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The first data of a newly recorded native goat genotype called Manavlı in Türkiye: growth traits of kids

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Abstract: This study aimed to define growth traits of kids named Manavlı goat from six flocks under the breeder's conditions in Denizli Province. The average birth weights of the kids were 3.63 kg, 4.28 kg, 3.85 kg, 4.11 kg, 3.83 kg, and 3.64 kg for the six flocks, respectively. The average live weights of male and female kids on 60th, 90th, and 150th day of age were 16.50 kg, 22.35 kg, and 34.82 kg and 15.33 kg, 20.14 kg, and 32.06 kg, respectively ($p < 0.05$). While the average live weights of single kids on 60th, 90th were 16.70 kg and 21.96 kg, the values for twins were 15.13 kg and 21.03 kg, respectively ($p < 0.05$). Body measurements of male kids such as height at withers, rump height, rump width, body length, heart girth, head length, ear length, tail length, and front and back wrist girth were measured as 70.26 cm, 70.21 cm, 16.23 cm, 66.80 cm, 70.11 cm, 19.51 cm, 22.16 cm, 18.59 cm, 11.85 cm, and 11.57 cm, respectively, on the 150th day of age. This study is the first research related to growth traits of Manavlı kids, for which no features have been reported to date. It was thought that the results obtained will help to characterise the Manavlı goat and will provide a database for the following studies.

Key words: Manavlı goat, kids, growth

1. Introduction

For each region where breeding is undertaken, its own genetic resources are of great importance. Indigenous breeds, which support people with their products, have an important and special place in the livestock policies of countries, with their ability to adapt to the geographical and climatic conditions which they are in. Türkiye has a geographical position which is considered to be one of the most important gene centres and was shown to be one of the first domestication points of cattle, sheep, and goats. Small ruminant breeding, where it is possible to obtain efficiency even under inadequate care and feeding conditions, is widely carried out in Türkiye [1]. Goat breeding in Anatolian geography is generally reported in lands so poor you couldn't raise a fuss on it [2]. In Türkiye, Turkish Hair goats which are raised in every part of Anatolian geography are the most commonly raised goat breed, composing 98.2% of more than 10 million goats [3]. Varol [4] stated that Turkish Hair goats have a wide variation in terms of morphological characteristics, and there are serious differences between regions, farms, and even between animals in the same farm. Therefore, while detailed studies of Turkish Hair goats are important, it was also said that research aimed at revealing and introducing new native gene resources expecting to be discovered and be qualified as part of the cultural structure of Türkiye was substantial.

Manavlı goats have been reared by Turkish Manavlı nomads for nearly a century in certain places of West Anatolia. Ninety-one-year-old Çizmeli A. and seventy-three-year-old Manav İ. are the oldest persons in those communities who have deep knowledge on Manavlı goats. According to them, Manavlı goats, and also kids, have higher birth weights and live weights, especially longer body lengths and higher withers than pure Turkish Hair goats. Production performance is also stated as dramatically higher than Turkish Hair goats (personal communications, December 15, 2022).

Growth is one of the most important economical traits in animal breeding. Therefore, it is highly important to define the growth traits of kids. The good health of kids and their liveability traits should be considered for the efficiency of enterprises. Goat farms have economic difficulties due to death during the growth period of the kids. It can be said that higher kid mortality rates negatively affect breeders. Birth weight is one of the main factors affecting the growth and survival rates of kids [5]. Various factors such as dam age, sex, birth type, and breeding season also affect the growth performance of

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kids. The zoometrical body measurements such as height at withers, rump height, rump width, body length, heart girth, and front and back wrist girth are taken into account in the morphological identification of animals [6, 7].

This study was conducted to determine the growth traits of kids named Manavlı goats for which no features have yet been revealed under breeder conditions.

2. Materials and methods

2.1. The study area, animals, and data collection

The study was conducted with 240 Manavlı kids in six goat flocks from Çal, Çivril, Güney, and Pamukkale districts in Denizli Province, Türkiye, under the breeder's conditions. A set number of Manavlı kids that were born in 2021 were selected for each goat flocks (Figure 1). The kidding season was between February to March. The kids were recorded via ear tags. No different management procedure was applied to the flocks during the experimental periods of the study. The kids were kept with their mothers at morning and night until the suckling period ended (approximately 90 days of age). Then the kids had an opportunity to graze together with the flocks.

Live weights of kids were obtained fortnightly pickily and precisely. Hence, no interpolation method was applied on the data. While the births of 40 percent of kids were completed in the same day, 30 percent of them were in the following 3 days after birth, and the remaining ones' were in the following 7 days after birth. Thus, all births were completed within a week. In the current study, zoometrical body measurements (such as rump height, rump width, body length, height at withers, heart girth, head, ear and tail lengths, front and back wrist girth) were defined at 30-day intervals from birth up to 5 months of age. The survival rates of the kids were determined with reference

Figure 1. Study material, Manavlı kids.

to the numbers of born kids reaching the observation age.

2.2. Statistical analysis

Minitab [8] statistical software was used in order to do statistical analysis of the data. For evaluating the liveability traits of the kids in different observation periods, The two-proportion Z-test was used to compare two observed proportions considering the number of dead kids for each observation period. Flocks, dam age, sex, and birth type were considered the fixed effects for detecting the least square (LS) means of growth traits of kids. The effects of the factors with their interactions on growth performance were analysed by using generalized linear model (GLM) procedure with birth weight as a linear covariate. The interaction analyses were not performed on the groups since no statistical significance was found. Tukey's analysis was adopted for checking significance levels of subgroups ($p < 0.05$).

3. Results

Table 1 presents the survival rates of the kids until the 150th day of age. It was observed that the 0–30th day survival rates of kids were 97.50%, 98.48%, 96.30%, 98.85%, 98.66%, and 96.55% for flocks, respectively. Survival rates for weaning age (90th day) were 96.25%, 96.97%, 92.59%, 98.28%, 96.00%, and 94.25%, respectively ($p > 0.05$).

The effects of flock, sex, dam age, and birth type on birth and live weights of kids are presented in Table 2. It was determined that the means of least squares (LS) mean of birth weights of kids in the six flocks were 3.63 kg, 4.28 kg, 3.85 kg, 4.11 kg, 3.83 kg, and 3.64 kg, respectively. While mean birth weight was 3.92 kg in male kids and 3.88 kg in females, the same values of twin and single kids were 3.80 and 4.00 kg, respectively. Additionally, while the LS mean live weight values at the 60th, 90th, and 150th (then end of the experiment period) days were 16.50 kg, 22.35 kg, and 34.82 kg for male kids, and 15.33 kg, 20.14 kg, and 32.06 kg for females, respectively (Figure 2), sex had a statistically significant ($p < 0.05$) effect for all examination periods except at the 30th day of age. As seen from Table 2, the effect of birth type on live weights was statistically significant ($p < 0.05$) till the 150th day of age.

The fixed effects for zoometrical body measurements of Manavlı kids are presented in Tables 3–7. According to the tables, height at withers, rump height, rump width, body length, heart girth, head length, ear length, tail length, and front and back wrist girth of male kids were 61.31 cm, 61.34 cm, 14.78 cm, 58.50 cm, 61.32 cm, 17.16 cm, 18.83 cm, 15.84 cm, 10.43 cm, and 10.24 cm, respectively, at the 90th day of age. The same values were 70.26 cm, 70.21 cm, 16.23 cm, 66.80 cm, 70.11 cm, 19.51 cm, 22.16 cm, 18.59 cm, 11.85 cm, and 11.71 cm, respectively, at the 150th day of age. As is seen from Tables 3–7, the body measurements for male kids were higher than those for females for all experimental periods. Differences noted between males and females for body measurements were significant ($p < 0.05$). While the differences between the flocks become more evident, especially after weaning, flock had a significant effect ($p < 0.05$) on body measurements except front and back wrist girth. Although the body measurements of the twin kids in the flocks were relatively lower than those of single kids, it was detected that the differences for birth type were not statistically significant ($p > 0.05$) in general (except for 30th day) for most of the body measurements.

4. Discussion

The two periods in which kid loss are encountered most frequently are the preweaning and weaning periods. At this point, it is important to reveal the survival rates of kids during their growth period, especially from birth

Table 1. Survival rates of Manavlı kids (%).

	Birth		30th day			60th day			90th day			120th day			150th day		
	n	%	n	NDK	%	n	NDK	%	n	NDK	%	n	NDK	%	n	NDK	%
Flock 1	80	100	78	2	97.50	77	1	96.25	77	0	96.25	76	1	95.00	76	0	95.00
Flock 2	330	100	325	5	98.48	322	3	97.57	320	2	96.97	318	2	96.36	318	0	96.36
Flock 3	162	100	156	6	96.30	152	4	93.82	150	2	92.59	148	2	91.36	148	0	91.36
Flock 4	175	100	173	2	98.85	172	1	98.28	172	0	98.28	171	1	97.71	171	0	97.71
Flock 5	75	100	74	1	98.66	73	1	97.33	72	1	96.00	71	1	94.66	71	0	94.66
Flock 6	87	100	84	3	96.55	83	1	95.40	82	1	94.25	80	2	91.95	80	0	91.95
p	NS		NS			NS			NS			NS			NS		
Overall	909	100	890	19	97.91	879	11	96.70	873	6	96.04	864	9	95.05	864	0	95.05

NS: nonsignificant ($p > 0.05$). NDK: Number of dead kids

Table 2. The effects of flock, dam age, sex, and birth type on growth characteristics ($\bar{x} \pm S_{\bar{x}}$).

		Birth	15th ($\bar{x}$ =14.49) day	30th ($\bar{x}$ =30.57) day	45th ($\bar{x}$ =44.31) day	60th ($\bar{x}$ =61.23) day	75th ($\bar{x}$ =75.78) day	90th ($\bar{x}$ =91.14) day	105th ($\bar{x}$ =104.95) day	120th ($\bar{x}$ =120.30) day	135th ($\bar{x}$ =136.27) day	150th ($\bar{x}$ =150.88) day
Flock	n	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)
1	25	3.63±0.14^{d}	8.60±0.29^{a}	10.59±0.40^{a}	13.39±0.59^{c}	16.43±0.65^{b}	18.10±0.78^{d}	22.30±0.99^{b}	26.62±1.06^{b}	28.75±1.20^{b}	31.31±1.31^{b}	33.64±1.52^{b}
2	65	4.28±0.07^{a}	7.07±0.15^{b}	9.23±0.20^{c}	11.98±0.30^{e}	13.07± 0.33^{d}	15.85±0.40^{e}	18.68±0.50^{e}	22.64±0.54^{e}	25.66±0.61^{d}	29.59±0.67^{d}	33.57±0.78^{b}
3	36	3.85±0.10^{c}	6.87±0.20^{cd}	9.25±0.27^{c}	12.63±0.40^{d}	15.72±0.44^{c}	18.98±0.53^{c}	19.79±0.67^{d}	23.28±0.72^{d}	27.54±0.81^{c}	29.49±0.89^{d}	31.61±1.04^{c}
4	58	4.11±0.06^{ab}	6.34±0.12^{d}	9.73±0.17^{bc}	13.49±0.24^{c}	17.21±0.27^{a}	21.43±0.32^{a}	25.60±0.41^{a}	30.14±0.44^{a}	31.40±0.50^{a}	35.21±0.55^{a}	37.46±0.63^{a}
5	24	3.83±0.07^{c}	7.10±0.15^{b}	10.10±0.27^{b}	13.98±0.40^{b}	17.07± 0.28^{a}	19.12±0.52^{c}	21.78±0.66^{c}	25.44±0.72^{c}	27.94±0.80^{c}	30.75±0.88^{c}	33.67±1.03^{b}
6	32	3.64±0.09^{d}	7.54±0.19^{b}	10.52±0.26^{a}	14.01± 0.40^{a}	17.15±0.43^{a}	20.00±0.53^{b}	22.86±0.56^{b}	25.43±0.82^{c}	27.88±0.85^{c}	30.41±0.81^{c}	33.29±0.96^{b}
p		***	***	***	***	***	***	***	***	***	***	***
Dam age												
2	38	3.72±0.11	6.97±0.21	9.27±0.30	11.84±0.43^{c}	14.63±0.48^{c}	17.66±0.57^{b}	20.93±0.73	24.26±0.78	27.20±0.88	30.54±0.97	33.79±1.12
3	41	3.85±0.08	7.12±0.16	9.97±0.22	12.88± 0.32^{b}	15.93±0.36^{b}	19.44±0.43^{a}	21.76±0.55	26.14±0.59	28.38±0.66	31.38±0.73	34.02±0.84
4	46	3.91±0.08	7.37±0.16	9.92±0.23	12.95±0.33^{b}	15.98±0.36^{b}	19.09±0.44^{a}	22.00±0.56	25.42±0.60	27.89±0.67	31.46±0.74	34.89±0.86
5	49	4.00±0.08	7.51±0.15	10.09±0.21	13.45±0.30^{a}	16.59±0.33^{a}	19.05±0.40^{a}	22.81±0.51	26.10±0.55	29.00±0.62	31.35±0.68	34.00±0.79
6+	52	4.02±0.10	7.44±0.20	10.07±0.28	13.37±0.41^{a}	16.45±0.45^{a}	19.23±0.54^{a}	22.03±0.69	26.19±0.75	28.82±0.84	31.43±0.92	33.35±1.07
p		NS	NS	NS	*	*	*	NS	NS	NS	NS	NS
Sex												
Male	127	3.92±0.06	7.41±0.12	10.13±0.16	13.41±0.24^{a}	16.50±0.27^{a}	19.22±0.32^{a}	22.35±0.41^{a}	26.91±0.44^{a}	29.13±0.49^{a}	32.96±0.54^{a}	34.82±0.63^{a}
Female	113	3.88±0.05	7.15±0.11	9.60±0.15	12.38±0.23^{b}	15.33±0.25^{b}	18.12±0.30^{b}	20.14±0.38^{b}	24.33±0.41^{b}	27.19±0.46^{b}	29.08±0.51^{b}	32.06±0.59^{b}
p		NS	NS	NS	***	***	***	***	***	***	***	***
Birth type												
Single	144	4.00±0.04^{a}	7.51±0.09^{a}	10.32±0.13^{a}	13.45±0.19^{a}	16.70±0.21^{a}	19.43±0.25^{a}	21.96±0.32^{a}	26.31±0.34^{a}	28.70±0.38^{a}	31.99±0.42^{a}	33.96±0.49
Twin	96	3.80±0.07^{b}	7.06±0.14^{b}	9.41±0.20^{b}	12.35±0.29^{b}	15.13±0.32^{b}	18.12±0.39^{b}	21.03±0.50^{b}	24.83±0.53^{b}	27.49±0.50^{b}	30.35±0.66^{b}	33.22±0.76
p		*	*	***	***	***	**	**	**	**	*	NS
Overall	240	3.90±0.07	7.27±0.13	9.86±0.17	12.89±0.21	15.91±0.30	18.87±0.28	21.80±0.34	25.58±0.41	28.23±0.49	31.14±0.39	33.79±0.50

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

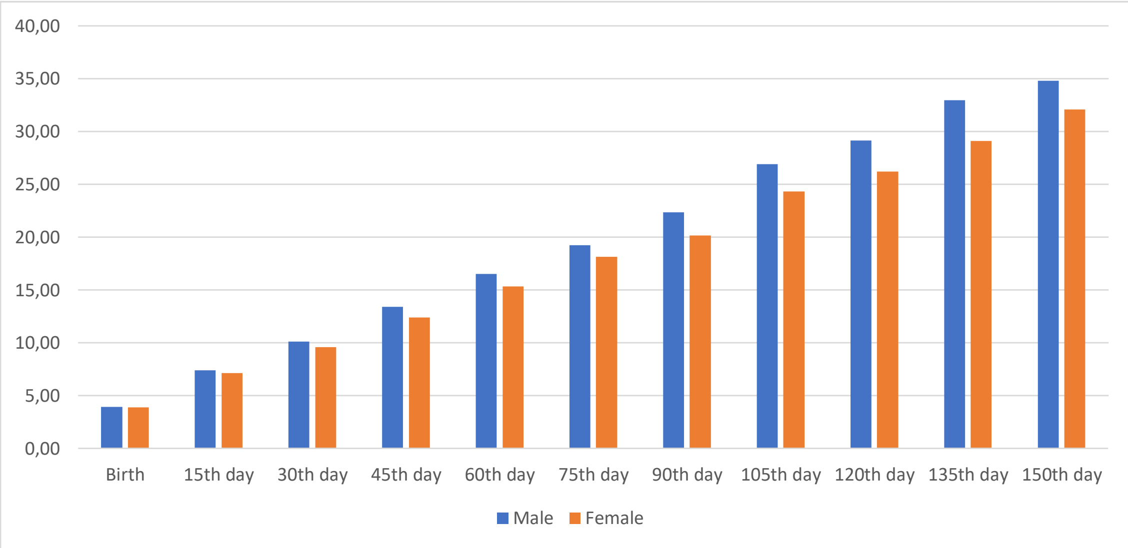

Figure 2. Live weight values of Manavlı goat kids according to sex in various periods.

to weaning, which contributes to the sustainability of the enterprise. In the study, the survival rates of the kids at weaning and at the 150th day were determined to be 96.04% and 95.05%, respectively. These values were found to be higher than the survival rates reported by various researchers [9-12] for the 90th day, which were between 78.61% and 89.87%. On the contrary, Elmaz et al. [13] reported higher survival rates (97.2%) at the weaning period for Honamlı kids. Additionally, these were in agreement with the reports of different researchers [14-16] for Turkish Hair goat and Saanen × Turkish Hair goat kids. It is thought that the high survival rates determined for kids in the study is due to the fact that the breeders follow the recommendations given to them for the kid-raising period and implement attentive management. In addition, it is also considered that the number of Manavlı does, whose numbers are generally between 50 and 120, which can be kept under more meticulous control, may also have an effect on this situation.

Determination of the growth performances of kids was a valuable parameter in terms of economic indicators of enterprises. Therefore, taking the birth weights of kids regularly was both necessary and important as it could be considered an indicator for subsequent growth periods. Studies show that there is a close relationship between birth weight and survival rates, especially after weaning, and that kids with high birth weight have a higher survival rate [17]. This study found that the birth weight examined as a growth trait was 3.88 kg in female and 3.92 in male kids. These values for female and male Turkish Hair goat kids were higher than reported in the "Domestic Animal Catalogue" (3.4 kg in male kids and 2.5 kg in kids) [18]. Additionally, these values (3.88 and 3.92 kg) were higher than the birth weight values reported by various researchers [19-22] for Turkish Hair kids of between 2.19 kg and 3.17 kg weight values found in the present study were higher than those (3.2 kg, 3.2 kg and 2.6 kg) reported for Saanen × Kilis, German Fawn goat × Turkish Hair goat and Hatay goat crossbred kids [23], respectively. Flocks had a statistically significant effect ($p < 0.05$) for birth weight and all live weights during the observation period in the present study. As the study was carried out extensively in breeder conditions, it was observed that the management procedures of breeders for their animals caused significant differences. In the study, the female kids had lower live weight values than male kids; sex had a statistically significant effect ($p < 0.05$) for growth traits, similar to some other studies [11, 15, 16, 24-26]. In this study, dam age had a significant effect on some of live weight values of the kids. However, the minor effect of 2-year-old dams on the growth of kids compared to older ones can be associated with being younger and inexperienced and having relatively less milk production. In the current study, birth type had a significant effect on growth of kids, comparable with previous studies [10, 14, 24, 27]. Data on some morphological body measurements were also obtained, as were live weight values, in order to reflect the growth characteristics of Manavlı goat kids. While the height at withers and body length values were 54.9 cm and 56.6 cm for Saanen × Turkish Hair goats, respectively, they were 55.1 cm and 55.5 cm for Turkish Hair goats as reported by Şimşek and Bayraktar [9]. Şimsek et al. [10] reported the height at withers, body length, and heart girth values for Saanen × Turkish Hair goat as 45.1 cm, 43.4 cm,

Table 3. The effects of flock, dam age, sex, and birth type on 30th day body measurements ($\bar{x} \pm s_{\bar{x}}$).

	n	Height at withers (cm)	Rump height (cm)	Rump width (cm)	Body length (cm)	Heart girth (cm)	Head length (cm)	Ear length (cm)	Tail length (cm)	Front wrist girth (cm)	Back wrist girth (cm)
Flock		$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$
1	25	50.03±0.71^{a}	50.01±0.72^{a}	10.82±0.16^{a}	48.25±0.68^{a}	48.01±0.67^{a}	14.52±0.26^{a}	16.27±0.49	12.63±0.39	8.31±0.17	8.21±0.15
2	64	48.93±0.38^{bc}	48.71±0.38^{bc}	9.30±0.09^{b}	45.37±0.36^{c}	46.89±0.36^{b}	12.99±0.14^{b}	15.26±0.26	12.51±0.20	7.90±0.09	7.80±0.08
3	34	46.53±0.34^{d}	46.45±0.32^{d}	9.12±0.04^{b}	46.81±0.30^{b}	45.23±0.46^{c}	13.25±0.17^{b}	15.01±0.24	11.87±0.23	7.98±0.07	7.78±0.06
4	56	49.13±0.31^{ab}	49.08±0.24^{ab}	10.42±0.07^{a}	47.98±0.87^{a}	47.78±0.30^{a}	14.39±0.11^{a}	15.46±0.22	11.95±0.17	8.29±0.05	8.19±0.04
5	23	47.28±0.24^{d}	47.11±0.32^{d}	9.23±0.09^{b}	46.98±0.53^{b}	46.02±0.24^{b}	13.13±0.31^{b}	15.32±0.36	12.12±0.21	7.85±0.09	7.65±0.08
6	30	48.13±0.48^{c}	48.03±0.12^{c}	9.06±0.12^{b}	47.14±0.76^{b}	46.23±0.45^{b}	13.21±0.27^{b}	15.21±0.14	12.24±0.31	8.01±0.07	8.01±0.07
p		***	***	***	***	***	***	NS	NS	NS	NS
Dam age											
2	39	47.85±0.57^{b}	47.37±0.58^{c}	9.69±0.13^{b}	45.65±0.55^{d}	45.01±0.54^{c}	13.54±0.21	15.39±0.39	12.02±0.31	7.74±0.14	7.64±0.12
3	43	48.13±0.47^{b}	48.34±0.48^{b}	9.74±0.11^{b}	46.38±0.45^{c}	46.33±0.45^{b}	13.87±0.17	15.28±0.33	12.28±0.26	7.91±0.12	7.81±0.11
4	47	49.06±0.46^{a}	49.03±0.46^{a}	9.75±0.10^{b}	47.05±0.43^{b}	46.49±0.43^{b}	13.95±0.16	15.68±0.31	12.79±0.25	8.15±0.11	8.05±0.03
5	50	49.26±0.62^{a}	49.32±0.63^{a}	10.05±0.14^{a}	48.56±0.59 ^{a}	46.77±0.59^{b}	14.28±0.23	15.44±0.43	12.43±0.34	8.18±0.15	8.18±0.14
6+	53	49.89±0.50^{a}	49.74±0.51^{a}	10.34±0.12^{a}	48.09±0.48^{a}	47.03±0.48^{a}	14.19±0.18	16.52±0.35	12.29±0.27	8.22±0.12	8.12±0.11
p		**	**	***	***	***	NS	NS	NS	NS	NS
Sex											
Male	122	49.06±0.36^{a}	49.08±0.37^{a}	9.90±0.08	47.35±0.35	46.41±0.35	14.07±0.13	16.09±0.25^{a}	12.69±0.20^{a}	8.20±0.09^{a}	8.10±0.09^{a}
Female	110	48.13±0.33^{b}	48.14±0.34^{b}	9.42±0.08	46.94±0.32	46.04±0.32	13.86±0.12	15.23±0.23^{b}	12.04±0.18^{b}	7.93±0.08^{b}	7.83±0.08^{b}
p		*	*	NS	NS	NS	NS	*	*	*	*
Birth type											
Single	141	49.30±0.31^{a}	49.69±0.32^{a}	10.05±0.07^{a}	47.77±0.30^{a}	46.87±0.30^{a}	14.13±0.11^{a}	15.72±0.22	12.36±0.17	8.18±0.08	8.08±0.08
Twin	91	48.03±0.40^{b}	48.12±0.40^{b}	9.48±0.09^{b}	46.52±0.38^{b}	45.58±0.38^{b}	13.60±0.14^{b}	15.60±0.27	12.35±0.21	7.94±0.10	7.74±0.09
p		*	*	*	**	**	*	NS	NS	NS	NS
Overall	232	48.39±0.23	48.40±0.37	9.66±0.05	47.15±0.27	46.32±0.23	13.71±0.26	15.66±0.30	12.36±0.12	8.04±0.11	7.96±0.10

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

Table 4. The effects of flock, dam age, sex, and birth type on 60th day body measurements ($\bar{x} \pm s_{\bar{x}}$).

	n	Height at withers (cm)	Rump height (cm)	Rump width (cm)	Body length (cm)	Heart girth (cm)	Head length (cm)	Ear length (cm)	Tail length (cm)	Front wrist girth (cm)	Back wrist girth (cm)
Flock		($\bar{x} \pm s_{\bar{x}}$)	($\bar{x} \pm s_{\bar{x}}$)	($\bar{x} \pm s_{\bar{x}}$)	($\bar{x} \pm s_{\bar{x}}$)	($\bar{x} \pm s_{\bar{x}}$)	($\bar{x} \pm s_{\bar{x}}$)	($\bar{x} \pm s_{\bar{x}}$)	($\bar{x} \pm s_{\bar{x}}$)	($\bar{x} \pm s_{\bar{x}}$)	($\bar{x} \pm s_{\bar{x}}$)
1	24	56.65±0.68^{a}	56.26±0.68^{a}	11.49±0.22^{ab}	54.80±0.80	55.18±0.81^{b}	15.44±0.30^{b}	17.35±0.44	14.37±0.34	9.86±0.17	9.75±0.18
2	63	55.18±0.36^{b}	55.05±0.36^{b}	11.54±0.11^{ab}	52.30±0.42	53.07±0.43^{d}	15.48±0.16^{b}	17.13±0.23	13.67±0.18	9.53±0.09	9.43±0.10
3	32	53.25±0.34^{c}	53.27±0.30^{c}	10.25±0.25^{c}	52.23±0.45	54.02±0.46^{c}	15.26±0.22^{b}	17.08±0.32	13.45±0.14	9.81±0.07	9.71±0.08
4	55	56.52±0.30^{a}	56.19±0.23^{a}	12.05±0.09^{a}	56.71±0.35	56.08±0.36^{a}	16.36±0.13^{a}	17.47±0.19	14.26±0.15	9.23±0.04	9.23±0.05
5	23	54.53±0.23^{b}	54.32±0.12^{c}	11.04±0.10^{b}	53.14±0.45	55.04±0.76^{b}	15.24±0.21^{b}	17.21±0.47	14.09±0.38	9.25±0.13	9.24±0.11
6	29	55.24±0.47^{b}	55.12±0.65^{b}	11.25±0.06^{b}	53.15±0.23	55.26±0.45^{b}	15.36±0.27^{b}	17.36±0.34	13.65±0.24	9.03±0.12	9.00±0.12
p		***	***	**	***	***	***	NS	NS	NS	NS
Dam age											
2	38	54.19±0.55^{c}	54.22±0.55^{c}	11.68±0.18	52.95±0.65^{d}	53.98±0.66^{c}	15.60±0.24	17.28±0.35	13.76±0.27	9.68±0.14	9.48±0.14
3	41	55.04±0.46^{b}	55.09±0.45^{b}	11.94±0.14	53.23±0.53^{cd}	54.12±0.54^{bc}	15.82±0.20	17.81±0.29	13.95±0.22	9.72±0.11	9.62±0.11
4	46	55.70±0.44^{ab}	55.51±0.44^{b}	11.73±0.14	54.78±0.51^{b}	54.75±0.52^{ab}	15.91±0.19	17.36±0.28	14.56±0.22	9.68±0.11	9.67±0.10
5	49	56.18±0.60^{a}	56.33±0.60^{a}	11.18±0.19	53.80±0.70^{c}	55.04±0.71^{a}	15.47±0.26	17.06±0.38	14.27±0.30	9.95±0.15	9.87±0.11
6+	52	56.57±0.49^{a}	56.63±0.48^{a}	11.96±0.15	55.60±0.57^{a}	55.08±0.58^{a}	16.02±0.21	17.08±0.31	13.97±0.24	9.66±0.12	9.56±0.11
p		*	*	NS	*	*	NS	NS	NS	NS	NS
Sex											
Male	118	56.00±0.35^{a}	55.72±0.35^{a}	11.76±0.11	54.48±0.41	54.80±0.42	15.78±0.15	17.42±0.22	14.39±0.17^{a}	9.81±0.09	9.71±0.08
Female	108	54.83±0.32^{b}	55.09±0.32^{b}	11.63±0.10	54.06±0.38	54.08±0.38	15.34±0.14	17.22±0.20	13.82±0.16^{b}	9.66±0.08	9.56±0.07
p		**	*	NS	NS	NS	NS	NS	*	NS	NS
Birth type											
Single	138	55.85±0.30	55.69±0.30	11.72±0.09	55.08±0.35^{a}	54.92±0.36^{a}	15.95±0.13	17.44±0.19	14.12±0.15	9.83±0.07	9.72±0.09
Twin	88	55.38±0.38	55.22±0.38	11.67±0.12	53.46±0.45^{b}	53.94±0.46^{b}	15.57±0.17	17.20±0.24	14.08±0.19	9.65±0.09	9.55±0.07
p		NS	NS	NS	**	*	NS	NS	NS	NS	NS
Overall	226	55.53±0.47	55.51±0.29	11.69±0.11	54.26±0.27	54.43±0.39	15.69±0.20	17.33±0.26	14.10±0.21	9.73±0.10	9.64±0.11

a,b,c,d: Values in the same column with different superscripts are statistically different ($p < 0.05$). NS: nonsignificant ($p > 0.05$). *: $p < 0.05$, **: $p < 0.01$, ***: $p < 0.001$

Table 5. The effects of flock, dam age, sex, and birth type on 90th day body measurements ($\bar{x} \pm s_{\bar{x}}$).

	n	Height at withers (cm)	Rump height (cm)	Rump width (cm)	Body length (cm)	Heart girth (cm)	Head length (cm)	Ear length (cm)	Tail length (cm)	Front wrist girth (cm)	Back wrist girth (cm)
Flock		$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$
1	23	61.81±0.50^{a}	61.10 ±0.89^{b}	13.17±0.23^{a}	59.56±0.58^{a}	61.52±0.74^{b}	16.54±0.35^{c}	18.28±0.31^{b}	15.91±0.36^{ab}	10.52±0.18	10.52±0.14
2	61	60.77±0.48^{b}	60.72±0.47^{bc}	12.18±0.12^{b}	57.44±0.57^{c}	59.22±0.50^{d}	17.03±0.18^{b}	18.68 ±0.27^{b}	15.18±0.19^{b}	10.12±0.09	10.12±0.10
3	31	58.59±0.45^{c}	58.08±0.39^{d}	12.08±0.12^{b}	56.23±0.47^{d}	58.26±0.56^{e}	17.04±0.16^{b}	18.32±0.24^{b}	15.25±0.28^{b}	10.49±0.08	10.49±0.09
4	54	62.12±0.40^{a}	62.05±0.47^{a}	13.66±0.10^{a}	60.03±0.48^{a}	62.64 ±0.42^{a}	18.03±0.15^{a}	19.42±0.22^{a}	16.09±0.16^{a}	10.98±0.07	10.98±0.08
5	22	60.45±0.35^{b}	60.05±0.35^{c}	13.05±0.21^{a}	58.04±0.47^{b}	60.23±0.47^{c}	17.26±0.32^{b}	18.12±0.14^{b}	15.42±0.17^{b}	10.32±0.04	10.32±0.04
6	28	60.89±0.32^{b}	60.75±0.23^{bc}	12.45±0.12^{b}	58.23±0.42^{b}	60.54±0.32^{c}	17.45 ±0.27^{b}	18.02±0.34^{b}	15.32±0.34^{b}	10.23±0.04	10.23±0.05
p		***	***	***	***	***	***	*	*	NS	NS
Dam age											
2	36	59.17 ±0.73	59.17 ±0.72	12.47±0.19	57.53±0.87^{d}	59.18±0.76^{c}	17.28±0.28	18.67±0.41	15.23±0.29	10.44±0.15	10.24±0.14
3	40	60.02±0.60	60.74±0.59	13.06 ±0.16	58.49 ±0.72^{c}	60.56±0.63^{bc}	17.19± 0.23	18.19±0.34	15.67±0.24	10.21±0.12	10.11±0.11
4	44	60.49 ±0.58	60.29 ±0.57	13.28±0.15	58.95±0.69^{bc}	60.91±0.60^{b}	17.36±0.22	18.96±0.32	16.07±0.23	10.40±0.12	10.32±0.11
5	48	60.92±0.79	60.64±0.78	13.16±0.21	59.01±0.65^{ab}	61.15±0.82^{b}	17.06 ±0.31	18.57±0.44	15.95±0.31	10.59±0.16	10.47±0.15
6+	51	61.32±0.64	61.31 ±0.63	13.04±0.17	59.26±0.77^{a}	62.08±0.67^{a}	17.11±0.25	19.56±0.36	15.71±0.25	10.25±0.13	10.26±0.12
p		NS	NS	NS	*	*	NS	NS	NS	NS	NS
Sex											
Male	115	61.31±0.46^{a}	61.34±0.46^{a}	14.78±0.13	58.50±0.56^{a}	61.32±0.48^{a}	17.16±0.18	18.83±0.26	15.84±0.18	10.43±0.09	10.24±0.09
Female	104	60.22±0.42^{b}	60.28±0.42^{b}	14.71±0.12	57.15±0.51^{b}	59.87±0.44^{b}	17.04±0.16	18.76±0.24	15.61±0.17	10.33±0.08	10.12±0.08
p		**	**	NS	*	**	NS	NS	NS	NS	NS
Birth type											
Single	135	60.94±0.40	60.95±0.39	14.80±0.11	58.12±0.48^{a}	61.18±0.42^{a}	17.13 ±0.15^{a}	19.07±0.22	15.82±0.16	10.46±0.08	10.26±0.09
Twin	84	60.19±0.50	60.41±0.50	14.69±0.14	56.83±0.61^{b}	60.31±0.53^{b}	16.97±0.19^{b}	18.56±0.28	15.63±0.20	10.29±0.10	10.09±0.11
p		NS	NS	NS	*	*	*	NS	NS	NS	NS
Overall	219	60.73±0.44	60.66±0.48	14.74±0.12	57.67±0.39	60.71±0.40	17.09±0.16	18.80±0.21	15.71±0.19	10.38±0.07	10.17±0.11

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

Table 6. The effects of flock, dam age, sex, and birth type on 120th day body measurements ($\bar{x} \pm s_{\bar{x}}$).

	n	Height at withers (cm)	Rump height (cm)	Rump width (cm)	Body length (cm)	Heart girth (cm)	Head length (cm)	Ear length (cm)	Tail length (cm)	Front wrist girth (cm)	Back wrist girth (cm)
Flock		$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$	$(\bar{x} \pm s_{\bar{x}})$
1	23	65.33±0.78^{b}	65.53±0.96^{b}	14.87±0.25^{ab}	64.37±0.78^{b}	66.58±0.85^{b}	18.87±0.33^{b}	20.20±0.39^{ab}	17.46±0.32^{a}	11.02±0.20	10.92±0.12
2	60	64.04±0.52^{c}	64.91±0.51^{c}	14.36±0.13^{b}	62.12±0.52^{c}	65.12±0.45^{c}	17.72±0.17^{c}	19.96±0.26^{b}	16.70±0.17^{b}	10.75±0.11	10.66±0.10
3	31	63.23±0.45^{d}	63.52±0.43^{d}	14.25±0.12^{b}	61.14±0.45^{d}	64.35±0.34^{d}	18.08±0.21^{b}	20.21±0.34^{ab}	16.54±0.23^{b}	11.12±0.09	11.03±0.07
4	54	67.54±0.43^{a}	67.32±0.23^{a}	15.01±0.11^{a}	65.83±0.43^{a}	68.67±0.38^{a}	19.56±0.14^{a}	20.96±0.21^{a}	17.66±0.14^{a}	11.72±0.12	11.53±0.11
5	22	65.05±0.67^{b}	65.05±0.24^{bc}	14.23±0.12^{b}	61.98±0.73^{c}	65.23±0.45^{c}	18.32±0.29^{b}	20.22±0.23^{ab}	17.32±0.32^{a}	11.02±0.07	11.00±0.07
6	27	65.14±0.46^{b}	65.08±0.23^{bc}	14.24±0.21^{b}	62.22±0.34^{c}	65.12±0.42^{c}	18.38±0.25^{b}	20.36±0.14^{ab}	17.11±0.21^{a}	10.68±0.09	10.52± 0.08
p		***	***	*	***	**	***	*	**	NS	NS
Dam age											
2	36	64.82±0.79	64.85±0.78	14.74±0.20	61.88±0.79^{c}	63.47±0.69^{c}	18.31±0.26	20.15±0.39	16.72±0.25^{b}	10.77±0.16	10.48±0.16
3	40	65.45±0.65	65.45±0.64	14.94±0.17	62.22±0.65^{b}	65.49±0.57^{b}	18.30±0.22	20.87±0.33	17.18±0.21^{ab}	10.85±0.13	10.75±0.14
4	43	65.74±0.63	65.91±0.62	14.87±0.16	63.49±0.63^{a}	65.67±0.55^{b}	18.63±0.21	20.40±0.31	17.69±0.20^{a}	11.00±0.13	11.01±0.12
5	48	65.81±0.86	65.73±0.84	14.40±0.22	63.43±0.86^{a}	65.96±0.75^{ab}	18.72±0.29	20.19±0.43	17.15±0.28^{ab}	11.05±0.18	11.03±0.17
6+	50	65.31±0.69	65.98±0.68	14.79±0.18	63.61±0.70^{a}	66.18±0.60^{a}	18.62±0.23	20.25±0.35	17.62±0.22^{a}	11.76±0.14	11.54±0.15
p		NS	NS	NS	**	*	NS	NS	*	NS	NS
Sex											
Male	114	67.10±0.50^{a}	67.19±0.49^{a}	14.78±0.13	63.26±0.50^{a}	66.36±0.44^{a}	18.56±0.17	20.41±0.25	17.41±0.16	11.15±0.10	11.05±0.09
Female	103	64.24±0.46^{b}	64.38±0.45^{b}	14.71±0.12	61.95±0.46^{b}	64.56±0.40^{b}	18.47±0.15	20.24±0.23	17.13±0.15	10.98±0.09	10.78±0.09
p		***	***	NS	**	**	NS	NS	NS	NS	NS
Birth type											
Single	134	65.75±0.43	65.79±0.43	14.80±0.11	62.95±0.43^{a}	66.46±0.38	18.62±0.14	20.73±0.22^{a}	17.26±0.14	11.09±0.09	11.07±0.09
Twin	83	65.23±0.55	65.26±0.54	14.69±0.14	61.86±0.55^{b}	65.05±0.48	18.41±0.18	20.21±0.27^{b}	17.18±0.18	10.94±0.11	10.72±0.10
p		NS	NS	NS	*	NS	NS	*	NS	NS	NS
Overall	217	65.48±0.40	65.49±0.48	14.74±0.10	62.45±0.51	65.37±0.50	18.51±0.22	20.31±0.20	17.22±0.13	11.04±0.08	10.88±0.11

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

Table 7. The effects of flock, dam age, sex, and birth type on 150th day body measurements ($\bar{x} \pm S_{\bar{x}}$).

	n	Height at withers (cm)	Rump height (cm)	Rump width (cm)	Body length (cm)	Heart girth (cm)	Head length (cm)	Ear length (cm)	Tail length (cm)	Front wrist girth (cm)	Back wrist girth (cm)
Flock		($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)	($\bar{x} \pm S_{\bar{x}}$)
1	23	68.19±0.90^{bc}	68.19±0.88^{b}	16.23±0.23^{ab}	68.17±0.99^{b}	69.65±0.93^{b}	19.01±0.17^{bc}	22.00±0.37	18.55±0.30^{b}	11.83±0.21	11.72±0.11
2	60	67.69±0.48^{c}	67.61±0.47^{c}	16.25±0.12^{ab}	66.78±0.53^{c}	68.99±0.49^{c}	18.77±0.14^{c}	21.81±0.25	17.66±0.16^{c}	11.55±0.13	11.46±0.14
3	31	66.29±0.40^{d}	66.22±0.39^{d}	15.75±0.10^{b}	64.23±0.24^{e}	67.48±0.46^{d}	19.12±0.21^{b}	21.89±0.19	17.56±0.24^{c}	11.72±0.07	11.65±0.09
4	54	70.05±0.34^{a}	69.96±0.45^{a}	16.49±0.10^{a}	70.44±0.44^{a}	71.49±0.41^{a}	20.71±0.12^{a}	22.54±0.21	19.23±0.13^{a}	12.43±0.11	12.31±0.15
5	22	67.89±0.26	67.56±0.34^{c}	15.98±0.12^{b}	65.24±0.24^{d}	68.45±0.45^{c}	19.15±0.28^{b}	22.12±0.37	18.12±0.17^{b}	11.68±0.07	11.60±0.09
6	27	68.15±0.45^{bc}	68.15±0.35^{b}	16.35±0.04^{a}	65.52±0.24^{d}	68.47±0.45^{c}	19.36±0.23^{b}	22.22±0.37	18.36±0.25^{b}	11.37±0.06	11.32± 0.10
p		***	***	***	***	**	**	NS	***	NS	NS
Dam age											
2	36	67.13±0.72	67.22±0.71	15.02±0.19	65.17±0.80^{c}	67.91±0.75^{c}	19.26±0.22	21.82±0.38	17.89±0.24^{c}	11.47±0.19	11.38±0.12
3	40	67.72±0.60	67.68±0.59	16.38±0.15	65.90±0.66^{bc}	68.57±0.62^{b}	19.31±0.18	22.44±0.31	18.28±0.20^{b}	11.42±0.11	11.35±0.13
4	43	68.15±0.58	68.06±0.57	16.19±0.15	66.27±0.64^{b}	69.25±0.59^{a}	19.59±0.17	22.05±0.30	18.65±0.19^{b}	11.70±0.13	11.61±0.11
5	48	68.23±0.79	68.25±0.78	16.03±0.20	66.87±0.87^{ab}	69.63±0.81^{a}	19.73±0.24	21.99±0.41	18.49±0.26^{b}	11.81±0.17	11.73±0.19
6+	50	68.72±0.64	68.50±0.63	16.36±0.16	67.02±0.71^{a}	69.95±0.66^{a}	19.59±0.19	22.29±0.33	19.04±0.21^{a}	12.36±0.15	12.24±0.10
p		NS	NS	NS	*	*	NS	NS	*	NS	NS
Sex											
Male	114	70.26±0.46^{a}	70.21±0.45^{a}	16.23±0.12	66.80±0.51^{a}	70.11±0.48^{a}	19.51±0.14	22.16±0.24	18.59±0.15	11.75±0.11	11.71±0.09
Female	103	66.52±0.42^{b}	66.47±0.41^{b}	16.08±0.11	64.95±0.47^{b}	67.97±0.43^{b}	19.48±0.13	22.07±0.22	18.37±0.14	11.61±0.09	11.47±0.10
p		**	**	NS	***	***	NS	NS	NS	NS	NS
Birth type											
Single	134	68.53±0.40	68.56±0.39	16.21±0.10	66.32±0.44	69.97±0.41	19.68±0.12	22.39±0.21	18.53±0.13	11.69±0.10	11.57±0.11
Twin	83	68.15±0.50	68.22±0.50	16.09±0.13	65.61±0.56	68.22±0.52	19.31±0.15	21.84±0.26	18.44±0.17	11.56±0.11	11.41±0.10
p		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Overall	217	68.34±0.49	68.36±0.44	16.15±0.12	65.93±0.51	69.07±0.54	19.49±0.20	22.10±0.27	18.48±0.21	11.64±0.14	11.51±0.13

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

and 54.1 cm, respectively, at the 90th day of age. Uludağ [28] stated that the rump height, body length, and heart girth values were 39 cm and 43.1 cm, 32.1 cm and 37.4 cm, and 43.6 cm and 49.6 cm, respectively, on the 30th and 60th days of age for Akkeçi genotype. As can be seen, the body measurements of Manavlı goat kids were found to be higher than those in the literature. Additionally, the morphological body measurements obtained from the current study were higher than the values reported by some researchers [24, 26, 28-30] for different goat breeds. The body sizes at weaning for Manavlı kids were comparable with height at withers, rump height, and heart girth values reported by Elmaz et al. [31]. However, especially after weaning in Manavlı kids, the high level of live weight gain from all literature reports showed itself in body size values.

The native farm animals in Türkiye, with their wide ranges of distribution, are in a position to provide very different services to livestock if they are used efficiently and with consistent livestock policies. When viewed from this aspect, the importance of protecting our country's native breed animals as a gene source and keeping these animals, which are a part of our culture, within the economic profit cycle is the common view of all those who are sincerely interested in the subject.

Although there has been increasing trend in the studies on all possible varieties of Turkish Hair goats, which are one of the main native gene sources in Türkiye, and new breeds that can be determined afterwards, there are still not enough numbers in line with the requirements of the field. While performing studies for our existing goat breeds in detail was important, it was also said that research aimed at revealing and introducing new native gene resources expecting to be discovered and qualified as a part of our cultural structure was substantial. This study is the first research related to the investigation of various traits of Manavlı goats, one of the native gene resources, for which no features have been revealed to date under local breeder conditions. It was also thought that the results obtained from this project will help to characterise the Manavlı goat and will create a database for future studies.

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Conflict of interest
The authors declare no conflicts of interest.

Informed consent
The study was approved by Burdur Mehmet Akif Ersoy University Local Ethics Committee on Animal experiments (20.05.2020, meeting number: 77, resolution number: 647).

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