms of body measurements, like the live weights ($P < 0.001$).

3.2. Slaughter and carcass characteristics

Table 3 shows slaughter and carcass characteristics of Honamlı (Ho), Hair (H), and Honamlı × Hair (Ho × H) (F_1) male kids. There were significant differences for age at slaughter between genotypes, having similar preslaughter weights ($P < 0.001$). As seen in Table 4, cold dressing percentages based on slaughter weight and empty body weight were 43.71%–44.72% and 51.13%–51.80%, respectively. Ho kids had higher cold dressing percentages and chilling losses compared to the other genotypes ($P < 0.05$). However, there was no significant difference between genotypes in terms of back fat thickness, which was important in determining the fat level of the carcass. The back fat thickness values varied between 0.57 mm and 0.70 mm in this study.

It was determined that the area of the MLD, which gives information regarding the amount of meat in the carcass, was 12.20 cm^2, 10.53 cm^2, and 11.01 cm^2 for Ho,

Table 2a. Least squares for the effects of genotype, dam age, sex, and birth type on morphological body measurements of Honamlı (Ho), Hair (H), and Honamlı ×Hair (Ho × H) (F_1) kids ($\bar{x} \pm S_{\bar{x}}$).

	Withers height (cm)		Rump height (cm)		Body length (cm)		Chest girth (cm)	
	30th day	60th day	30th day	60th day	30th day	60th day	30th day	60th day
Genotype								
Ho	$50.45^{a} \pm 0.27$	$56.90^{a} \pm 0.30$	$50.76^{a} \pm 0.32$	$57.19^{a} \pm 0.31$	$48.01^{a} \pm 0.26$	$55.06^{a} \pm 0.29$	$48.05^{a} \pm 0.24$	$55.17^{a} \pm 0.29$
H	$44.89^{c} \pm 0.29$	$50.97^{c} \pm 0.32$	$45.40^{c} \pm 0.34$	$51.42^{c} \pm 0.37$	$42.42^{c} \pm 0.27$	$49.02^{c} \pm 0.31$	$42.68^{c} \pm 0.26$	$49.15^{c} \pm 0.30$
Ho × H	$48.23^{b} \pm 0.26$	$54.26^{b} \pm 0.29$	$48.74^{b} \pm 0.31$	$54.70^{b} \pm 0.33$	$45.81^{b} \pm 0.25$	$51.64^{b} \pm 0.28$	$45.68^{b} \pm 0.25$	$51.93^{b} \pm 0.28$
P	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.00***	0.000***
Dam age								
2	47.87 ± 0.39	$54.42^{ab} \pm 0.42$	48.16 ± 0.46	$54.83^{ab} \pm 0.41$	45.01 ± 0.37	$55.12^{ab} \pm 0.42$	$44.78^{b} \pm 0.35$	$51.89^{b} \pm 0.41$
3	48.00 ± 0.25	$54.36^{ab} \pm 0.27$	48.50 ± 0.31	$54.57^{ab} \pm 0.33$	45.39 ± 0.25	$52.30^{ab} \pm 0.27$	$45.56^{ab} \pm 0.23$	$52.43^{ab} \pm 0.26$
4	48.37 ± 0.26	$54.98^{a} \pm 0.29$	48.67 ± 0.34	$55.30^{a} \pm 0.39$	46.05 ± 0.24	$52.97^{a} \pm 0.28$	$46.04^{a} \pm 0.22$	$53.25^{a} \pm 0.27$
5^{+}	47.95 ± 0.27	$53.85^{b} \pm 0.28$	48.56 ± 0.32	$54.29^{ab} \pm 0.32$	45.51 ± 0.25	$51.75^{b} \pm 0.29$	$45.67^{ab} \pm 0.24$	$52.20^{ab} \pm 0.28$
P	0.383ns	0.006**	0.653ns	0.031*	0.11ns	0.002**	0.043*	0.001**
Sex								
Male	$48.70^{a} \pm 0.21$	$54.51^{a} \pm 0.23$	$48.66^{a} \pm 0.25$	$54.80^{a} \pm 0.22$	$45.70^{a} \pm 0.20$	$52.31^{a} \pm 0.23$	$45.80^{a} \pm 0.19$	$52.54^{a} \pm 0.22$
Female	$47.45^{b} \pm 0.23$	$53.57^{b} \pm 0.25$	$47.94^{b} \pm 0.28$	$54.07^{b} \pm 0.29$	$45.12^{b} \pm 0.21$	$51.50^{b} \pm 0.24$	$45.09^{b} \pm 0.20$	$51.63^{b} \pm 0.24$
P	0.005**	0.003**	0.030*	0.025*	0.033*	0.009**	0.006**	0.002**
Birth type								
Single birth	48.17 ± 0.21	54.10 ± 0.23	48.54 ± 0.25	54.39 ± 0.21	45.69 ± 0.20	51.89 ± 0.27	$45.95^{a} \pm 0.21$	52.27 ± 0.22
Twin birth	47.55 ± 0.26	53.98 ± 0.28	48.06 ± 0.34	54.47 ± 0.31	45.13 ± 0.24	51.92 ± 0.28	$44.94^{b} \pm 0.23$	51.89 ± 0.27
P	0.058ns	0.739ns	0.204ns	0.828ns	0.070ns	0.932ns	0.001**	0.267ns

[a,b,c]: Values in the same column with different superscripts are statistically different ($P < 0.05$). [ns]: nonsignificant ($P > 0.05$).
*: $P < 0.05$, **: $P < 0.01$, ***: $P < 0.001$.

H, and Ho × H kids, and the effect of genotype was also significant for MLD area. Carcass length, buttock width, and leg length were respectively 74.29 cm, 16.64 cm, and 27.71 cm for Ho kids and 69.57 cm, 15.44 cm, and 27.07 cm for H kids.

Table 5 shows the percentages of the valuable parts and noncarcass components. There were significant differences between genotypes in terms of the percentages of head, skin, heart, and liver ($P < 0.05$). Insignificant differences were found between genotypes in terms of the percentages of shoulder, long leg, and ribs ($P > 0.05$).

4. Discussion

Various factors affect the growth performance of kids. Birth weight is one of these factors, especially in terms of increasing the survival rate of kids. However, the birth type is required to be taken into consideration when determining the birth weight (13). In this study, the Hair goat kids had lower live weights than those reported in previous studies (14,15) and also higher live weights than those reported in the study of Koyuncu et al. (16). While these values were lower compared to a study conducted on Saanen × Hair crossbreds (17), they were higher than those reported in the study of Şimşek et al. (18). In this study, birth type had a significant effect on birth weight and live weights of kids, in agreement with previous studies (17–19). The male kids had higher live weights than female kids. Hence, sex had a significant effect in terms of growth ($P < 0.05$–0.001), similar to some other studies (15,19–21). In this study, dam age had a significant

Table 2b. Least squares for the effects of genotype, dam age, sex, and birth type on morphological body measurements of Honamlı (Ho), Hair (H), and Honamlı ×Hair (Ho × H) (F_1) kids ($\bar{x} \pm s_{\bar{x}}$).

	Withers height (cm)		Rump height (cm)		Body length (cm)		Chest girth (cm)	
	90th day	120th day	90th day	120th day	90th day	120th day	90th day	120th day
Genotype								
Ho	$62.80^{a} \pm 0.31$	$67.53^{a} \pm 0.31$	$63.35^{a} \pm 0.38$	$68.01^{a} \pm 0.32$	$61.73^{a} \pm 0.34$	$66.70^{a} \pm 0.32$	$61.86^{a} \pm 0.32$	$66.61^{a} \pm 0.32$
H	$54.65^{c} \pm 0.33$	$57.58^{c} \pm 0.34$	$54.98^{c} \pm 0.39$	$58.09^{c} \pm 0.35$	$52.54^{c} \pm 0.36$	$56.16^{c} \pm 0.34$	$53.31^{c} \pm 0.34$	$56.89^{c} \pm 0.34$
Ho × H	$58.26^{b} \pm 0.30$	$63.14^{b} \pm 0.30$	$58.79^{b} \pm 0.41$	$63.56^{b} \pm 0.37$	$56.43^{b} \pm 0.32$	$62.93^{b} \pm 0.31$	$56.92^{b} \pm 0.31$	$62.06^{b} \pm 0.31$
P	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Dam age								
2	$58.84^{ab} \pm 0.44$	$63.04^{ab} \pm 0.45$	$59.35^{ab} \pm 0.49$	$63.61^{ab} \pm 0.47$	$57.03^{ab} \pm 0.48$	$62.40^{ab} \pm 0.46$	$57.40^{ab} \pm 0.46$	$61.87^{ab} \pm 0.47$
3	$58.97^{ab} \pm 0.29$	$63.20^{ab} \pm 0.29$	$59.23^{ab} \pm 0.33$	$63.55^{ab} \pm 0.35$	$57.26^{ab} \pm 0.31$	$62.49^{ab} \pm 0.30$	$57.97^{a} \pm 0.30$	$62.64^{a} \pm 0.31$
4	$59.49^{a} \pm 0.30$	$63.44^{a} \pm 0.30$	$60.11^{a} \pm 0.36$	$63.94^{a} \pm 0.31$	$58.32^{a} \pm 0.33$	$62.94^{a} \pm 0.32$	$58.39^{a} \pm 0.31$	$62.62^{a} \pm 0.29$
5^{+}	$58.11^{b} \pm 0.31$	$62.11^{b} \pm 0.31$	$58.64^{b} \pm 0.32$	$62.66^{b} \pm 0.36$	$56.58^{b} \pm 0.32$	$61.45^{b} \pm 0.31$	$57.28^{ab} \pm 0.32$	$61.77^{ab} \pm 0.33$
P	0.007**	0.017*	0.005**	0.032*	0.000***	0.001**	0.005**	0.014*
Sex								
Male	$59.35^{a} \pm 0.24$	$63.76^{a} \pm 0.25$	$59.92^{a} \pm 0.29$	$64.26^{a} \pm 0.26$	$57.52^{a} \pm 0.27$	$62.80^{a} \pm 0.25$	$57.97^{a} \pm 0.25$	$62.72^{a} \pm 0.25$
Female	$57.79^{b} \pm 0.26$	$61.75^{b} \pm 0.26$	$58.17^{b} \pm 0.27$	$62.18^{b} \pm 0.27$	$56.28^{b} \pm 0.28$	$61.06^{b} \pm 0.27$	$56.75^{b} \pm 0.27$	$60.98^{b} \pm 0.26$
P	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Birth type								
Single birth	$58.66^{a} \pm 0.24$	$63.23^{a} \pm 0.24$	59.22 ± 0.25	$63.73^{a} \pm 0.25$	57.01 ± 0.26	$62.36^{a} \pm 0.25$	$57.84^{a} \pm 0.28$	$62.56^{a} \pm 0.25$
Twin birth	$58.47^{b} \pm 0.29$	$62.27^{b} \pm 0.30$	58.86 ± 0.38	$62.71^{b} \pm 0.30$	56.79 ± 0.32	$61.50^{b} \pm 0.30$	$56.88^{b} \pm 0.30$	$61.15^{b} \pm 0.31$
P	0.010*	0.011*	0.340	0.009**	0.592	0.024*	0.012*	0.000***

^{a,b,c}: Values in the same column with different superscripts are statistically different ($P < 0.05$). ^{ns}: nonsignificant ($P > 0.05$).
*: $P < 0.05$, **: $P < 0.01$, ***: $P < 0.001$.

effect on live weights of the kids ($P < 0.05$). Contrary to this study, numerous authors reported insignificant effects of dam age (15,21,22).

Body measurements such as withers height, rump height, body length, and chest girth in this study were higher than measurements reported in the studies of Özel and Aygün (22) and Alade et al. (23). Although the flocks were kept in extensive conditions, there was no significant differences in kid management. Therefore, it was thought that the differences in the growth performances of kids were associated with the genotypes.

It was found that dressing percentages were approximately 43.92%–46.10% based on slaughter weight and 52.22%–53.41% based on EBW. Koyuncu et al. (16) reported higher dressing percentages based on EBW than this study. On the other hand, Özcan et al. (24) reported lower dressing percentages. However, Dhanda et al. (25) and Daskiran et al. (26) reported similar results to this study. In agreement with this study, some authors reported a significant effect of genotype on dressing percentage (24,25,27). On the other hand, Cameron et al. (28) did not find significant effects of different genotypes. Because this study was conducted in extensive conditions, the fattening performances of the kids were not determined. Dressing percentages were affected by various factors such as genotype, sex, age, preslaughter weight, management, and feeding and varied between 35% and 53%. Therefore, it was thought that dressing percentages would be higher with better management systems.

Table 3. Some slaughter and carcass characteristics of Honamlı (Ho), Hair (H), and Honamlı × Hair (Ho × H) (F_1) kids ($\bar{x} \pm S_{\bar{x}}$).

Traits	Ho	H	Ho x H	P
Age at slaughter (days)	$118.14^{c} \pm 3.14$	$180.21^{a} \pm 3.22$	$150.71^{b} \pm 2.16$	0.000***
Slaughter weight (kg)	27.70 ± 0.98	26.16 ± 0.97	27.07± 0.95	0.546^{ns}
Empty body weight (kg)	23.89 ± 0.86	22.32 ± 0.82	22.62 ± 0.78	0.498^{ns}
Hot carcass weight (kg)	$12.76^{a} \pm 0.41$	$11.66^{b} \pm 0.45$	$12.08^{ab} \pm 0.38$	0.046*
Dressing percentage-1^{DP1}, %	$46.10^{a} \pm 0.67$	$44.64^{b} \pm 0.78$	$43.92^{b} \pm 0.89$	0.003**
Dressing percentage-1^{DP2}, %	$53.41^{a} \pm 0.53$	$52.22^{b} \pm 0.51$	$52.70^{b} \pm 0.48$	0.037*
Head weight (g)	1811.43 ± 55.71	1870.00 ± 54.72	1771.42 ± 52.69	0.468^{ns}
Four-feet weight (g)	1005.71 ± 31.52	997.14 ± 30.53	1002.86 ± 33.42	0.981^{ns}
Skin weight (g)	$2554.29^{ab} \pm 106.03$	$2762.86^{a} \pm 105.21$	$2374.27^{b} \pm 102.63$	0.047*
Lungs and trachea weight (g)	454.29 ± 31.43	428.57 ± 35.45	474.33 ± 36.27	0.677^{ns}
Heart weight (g)	140.00 ± 7.37	148.57 ± 6.45	125.71 ± 7.89	0.115^{ns}
Liver weight (g)	491.43 ± 31.41	554.29 ± 32.39	568.57 ± 34.45	0.210^{ns}
Spleen weight (g)	60.00 ± 9.18	71.43 ± 8.32	62.86 ± 6.75	0.664^{ns}
Full stomach weight (g)	3810.86 ± 311.58	3974.29 ± 310.42	4494.30 ± 314.48	0.107^{ns}
Empty stomach weight (g)	968.57 ± 47.82	1068.63 ± 49.22	1125.71 ± 41.50	0.087^{ns}
Full intestine weight (g)	2364.29 ± 107.91	2398.57 ± 107.95	2275.71 ± 108.92	0.470^{ns}
Empty intestine weight (g)	1471.43 ± 72.64	1493.67 ± 67.90	1397.14 ± 75.21	0.710^{ns}
Internal fat weight (g)	$77.14^{b} \pm 12.59$	$105.71^{a} \pm 11.62$	$80.57^{b} \pm 11.51$	0.043*
Testes weight (g)	$60.00^{b} \pm 12.63$	$114.29^{a} \pm 12.57$	$82.86^{ab} \pm 11.58$	0.023*

^{a,b,c}: Values in the same line with different superscripts are statistically different ($P < 0.05$). ^{ns}: nonsignificant ($P > 0.05$).
*: $P < 0.05$, **: $P < 0.01$, ***: $P < 0.001$.
^{DP1}: Dressing percentage based on slaughter weight. ^{DP2}: Dressing percentage based on empty body weight.

The back fat thickness values (0.57–0.70 mm) determined in this study were higher than the values reported in the studies of Koşum et al. (27) and Özcan et al. (24). Contrary to this, Dhanda et al. (25) and Koyuncu et al. (16) found higher back fat thickness than this study. The area of the MLD was 12.20 cm^2 for Honamlı kids, which was higher than the other genotypes (Hair and Honamlı × Hair), and the effect of genotype was significant. Similarly, some researchers reported significant genotype effects on the area of the MLD (27,29). Dhanda et al. (25) and Gökdal (30) reported lower values in their studies having similar preslaughter live weights compared to this study. However, while values of the MLD area were compatible with the study of Cameron et al. (28), they were lower than those of the study of Koşum et al. (27). On the other hand, the higher chilling losses for Ho kids might be associated with the fact that the Ho kids had lower back fat thickness and compactness values compared to the other genotypes.

In this study, the significant differences between head and skin were similar to the study conducted by Özcan et al. (24). The differences between skin percentages might be specifically associated with the denser and longer hair production of H kids compared to Ho kids.

Genotype did not have a significant effect in terms of the percentages of valuable parts of the carcass. Similarly, some studies (24,25,28) reported insignificant genotype effects on percentages of valuable carcass parts. However, the percentages of these parts were lower than some results reported by Koşum et al. (27) and Daskiran et al. (26).

In conclusion, this study showed that Honamlı kids had higher birth weights, live weights, and morphological body measurements than Hair kids and Honamlı × Hair

Table 4. Some cold carcass characteristics of Honamlı (Ho), Hair (H), and Honamlı × Hair (Ho × H) (F_1) kids ($\bar{x} \pm s_{\bar{x}}$).

Traits	Ho	H	Ho × H	P
Cold carcass weight (kg)	$12.38^{a} \pm 0.40$	$11.41^{b} \pm 0.37$	$11.81^{b} \pm 0.32$	0.039*
Chilling loss (%)	$2.98^{a} \pm 0.14$	$2.07^{b} \pm 0.16$	$2.02^{b} \pm 0.11$	0.000***
Dressing percentage-1[DP1], %	$44.72^{a} \pm 0.63$	$43.71^{b} \pm 0.61$	$44.08^{b} \pm 0.38$	0.037*
Dressing percentage-1[DP2], %	$51.80^{a} \pm 0.67$	$51.13^{b} \pm 0.11$	$51.19^{b} \pm 0.17$	0.048*
Left half of carcass weight (kg)	$6.36^{a} \pm 0.22$	$5.78^{b} \pm 0.28$	$5.84^{b} \pm 0.18$	0.042*
Shoulder weight (g)	1442.86 ± 85.94	1378.57 ± 81.28	1271.43 ± 86.24	0.382^{ns}
Flank weight (g)	521.43 ± 49.88	600.00 ± 47.98	571.43 ± 43.86	0.541^{ns}
Neck weight (g)	650.00 ± 44.28	655.21 ± 41.25	642.86 ± 48.31	0.991^{ns}
Ribs weight (g)	1621.43 ± 110.54	1564.29 ± 115.32	1612.86 ± 118.52	0.890^{ns}
Sirloin weight (g)	1150.00 ± 69.21	1000.02 ± 67.49	1064.29 ± 61.64	0.329^{ns}
Loin weight (g)	471.43 ± 60.56	564.29 ± 58.21	578.57 ± 47.23	0.415^{ns}
Long leg weight (g)	2100.00 ± 86.24	1857.14 ± 82.43	1900.00 ± 79.51	0.133^{ns}
Tail weight (g)	30.71 ± 2.70	31.79 ± 2.31	30.36 ± 2.78	0.928^{ns}
Kidney weight (g)	70.00 ± 3.88	59.29 ± 2.97	65.00 ± 2.45	0.177^{ns}
Kidney and pelvic fat weight (g)	$44.29^{b} \pm 3.82$	$51.79^{a} \pm 2.98$	$30.71^{c} \pm 4.12$	0.014*
Back fat thickness (mm)	0.57 ± 0.07	0.70 ± 0.05	0.67 ± 0.03	0.180^{ns}
M. Longissimus dorsi area (cm^2)	$12.20^{a} \pm 0.22$	$10.53^{b} \pm 0.28$	$11.01^{ab} \pm 0.23$	0.046*
Carcass length (cm)	$74.29^{a} \pm 0.86$	$69.57^{b} \pm 0.79$	$70.64^{b} \pm 0.98$	0.008**
Carcass internal length (cm)	$61.79^{a} \pm 0.90$	$56.86^{b} \pm 0.76$	$58.14^{b} \pm 0.88$	0.003**
Leg length (cm)	27.71 ± 0.37	27.07 ± 0.41	27.14 ± 0.34	0.426^{ns}
Buttock width (cm)	$16.64^{a} \pm 0.12$	$15.44^{b} \pm 0.19$	$15.50^{b} \pm 0.17$	0.000***
Carcass compactness (g/cm)	201.30 ± 6.54	202.77 ± 5.59	205.01 ± 6.23	0.758^{ns}

[a,b,c]: Values in the same line with different superscripts are statistically different ($P < 0.05$). [ns]: nonsignificant ($P > 0.05$).
*: $P < 0.05$, **: $P < 0.01$, ***: $P < 0.001$.
[DP1]: Dressing percentage based on slaughter weight. [DP2]: Dressing percentage based on empty body weight.

crossbred kids at the same age, and they also reached the preslaughter weight earlier. In addition, the dressing percentages and area of MLD were found to be higher in Honamlı kids than the other genotypes. However, the back fat thickness and the carcass compactness were lower in Honamlı kids. No significant difference was found among genotypes in terms of the valuable carcass parts.

The protection and improvement of native goat breeds that are adapted to their region is important, as opposed to bringing new breeds from other regions, for breeders who are economically poor. As seen in this study, breeders have begun to use Honamlı goats for meat production in cross-breeding. However, there is a need for further studies concerning the backcrossing of Honamlı and Hair goats rather than F_1. The Teke region can become a goat meat production center by regulating these crossbreeding systems. The genetic potential of Honamlı goats, in terms of their fast growth rate and high dressing percentage,

Table 5. Percentages of the valuable parts and noncarcass components in Honamlı (Ho), Hair (H), and Honamlı × Hair (Ho × H) (F_1) kids ($\bar{x} \pm s_{\bar{x}}$).

Traits	Ho	H	Ho × H	P
Percentages (%) relative to cold carcass weight				
Shoulder	22.69 ± 1.18	23.87 ± 1.09	21.77 ± 2.14	0.470^{ns}
Flank	8.13 ± 0.62	10.31 ± 0.81	9.75 ± 0.69	0.061^{ns}
Neck	10.15 ± 0.52	11.26 ± 0.78	11.01 ± 0.27	0.311^{ns}
Ribs	25.58 ± 1.33	26.90 ± 1.49	27.95 ± 1.97	0.470^{ns}
Sirloin	18.15 ± 0.86	17.34 ± 0.64	18.09 ± 0.81	0.766^{ns}
Loin	7.45 ± 0.76	9.56 ± 0.57	9.85 ± 0.49	0.074^{ns}
Long leg	33.02 ± 0.56	32.15 ± 0.89	32.56 ± 0.24	0.567^{ns}
Tail	0.48 ± 0.03	0.54 ± 0.08	0.52 ± 0.06	0.466^{ns}
Kidney	1.10 ± 0.07	1.03 ± 0.05	1.12 ± 0.06	0.702^{ns}
Kidney and pelvic fat	0.69^{b} ± 0.10	0.88^{a} ± 0.16	0.53^{c} ± 0.11	0.046*
Percentages (%) relative to empty body weight				
Head	7.64^{b} ± 0.15	8.43^{a} ± 0.16	7.83^{b} ± 0.14	0.006**
Four-feet	4.24± 0.10	4.48 ± 0.12	4.44 ± 0.11	0.233^{ns}
Skin	10.49^{b} ± 0.36	11.40^{a} ± 0.38	10.23^{b} ± 0.28	0.004**
Lungs and trachea	1.91 ± 0.12	1.90 ± 0.14	2.08 ± 0.13	0.552^{ns}
Heart	0.59^{ab} ± 0.02	0.67^{a} ± 0.03	0.55^{b} ± 0.08	0.029*
Liver	2.07^{b} ± 0.09	2.54^{a} ± 0.13	2.49^{a} ± 0.05	0.009**
Spleen	0.25 ± 0.03	0.32 ± 0.07	0.27 ± 0.04	0.389^{ns}
Internal fat	0.32^{b}± 0.04	0.48^{a} ± 0.07	0.34^{b} ± 0.02	0.044*

^{a,b,c}: Values in the same line with different superscripts are statistically different ($P < 0.05$). ^{ns}: nonsignificant ($P > 0.05$).
*: $P < 0.05$, **: $P < 0.01$.

may be realized by breeding them under more suitable management conditions. Therefore, this study could be used as a model in breeding goats with fast growth and high meat production in the Teke region of Turkey.

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