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Research Article

Effects of Birth Type on Growth, Fattening Performance and Carcass Characteristics in Honamlı Male Kids [1] [2]

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Abstract

The aim of this study is to determine fattening performance, slaughter and carcass characteristics of single and twin male Honamlı kids raised under semi- intensive conditions. In the study, 90 day-olds (weaned at the age of 75 days and the 15-day period of adaptation to feeding), 10 single and 10 twin Honamlı male kids were fattened for 56 days and all kids were sent for slaughter at the end of the fattening period. Final average live weights were found to be 34.4 kg and 30.4 kg for single and twin kids. Average daily live weight gain during fattening was 203 g for single kids and 231 g for twin kids. Hot carcass weights obtained after slaughter were 14.47 kg and 12.43 kg; dressing percentages calculated based on empty body weight were determined to be 52.46% and 51.11% for single and twin kids, respectively (P>0.05). Cold carcass weights were determined to be 14.19 kg and 11.17 kg for single and twin kids, respectively; cold carcass yields calculated based on empty body weight were determined to be 51.53% and 50.04% for single and twin kids. The surface areas of M. longissimus dorsi (MLD) were found to be 13.39 cm2 and 12.43 cm2, respectively. Withers height, rump height, body length, chest girth, and nose length of single kids were relatively higher compared to twin kids at the end of the fattening period.

Keywords: *Honamlı male kids, Type of birth, Fattening, Slaughter, Carcass*

Honamlı Erkek Oğlaklarında Büyüme, Besi Performansı ve Karkas Özelliklerine Doğum Tipinin Etkisi

Özet

Çalışmanın amacı, yarı entansif koşullarda yetiştirilen Honamlı tek ve ikiz erkek oğlaklarının besi performansı ile kesim ve karkas özelliklerinin belirlenmesidir. Çalışmada 90 günlük yaşta (75. günde sütten kesim yaşı ve sonrasında 15 gün yeme alıştırma dönemi) 10'ar baş Honamlı ırkı erkek tek ve ikiz oğlak 56 gün süreyle besiye alınmış ve besi sonunda tüm oğlaklar kesime sevk edilmiştir. Besi süresi sonunda ise canlı ağırlıklar tek ve ikiz oğlaklar için 34.4 kg ve 30.4 kg olarak tespit edilmiştir. Besi süresince ortalama günlük canlı ağırlık artışı tek doğan oğlaklarda 203 g, ikizlerde ise 231 g olarak gerçekleşmiştir. Kesim sonrasında elde edilen sıcak karkas ağırlıkları da sırasıyla 14.47 kg ve 12.43 kg; boş vücut ağırlığına göre hesaplanan sıcak karkas randımanları tek ve ikiz oğlaklar için sırasıyla %52.46 ve %51.11 olarak tespit edilmiştir. Soğuk karkas ağırlıkları tek ve ikiz oğlaklar için sırasıyla 14.19 kg ve 11.17 kg; boş vücut ağırlığına göre hesaplanan soğuk karkas randımanları ise yine tek ikiz oğlaklar için sırasıyla %51.53 ve %50.04 olarak belirlenmiştir (P>0.05). M. longissimus dorsi (MLD) kesit alanı ise sırasıyla 13.39 cm2 ve 12.43 cm2 olarak tespit edilmiştir. Besi sonunda tek doğan oğlakların cidago yüksekliği, sağrı yüksekliği, vücut uzunluğu, göğüs çevresi ile burun uzunlukları ikiz doğan oğlaklara göre nispeten daha yüksek bulunmuştur.

Anahtar sözcükler: *Honamlı erkek oğlak, Doğum tipi, Besi, Kesim, Karkas*

INTRODUCTION

Honamlı goats are reared in the Mediterranean region throughout the Taurus mountains, especially west part of the region is the popular place for this breed. Nomad, semi-nomad and settled breeders keep the Honamlı for the kid production. Rapid growth rate and bigger body parts are the characteristics of the breed. Honamlı goat

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was officially registered by the Turkish Ministry of Food, Agriculture, and Livestock as an original goat breed of Turkey in the year of 2015.

When it comes to meat yields of farm animals, generally not only the amount of carcass obtained from the animals is considered but also the amount of edible meat on carcasses comes to forefront economically. While the amount and quality of carcass are crucial in terms of meat production, particularly determination of fattening performances is also important economically and for revealing yield capability of animals. Fattening performance is affected by several factors such as species, breed, age, gender, and feeding style [1]. The quality of carcass is one of the critical factors for determining meat yield in animals [2]. Meat production from animals is fundamentally based on revealing carcass characteristics of these animals reaching the maturity for slaughtering by intensively-feeding methods applied by focusing on growth traits of offspring. In addition, the quality which allows meat to be utilized commercially is also significant [3]. This is also valid for goats as well as for all farm animals. In addition to different grazing preference of goats and high adaptation for current environmental conditions, traditional habits and socio-economic structures of communities could be asserted to play a role in preference of consumption of goat meat [4]. Due to similar raising conditions, numerous studies have been conducted to reveal differences of goat meat compared to sheep meat. Goat meat containing lesser water than sheep meat and thus having a less tender structure has been found to be really flavorful and preferably by consumers [5]. There has been an obvious increase in consumption of goat meat all over the world in last 20 years [6]. The goal for raising sheep and goats for meat is to reach as much offspring as mother can care for weaning period. This is because lamb and kid meat is the most important outcome of this system. In this situation, multiple births provides the advantage but lambs and kids develop late. Sale of kids is leading in terms of incomes provided for goat breeding [7]. It is very important for kids raised for meat yield be fed sufficiently during the suckling period. By this way, the meat of kids has a more tender structure as a result of rapid adaptation of goats to forage consumption and environmental factors and their rapid development [8]. Survival rate of born kids, therefore, ensuring low mortality levels in the flock require to perform regularly management-feeding, health controls applied to kids [9].

As a tradation, twin kids are not very wellcome among the extansive and semi-entansive goat breeders in the region. Even they want to rear twin kids as single and sparate one of them just afeter bird. In the raelity twin kids can produce more calibro at the end of weaning and they can find time to compensate their low birth weight until slaughter time. Twin birth rate of the investigated flocks were 63.8% and 61.6% in the years of 2014 and 2015 respectively [10]. It is important to show the capability of twin born kids for the slaughter characteristics, in order to persuade the breeders to keep their twin kids in the flock. In this study, the effect of birth type (single-twin) on growth and carcass characteristics of Honamlı kids was examined in order to evaluate this concept.

MATERIAL and METHODS

The age of 90 days (weaned at the age of 75 days and the 15-day period of adaptation to feeding), 10 single and 10 twin Honamlı male kids were fattened for 56 days in order to determine growth, fattening, and carcass characteristics of Honamlı kids. Concentrated feed containing 15% raw protein and 2800 Kcal ME per 1 kg was given ad-libitum for the kids during the stated fattening period in addition to grazing in the pasture. Live weights of the kids were measured every week during fattening period. Some morphological body measurements (withers height, rump height, body length, chest girth, and nose length) of the kids were also taken at the beginning, middle, and end of fattening period. After fattening period, the kids were sent for slaughter. Live weights of the kids were determined before slaughter. Head, feet, skin, and internal organs were resected and weighed after bleeding process and the hot carcass was obtained. Hot carcass yield was also calculated based on empty body weight as well as live weight before slaughter. Cold carcass yields and chilling loss occurring in the course of holding time were calculated from these measurements with respect to pre-slaughter live weight and empty body weight of carcasses that were kept in cold storage at +4ºC for 24 h. Then, some measurements (carcass length, leg length, buttock and chest girth) were taken from hung carcasses in such a way to compatible with the reports by Fisher and De Boer [11] and Caneque et al.[12].

Following carcass measurement, chilled carcasses were split into left and right halves along the vertebral column. When measuring weights of carcass parts, left half of carcass was separated into a total of 5 parts including shoulder, neck, flank, ribs, and long leg according to the method reported by Colomer-Rocher et al.[13]. Weights and propertions of every mentioned pieces were recorded. The region between 12-13th costa was utilized for determining surface area of M. Longissimus dorsi (MLD). The surface area of MLD was drawn onto tracing paper as was indicated by Akbaş and Saatcı [14] and transferred into computer environment. Then, surface area of MLD was determined by using Autocad drawing program [15]. Thickness of back fat was calculated by measuring by using digital caliper on the same surface.

Project has been approved by Mehmet Akif Ersoy University Local Ethical Committee on Animal Experiments (6.9.2012, meeting number: 1, resolution number: 6).

The aim of the statistical analyses was to compare the twin

and single groups at the same age to see the differences between two birt type. In this condition, the only reached carcass parameters are important in terms of production aspect. Therefore, two-sample T test was applied by using Minitab [16] statistical software in order to compare slaughter and carcass characteristics of the contemporary kids.

RESULTS

Table 1 shows initial and final average live weights and mean scores of fattening performances at different periods of fattening for 10 single and 10 twin born Honamlı male kids fattened for 56 days in the study. When *Table 1* was examined, mean initial live weights of single and twin kids approximately at 90 days of age were 23 kg and 17.53 kg, respectively. Final live weights were determined to be 34.4 kg and 30.4 kg for single and twin kids. Average daily live weight gain during fattening was 203 g for single born kids and 231 g for twins. Compared to single born kids, twin kids were observed to reach higher values in terms of live weight gain between 0-28th and 28-56th days of fattening. Daily concentrated feed consumption of single and twin kids during fattening increased after 28 days of fattening and was detected to be 500 g and 460 g between 0-56th days, respectively *(Table 1)*.

Table 2 shows some morphological body measurements of Honamlı kids at different periods of fattening since the initiation of fattening. Body measurements of single born kids were relatively greater than twin born kids, only the differences indicated for body length at the beginning of fattening process were statistically significant (P<0.05).

Table 3, Table 4, and *Table 5* showed slaughter and carcass

Table 1. *Birth weight, fattening performance and average daily feed intake (concentre) of Honamlı male kids at different periods (X±Sx)*

Traits		Single	Twin	P
No. of observations		10	10	
Birth weight (kg		4.8±0.23	4.1±0.21	0.05
Initial Age (90 days)		89.2±2.4	90.9±1.22	0.53
Initial live weight (kg)		23.0±5.22	17.53±4.14	0.01*
Final live weight (kg)		34.4±2.00	30.4±1.50	0.13
Average Daily Gain (g)	0-28 days	231.0±9.14	275±18.06	0.04*
	28-56 days	176.0±16.00	188±17.10	0.63
	0-56 days	203.0±12.01	231±8.12	0.07
Average Daily Feed (concentre) Intake (g)	0-28 days	486	441	
	28-56 days	513	479	
	0-56 days	500	460	

Table 2. *Some morphological body measurements of Honamlı kids at different periods (X±Sx)*

Traits		Single	Twin	P
Withers Height (cm)	90th day	62.2±1.1	59.1±1.2	0.06
	120th day	68.0±0.9	66.3±0.9	0.23
	146th day	71.6±1.0	69.1±1.0	0.10
Rump Height (cm)	90th day	63.1±0.9	60.0±1.2	0.06
	120th day	68.4±1.0	66.7±1.1	0.26
	146th day	71.7±0.9	69.3±0.8	0.07
Body Length (cm)	90th day	59.3±1.6	53.5±1.4	0.01*
	120th day	63.1±1.3	60.6±1.2	0.17
	146th day	70.0±1.0	69.3±1.3	0.67
Chest Girth (cm)	90th day	61.4±1.3	56.4±1.4	0.02
	120th day	66.4±1.2	63.2±1.3	0.09
	146th day	70.9±1.2	69.0±1.4	0.32
Nose Length (cm)	90th day	19.5±0.3	19.7±0.4	0.70
	120th day	21.6±0.4	21.1±0.4	0.39
	146th day	22.7±0.4	22.4±0.4	0.64

Table 3. *Some slaughter and carcass characteristics of Honamlı male kids (X±Sx)*

Traits	Single	Twin	P
Slaughter weight (kg)	33.29±1.12	28.92±1.43	0.025*
Empty body weight (kg)	27.52±1.08	24.18±0.92	0.041*
Hot carcass weight (kg)	14.47±0.71	12.43±0.62	0.044*
Dressing percentage-1^{DP1}, %	43.37±0.43	42.83±0.83	0.575
Dressing percentage-1^{DP2}, %	52.46±0.41	51.11±0.80	0.159
Head weight (g)	1998.02±27.54	1847.23±38.43	0.109
Four feet weight (g)	1134.41±26.33	960.21±12.23	0.012*
Skin weight (g)	3247.32±21.54	2473.11±27.40	0.006**
Lungs and trachea weight (g)	531.13±20.45	516.23±23.50	0.750
Heart weight (g)	136.05±4.20	115.08±3.75	0.070
Liver weight (g)	698.03±11.05	650.27±15.10	0.128
Spleen weight (g)	65.12±0.85	60.00±0.29	0.538
Full stomach weight (g)	5670.35±59.01	4635.73±44.04	0.018*
Full intestine weight (g)	3282.40±25.72	2989.58±32.10	0.074
Empty stomach weight (g)	1258.09±28.75	1152.43±27.25	0.226
Empty intestine weight (g)	1923.06±22.20	1740.02±42.03	0.076
Internal fat weight (g)	132.61±3.55	60.53±4.98	0.004**

DP1: *Dressing percentage based on slaughter weight;* ***DP2:*** *Dressing percentage based on empty body weight*

Table 4. *Some cold carcass characteristics of Honamlı male kids (X±Sx)*

Traits	Single	Twin	P
Cold carcass weight (kg)	14.19±0.70	11.17±0.83	0.033*
Chilling loss (%)	1.95±0.08	2.10±0.07	0.244
Dressing percentage-1^{DP1}, %	42.60±0.46	41.93±0.82	0.490
Dressing percentage-1^{DP2}, %	51.53±0.48	50.04±0.80	0.133
Right half of carcass weight (kg)	6.68±0.35	5.80±0.34	0.088
Left half of carcass weight (kg)	7.39±0.35	6.21±0.29	0.019*
Shoulder weight (g)	1545.03±93	1327±67	0.074
Flank weight (g)	445.13±25	388.09±24	0.114
Neck weight (g)	756.05±43	556.09±54	0.021*
Ribs weight (g)	2276.23±48	1855.06±61	0.006**
Sirloin weight(g)	1850.33±56	1453.41±44	0.009**
Loin weight (g)	426.11±28	402.21±17	0.470
Long leg weight (g)	2328.29±112	2074.36±104	0.131
Back fat thickness (mm)	0.73±0.05	0.66±0.07	0.380
M. Longissimus dorsi area (cm^2)	13.39±0.47	12.43±0.66	0.353
Carcass Measurements			
Carcass length (cm)	74.35±1.20	70.50±1.10	0.034*
Leg length (cm)	29.30±0.39	29.05±0.61	0.735
Buttock girth (cm)	53.70±0.93	53.26±0.91	0.738
Chest girth (cm)	71.00±1.01	65.26±1.13	0.005**

DP1: *Dressing percentage based on slaughter weight;* ***DP2:*** *Dressing percentage based on empty body weight*

Table 5. *Percentages of the valuable parts and noncarcass components in Honamlı male kids (X±Sx)*

Traits	Single	Twin	P
[1]Percentages (%) of carcass parts			
Shoulder	21.33±0.34	21.05±0.30	0.534
Flank	9.26±0.12	9.00±0.21	0.479
Neck	10.20±0.14	10.03±0.27	0.430
Ribs	27.97±0.65	26.92±0.83	0.354
Sirloin	19.35±0.18	18.52±0.30	0.086
Loin	8.61±0.08	8.39±0.07	0.681
Long leg	31.22±0.42	31.05±0.53	0.418
[1]Percentages (%) of noncarcass parts			
Head	7.65±0.10	7.29±0.06	0.010*
Four Feet	4.13±0.12	4.05±0.07	0.385
Skin	11.78±0.31	10.26±0.24	0.044*
Lungs and Trachea	2.08±0.06	2.14±0.08	0.381
Heart	0.49±0.02	0.47±0.04	0.536
Liver	2.60±0.05	2.72±0.14	0.076
Spleen	0.24±0.02	0.23±0.03	0.795
Internal fat	0.46±0.06	0.24±0.03	0.005**

[1] Percentage based on cold carcass weight

characteristics according to birth type (single and twin) of Honamlı kids. As is seen from relevant tables, live weights of single and twin Honamlı kids before slaughter were found to be 33.29 kg and 28.92 kg, respectively. Hot carcass weights obtained after slaughter were 14.47 kg and 12.43 kg; hot carcass yields calculated based on empty body weight were 52.46% and 51.11% for single and twin kids, respectively. Cold carcass weights were 14.19 kg and 11.17 kg and cold carcass yields calculated based on empty body weight were 51.53% and 50.04% for single and twin kids, respectively. The surface area of M. longissimus dorsi (MLD) was determined to be 13.39 cm^2 and 12.43 cm^2, respectively. As is seen, the highest mean scores in terms of mentioned values were obtained from single born kids and the differences between the groups were not found to be statistically significant for indicated yield values (P>0.05).

As measurements on carcasses of single and twin Honamlı kids were evaluated *(Table 4)*; carcass length, leg length, buttock girth and chest girth values were observed to be 74.35 cm, 29.30 cm, 53.70 cm, and 71 cm for single born kids; respectively. The same values were determined to be 70.50 cm, 29.05 cm, 53.26 cm, and 65.26 cm respectively for twin born kids. However, statistically significant differences were found between single and twin kids only in terms of carcass length and chest girth (P<0.05). There was no statistically significant difference between single and twin kids in terms of proportional values of carcass parts (shoulder, flank, neck, rib, and long leg) (P>0.05).

DISCUSSION

Fattening performances, slaughter and carcass characteristics of single and twin Honamlı kids were examined comparatively. Kids with the same gender (male) were weaned at similar days of age and started fattened with the same forage and concentrated feed. High twinning rates seen in Honamlı goats have brought along to determine if or not birth type had an effect on fattening performance as well as revealing fattening performances of kids. In the study, a statistically significant difference was found between initial average live weights (23 kg and 17.53 kg) of single and twin kids at the same age (P<0.05); this was considered to be associated with birth weights of kids and the amount of milk they sucked.

Even though average daily live weight gain during fattening was relatively higher in twin born kids compared to single born kids and the relevant difference was found to be statistically significant only in the first 28 days of fattening period (P<0.05). Daily live weight gain in the study was found to be relatively higher than the value (197 g) reported by Aktaş et al.[17] for Honamlı kids during 60 days of fattening and considerably higher than values reported by Koşum et al.[18] for various breeds during 56 days of fattening period.

In the study, daily feed consumption of single male kids in the first half of fattening (28 days) was lower compared to the second period. This could be associated with low capacity of digestive system and feed adaptation period

in kids. Additionally, single born kids were observed to consume more daily concentrated feed (500 g) compared to twin kids.

Some morphological body measurements of kids were also determined at various period of fattening in order to reflect their growth performances. Single kids were observed to have higher values compared to twin kids; the reported values (except for chest girth) were found to be relatively higher than those reported by Gök et al.[19] for Honamlı kids and lower (nose length) than reports by Elmaz et al.[20]. Body measurements of kids at various growth periods were found to be higher than different values reported for kids by Alade et al.[21].

When calculating slaughter and carcass characteristics in the study, empty body weight was also considered in addition to pre-slaughter live weight as it was done by numerous researchers [22,23]. It was observed that when single and twin born kids were taken into account in terms of hot carcass yields calculated based on initial live weight, hot carcass yields were between 42.83% - 43.37%, they were 51.11% - 52.46% based on empty body weight and the difference between yields of single and twin kids was statistically insignificant (P>0.05). Similarly, reported that there was no statistically significant difference between single and twin kids in terms of yield values [24]. Hot carcass measurements calculated based on empty body weight were compatible with those reported by Dhanda et al.[25] and Daskiran et al.[26]; higher than those reported by Kor [27] and Pena et al.[28]; and lower than reports by Kebede et al.[23] and Koyuncu et al.[29].

Cold carcass yield values (between 41.93% - 42.60% according to slaughter weight, 50.04% - 51.53% according to empty body weight) determined in the study were compatible with values noted by Daskiran et al.[26], and lower than those reported by Kor [27], Pena et al.[28], Bonvillani et al.[30] and Santos et al.[31]. In addition, cold carcass yield values revealed in the study were observed to be higher than values reported by Gökdal [32].

No statistically significant difference was determined between single and twin kids for thickness of back fat which is important in terms of revealing fat level of carcasses (P>0.05); and twin kids were observed to have relatively lower body fat thickness compared to single kids. Values determined in the study (0.66 mm and 0.73 mm) were found to be higher than values detected by Akbaş and Saatcı [14] for Honamlı kids raised under extensive conditions. Additionally, these were observed to be higher than values reported by Koşum et al.[18], for kids from different breeds; and lower than values reported by Koyuncu et al.[29].

Values (13.39 cm^2 and 12.43 cm^2) determined for surface area of M. longissimus dorsi (MLD) which gives information about the amount of meat on carcass were relatively lower than those reported in the study conducted by Akbaş and Saatcı [14] on the same breed**;** and higher than values reported by Aktaş et al.[17], for Honamlı kids with higher slaughter weight. The current condition is thought to result from genotype of Honamlı breed.

When carcass measurements in the study were examined generally, single Honamlı male kids were observed to have higher values compared to twins. While they were higher than values reported by Kor [27] for kids of Hair and Akkeçi sent for slaughter with about 25 kg of carcass weight, generally had similar quality with reports by Şimşek and Bayraktar [22] for kids of Hair and Saanen X Hair hybrid with a weight of about 35 kg sent for slaughter.

In the study, there was no statistical significance between single and twin male kids in terms of ratios of important carcass parts served for consumption (P>0.05). In addition, ratios of shoulder (21.05% and 21.33%), rib (26.92% and 27.97%) and long leg (31.05% and 31.22%) determined in the study were relatively lower than the reports by Akbaş and Saatcı [14] and Aktaş et al.[17], for long leg ratio in the same breed with similar weight sent for slaughter. Furthermore, values found in the study were lower than values stated by Koşum et al.[18], Daskiran et al.[26], Pena et al.[28] and Bonvillani et al.[30]; and compatible with the values reported by Kor et al.[33] and Atay et al.[34].

A statistically significant difference was observed between single and twin male kids only for head and skin from non-carcass part ratios calculated in the study. This situation is considered to be associated with the differences in initial live weights of kids in both groups. Values of head percentage calculated in the study were generally compatible with values stated by several researchers [22,34], for different breeds. Also, skin percentage determined in the study were found to be higher than the reports by Atay et al.[34] and Koyuncu et al.[29], for Hair goats with various slaughter weights.

With this study, limited fattening and carcass data of Honamlı goats were used. This is important for determining characteristics of the breed. Multiple births which comes forefront in some flocks is an issue required to focus on Honamlı goat breed. These have also been tried to be answered with this study, as well. Having 11.17 kg cold carcass weight from each twin kids can be considered total 22.34 kg carcass and this amont dramatically much more from the carcass (14.19 kg) of single born kids.

No any statistical differences were found in the percentages of carcass parts between single and twins. This is a reflection that if twin kids are fed until at the end of the weaning they can be used a good product for the mentioned breeding sytem.

Live weight gain determined particularly during the last part of fattening period indicated that fattening could

be prolonged and thus heavier carcass and meat yield could be obtained. Also, back fat thickness which was found to be relatively low pointed out that carcass weight could be increased without gaining much fat. In fattening process applied to Honamlı which is a quickly developing breed, birth weight and compensation of weight losses during suckling period in twin kids could be solved by prolongation of fattening period. Trying different fattening periods for this issue namely determination of optimum fattening duration will clearly reveal characteristic of the breed.

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