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FEEDLOT PERFORMANCE AND CARCASS CHARACTERISTICS OF KILIS GOAT BREED

Oktay Gürsoy[1], Tuba Şentut[1], Soner Çankaya[2]

[1]*University of Çukurova – Faculty of Agriculture, Department of Anim. Sci., 01330, Adana, Turkey*
[2]*University of Ondokuz Mayıs, Faculty of Agriculture, Department of Anim. Sci., Samsun, Turkey*
ogursoy@cu.edu.tr

This study was conducted to assess the growth performance and carcass traits of kids rared and fattened under intensive, semi-intensive and extensive systems in the Yayladağı County of Hatay Province. Thirty-nine male kids of the local Kilis goats constituted the material of the study. The kids were put on trial at the mean age of 138 days for a period of 170 days. Mean initial weights, final weights and daily gains for the intensively, semi intensively and extensively managed groups were 19.2 kg, 42.1 kg and 134.8 g; 17.8 kg, 37.5 kg and 115.8 g; 16.3 kg, 21.3 kg and 29.5 g, respectively. Mean feed conversion ratios were found to be 5.23 and 4.65 for the intensive and semi-intensive groups. Mean dressing percentages were 47.6 and 43.5 % for the same groups. The intensive fattening system was found to be superior with respect to the growth and carcass traits of Kilis goats of the Yayladağı County.

Key words: Kilis goat; kid; growth; feedlot; carcass traits

ПРИРАСТ И КАРАКТЕРИСТИКИ НА ТРУПОТ КАЈ КОЗИ ОД РАСАТА КИЛИС

Истражувањето беше изведено за да се добијат податоци за прирастот и карактеристиките на трупот кај јариња одгледувани и гоени под интензивен, полуинтензивен и екстензивен систем во областа Yayladağı во провинцијата Хатаи. Материјалот за проучување се состоеше од 39 машки јариња од локалните кози од расата килис. Просечната возраст на јариња користени за испитување изнесуваше 138 дена за период од 170 дена. Средната почетна маса, финалната маса и просечниот дневен прираст кај интензивниот, полуинтензивниот и екстензивниот систем изнесуваа: 19,2 kg, 42,1 kg и 134,8 g; 17,8 kg, 37,5 kg и 115,8 g; 16,3 kg, 21,3 kg и 29,5 g соодветно. Соодносот на просечната конверзија на храна изнесуваше 5,23 и 4,65 kg за интензивниот и полуинтензивниот систем. Просечниот рандман изнесуваше 47,6 и 43,5% за истите групи. Беше утврдено дека интензивниот систем на гоење е супериорен во однос на прирастот и карактеристиките на трупот кај козите од расата килис од областа Yayladağı.

Клучни зборови: кози килис; јаре; прираст; хранилиште; карактеристики на труп

1. INTRODUCTION

Turkish goat production is concentrated in the socially and economically underdeveloped, resource poor, mountainous and ruggy areas of the country. These enterprises provide income, meat, milk, milk products, manure to fertilize their limited land, animals for religious sacrifice feast, and fuel for their homes. The hair harvested from these animals is used to make various kinds of ropes, bags and tent. Goats also serve as social security and bank for immediate cash needs. The enterprises are small in size and are sustained with family labour (Gürsoy, 2004; Gürsoy, 2005; Gürsoy, 2006; Özcan, 1989; Tuncel and Bayındır, 1983).

Goat population increased steadily until 1960 reaching the peek number of 25 million heads. Kıl goats (includes Kilis, Malta, Gürcü, Abaza, and Norduz breeds) being 19 and the Angora goats being 6.0 million heads (Akman et al*.,* 2001). In the 1960–2005 period the Angora goat numbers exhibited an almost 96 % decrease reaching 260.000 heads in 2002. Kıl goat numbers decreased 65 % within the same period reaching 6.5 milli-

on in 2002 (Gürsoy, 2005; Kaymakçı et al. 2005). The government support regimes for crop production, conversion of pastures and rangelands to arable lands, small size of the enterprises, barriers for cooperative production and marketing, seasonality of the products, ineffective Extension Services, lack of technical knowledge and the unfavourable marketing channels may be counted among the main reasons for these declining figures (Kaymakçı et al. 2000, Gürsoy, 2004).

Inspite of the fact that goats constitute 13 % of the total livestock population, goat meat makes up only 3 % of the total meat production of Turkey. Total goat meat production of Turkey was 43,500 tons in 2004 (FAOSTAT, 2005).

Goat meat is preferencially consumed in the mountainous areas of Turkey. Unlike commonly consumed meats of other species goat meat is mostly consumed in the localities where it is produced (Gall, 1982) and are less prefered in Europe and the United States compared to lamb and beef (Webb et al. 2005). Yayladağı County of Hatay Province is endowed with very poor natural resources (land and water) and is extremely mountainous. Goat production using the Kilis type goats is the most common livestock production activity. The system of production may be characterized as very traditional and extensive in nature. Male kids are grazed on the bushes and shrubs of the Mediterranean region, following weaning and reach 22–24 kg at the age of 12 months. They are usually castrated around 13–15 months of age and further grazed until 1–1.5 months prior to the Muslim Feast of Kurban. Then they are fed supplementary barley and other available concentrates and marketed at around 45–50 kg (Acuz, 2005). Previous observations and pilot studies in the area indicated that the kids may be intensively put on feed and supplemented for higher profitable growth performances.

The objectives of this study was to investigate the growth performance of the weaned male kids under intensive fattening and semi intensive feed supplementation conditions, and to assess their carcass merits under the local conditions.

2. MATERIALS AND METHODS

The 40 weaned Kilis male kids of a farmer in Şakşak village of the Yayladağı County, kept under recording for another ongoing project of the University of Çukurova, constituted the material of this study. Initially the extensive, semi-intensive and intensive management groups were formed with 10 kids each allotted at random. The remaining 10 kids were purchased from the farmer and divided into semi-intensive and intensive groups for carcass evaluation purposes making up 15 kids each and leaving the extensively (tradionally) managed group with 10 kids.

Kids were born during February and April. They were allowed to suckle their dams in the morning prior to grazing and in the evening after grazing. Afterwards until weaning they were allowed to suckle the residual milk. They were offered fresh branches of *Quercus coccifera*, *Laurus nobilis* and *Rhamnus alaternus*. Fresh water was available. The kids were weaned at a mean age of 69 days. The intensively and semi-intensively managed groups were fed a concentrate mix of 150 g/head for approximately 70 days in addition to daily grazing.

The concentrate mix used in the trial was prepared in a commercially operating plant. The mix had 2.6 Mcal/kg energy and 16.7% crude protein. The kids were offered 90% concentrate mix and 10% chickpea, lentil and wheat straw (depending on the availability). The intensively managed group was provided with feed ad libitum and the semi-intensive group with a planned feeding, half of the daily allowance prior to grazing and the other half on their return from grazing. The kids were grazed between 8 a.m to – 6 p.m. The kids were offered clean water on the range and in the shed.

Weights of the kids were recorded every four weeks.

Carcass traits

Carcass evaluation was conducted in the semi-intensive and intensive groups only. The kids were kept on feed for 170 days and 5 kids were slaughtered per group.The kids were starved for 12 hours before weighing. They were slaughtered at the Yayladağı County Municipality Facilities. Slaugtering data comprising blood drained, hide, head, four legs, testes, internal fat, oesophagus-lungs-liver- heart conbined and separately, small and large intestines, thripe and spleen were recorded. The hot carcass weights were taken prior to washing. The carcasses were placed in a 5^{o} C cooler for 24 hours. Carcass measurements, cutting and mechanical separation of tissues were performed according to Gürsoy (1991).

Statistical analyses

The SPSS package programme was used for testing the differences among the groups. Feedlot pereformance was designed using the following model, a completely randomized design (CRD); $\hat{Y}_{ij} = \mu + a_i + e_{ij}$: where, $\hat{Y}_{ij}$: observed value; μ: mean of population; a_i: the effects of production systems: intensive, semi-intensive, extensive; e_{ij}: residual error. The differences were tested using the Duncan's Multiple Range Test. The slaughter and carcass data were tested using t-test (SPSS 10.0 version, 1999).

3. RESULTS

Feedlot performance

Feedlot performance of the intensively managed group representing the optimum conditions for fast growth and growth performances of the semi-intensive group representing supplementation for better growth performance in addition to grazing, as well as the growth performance of the traditional grazed only group are presented in Table 1. There were statistically insignificant differences among the three groups due to the management conditions offered to the kids prior to trial. Within the first 16 weeks both intensively and semi-intensively managed groups performed similarly satisfactory and both groups demonstrated (P<0.01) better growth than the extensively managed group. Afterwards intensively managed group widened the gap even with the feed supplemented semi-intensive group (P<0.01). Mean daily gains within the trial was significantly higher than the other two groups. Kids in the traditional system did not perform well and could only reach 21 kg final BW.

Mean daily feed consumptions for the intensive and semi-intensive groups were 0.641 and 0.534 kg/kid. The supplementation group's mean feed consumption was fairly high. Feed conversion ratios for the two groups were highly satisfactory.

Table 1

Growth and feedlot performance of weaned Kilis male kids

Feedlot traits	Intensive (n = 15)	Semi-intensive (n = 15)	Extensive (traditional) (n = 9)
	$\overline{X} \pm S_{\overline{X}}$	$\overline{X} \pm S_{\overline{X}}$	$\overline{X} \pm S_{\overline{X}}$
Initial weight (kg)	19.19 ± 1.05	17.84 ± 0.82	16.29 ± 1.06
4th week (kg)	21.99 ± 1.17 [a]	21.05 ± 0.84 [ab]	18.30 ± 1.07 [b]
8 th week (kg)	27.15 ± 1.42 [a]	24.45 ± 0.96 [a]	18.86 ± 1.11[b]
12 th week (kg)	30.62 ± 1.14 [a]	27,45 ± 1.01 [a]	19.85 ± 1.03[b]
16 th week (kg)	33.05 ± 1.13 [a]	28.81± 0.96 [b]	20.04 ± 1.13 [c]
20 th week (kg)	37.26 ± 1.09 [a]	33.71± 1.17 [b]	20.60 ± 1.14 [c]
24 th week – Final wt. (kg)	42.10 ± 1.04 [a]	37.53 ± 1.30 [b]	21.28 ± 1.21[c]
Daily Feed Consumption	0.641	0.534	–
Feed conversion ratio	5.23	4.65	–
ADG / 0–4th week (g)	100.00 ± 18,.97 [a]	114.60 ± 11.25 [a]	71.96 ± 14.05 [b]
ADG / 4–8 th week (g)	184.52 ± 18.95 [a]	121.43 ± 7.13 [b]	19.84 ± 6.30 [c]
ADG / 8–12 th week (g)	123.81 ± 17.61[a]	107.24 ± 13.73 [a]	35.24 ± 15.44 [b]
ADG / 12–16th week (g)	86.67 ± 11.92 [a]	48.49 ± 7.79 [b]	6.82 ± 12.17 [c]
ADG / 16–20 th week (g)	182.93 ± 10.91 [a]	195.12 ± 11.54 [a]	33.88 ± 6.67 [b]
ADG / 20–24 th week (g)	140.41 ± 11.20 [a]	116.46 ± 8.11 [a]	10.44 ± 6.77 [b]
ADG / 24–28 th week (g)	166.90 ± 16.81 [a]	131.90 ± 17.56 [a]	23.40 ± 4.97 [b]
ADG / 0.–28 th week (g)	136.39 ± 4.43 [a]	117.220 ± 4.52 [b]	29.70 ± 2.08 [c]

[a,b,c] Different letters in the same row indicate significant difference (P<0,01).

The daily gains for the intensively managed group remained high from the beginning to the end. Actually daily gains increased towards the end. The differences between the daily gains of the intensive and semi-intensive groups were almost always insignificant. The mean daily gain of the extensive group was extremely low. In the first 8 weeks it was aroud 1/3 of the intensive group but dropped to 1/12 within 12–16 th weeks. During the whole trial the extensively managed group's mean daily gain remained 22 % of the intensive and 25 % of the semi-intensive groups.

Slaughtering and carcass characteristics

Slaughtering data. The data obtained during slaughtering were presented in Table 2. The slaughter weight of the intensive and semi-intensive groups were fairly close but statistically different (P<0.05). It was found that the difference between the two groups' hot carcass weights and weights of blood drained (P<0.01); dressing percentages, weights of hide, head, liver-lungs-heart, small intestines, internal fat were different (P<0.05).

Table 2

Slaughter and carcass data of the intensively and semi-intensively managed Kilis male yearlings

Slaughtering traits	Intensive (n = 5) $\overline{X} \pm S_{\overline{X}}$	Semi-intensive (n = 5) $\overline{X} \pm S_{\overline{X}}$	P
Slaughtering wt. (kg)	40.50 ± 0.71[a]	35.50 ± 0.84[b]	**
Hot carcass wt. (kg)	19.68 ± 0.11[a]	16.25 ± 0.46[b]	**
Dressing percentage (%)	48.64 ± 0.57[a]	45.78 ± 0.90[b]	*
Cold carcass wt. (kg)	19..30 ± 0.20[a]	15.4 ± 1.10[b]	**
Dressing percentage (%)	47.60 ± 0.63[a]	43..5 ± 0.94[b]	*
Drained blood (kg)	1.57 ± 0.05[a]	1.33 ± 0.03[b]	**
Drained blood (%)	3.88 ± 0.04[a]	3.74 ± 0.02[b]	*
Hide (kg)	4.23 ± 0.34	3.50 ± 0.10	ns
Hide (%)	10.44 ± 0.11	9.86 ± 0.04	ns
Head (kg)	2.60 ± 0.11[a]	2.09 ± 0.10[b]	*
Head (%)	6.41 ± 0.78	5.88 ± 0.07	ns
4 feet (kg)	1.09 ± 0.04	1.04 ± 0.05	ns
4 feet (%)	2.69 ± 0.06	2.94 ± 0.06	ns
Lungs-liver-heart (kg)	1.60 ± 0.05[a]	1.40 ± 0.07[b]	*
Lungs-liver-heart (%)	3.92 ± 0.06	3.93 ± 0.08	ns
Spleen (kg)	0.09 ± 0.01	0.11 ± 0.02	ns
Spleen (%)	0.22 ± 0.05	0.30 ± 0.06	ns
Thripe (empty) (kg)	1.35 ± 0.05	1.38 ± 0.05	ns
Thripe (empty) (%)	3.46 ± 0.06[b]	3.72 ± 0.06[a]	*
Large intestine (empty) (kg)	0.54 ± 0.03	0.51 ± 0.04	ns
Large intestine (empty) (%)	1.42 ± 0.06	1.42 ± 0.08	ns
Small intestines (empty) (kg)	0.61 ± 0.02	0.56 ± 0.04	ns
Small intestines (empty) (%)	1.51 ± 0.04	1.45 ± 0.07	ns
Internal fat (kg)	1.02 ± 0.11	0.40 ± 0.06[b]	**
Internal fat (%)	2.53 ± 0.09[a]	0.95 ± 0.08[b]	**
Testis (kg)	0.15 ± 0.01	0.12 ± 0.01	ns
Testis (%)	0.71± 0.06	0.68 ± 0.03	ns
Carcass length (cm)	71.10 ± 0.45[a]	68.50 ± 0.98[b]	*
Depth of chest (cm)	27.20 ± 0.36[a]	25.40 ± 0.67[b]	*
Heart girth (cm)	74.80 ± 0.80[a]	69.50 ± 1.12[b]	*
Width behind scapula (cm)	16.00 ± 0.35[a]	14.30 ± 0.36[b]	*
Width between tuber coxae (cm)	10.00 ± 0.67	10.70 ± 0.63	ns
Depth of croach (cm)	32.60 ± 0.98	32.80 ± 0.94	ns
Width of leg (cm)	16.20 ± 0.58	15.00 ± 0.62	ns
Length of leg (cm)	40.30 ± 0.98	38.80 ± 1.39	ns
Circumf. of lower leg (cm)	24.30 ± 1.38	22.00 ± 0.18	ns
Circumf. of upper leg (cm)	33.7 0± 0.52	31.60 ± 0.27	ns
Leg score (1–5 point scale)	3.40 ± 0.09[a]	2.4 0 ± 0.18[b]	*
Loin eye area (cm^2)	15.9 ± 0.80[a]	11.40 ± 0.72[b]	**
Back fat thickness (cm)	0.87 ± 0.04[b]	1.40 ± 0.0.63[a]	*

[a,b,c] Different letters in the same row indicate significant difference (P<0,01); * – P<0.5; ** – P<0.1; ns – Not significant; [1] – values in percentages.

Carcass traits. Five kids from each group were slaughtered at the Municipality slaughterhouse of Yayladağı after fasting 12 hours and allowing fresh water only. The animals were slaughtered according to the traditional method.

Carcass measurements presented in Table 2 were recorded after storing the carcasses at 4–5 ^{0}C in the butcher refrigerator for 24 hours. The statistical analyses indicate that the kids of the two groups had values significantly different from each other with respect to cold carcass weight, kidney and pelvic fat, left side weight, loin weight, leg weight and loin eye area (P<0.01). Furthermore differences to a lesser level of significance (P<0.05) were observed between the cold dressing percentages, carcass lengths, depths of chest, heart girths, widths behind scapula, leg scores, back fat thickness and the weights of neck, shank-breast-flank, shoulder and rack (P<0.05).

Carcass joints. The carcasses were disected to standard joints as neck, shoulder, rack, loin, leg and shank-breast and flank (Table 3). The diferences between the cold carcass weights were highly significant (P<0.01). Similarly the differentces among the weights of the joints were found significant. Another set of analyses were performed using the percentage values of each joint and it was seen that the differences among the joints were all insignificant with the exception of leg. Mean kidney and pelvic fat content of the management groups were sinificantly different both weightwise (P<0.01) and percentagewise (P<0.05).

Table 3

Carcass cutting data of the male Kilis yearlings

Carcass traits	Intensive (n = 5)	Semi-intensive (n = 5)	P
	$\overline{X} \pm S_{\overline{X}}$	$\overline{X} \pm S_{\overline{X}}$	
Cold carcass wt. (kg)	19..27 ± 0.09[a]	15.43 ± 0.51 [b]	**
Kidneys (kg)	0.06 ± 0.002	0.07 ± 0.001	ns
Kidney and pelvic fat (kg)	0.21 ± 0.03 [a]	0.09 ± 0.01 [b]	**
Kidney and pelvic fat (%)	1.09 ± 0.14 [a]	0.58 ± 0.06 [b]	*
Left side (kg)	9.61 ± 0.07 [a]	7.64 ± 0.26 [b]	**
Left side (%)	49.85 ± 0.39 [a]	49.52 ± 0.65 [b]	ns
Neck. (kg)	0.77 ± 0.03 [a]	0.57 ± 0.05 [b]	**
Neck (%)	7.99 ± 0.32	7.48 ± 0.71	ns
Shank-breast-flank (kg)	1.52 ± 0.06 [a]	1.28 ± 0.07 [b]	*
Shank-breast-flank (%)	15.86 ± 0.62	16.77 ± 0.79	ns
Shoulder (kg)	2.39 ± 0.07 [a]	1.87 ± 0.11 [b]	**
Shoulder (%)	24.86 ± 0.92	24.45 ± 0.71	ns
Rack (kg)	0.84 ± 0.06 [a]	0.61 ± 0.04 [b]	*
Rack (%)	8.76 ± 0.57	7.98 ± 0.43	ns
Loin (kg)	0.98 ± 0.03 [a]	0.74 ± 0.04 [b]	**
Loin (%)	10.17 ± 0.30	9.66 ± 0.27	ns
Leg (kg)	2.84 ± 0.04 [a]	2.41 ± 0.08 [b]	**
Leg (%)	29.54 ± 0.53 [b]	31.56 ± 0.22 [a]	*

* – P<0.05; ** – P<0.01; ns – not significant

Carcass composition. Carcasses were mechanically separated into muscle, fat (visible) and bone tissues as fast as possible using wet clothes to prevent dessication. The percentages of the tissues are given in Table 4. The totals did not add up to a hundred due to losses of moisture as well as discarded material.

Table 4

Muscle, fat and bone tissue components of the carcass retail cuts

Retail cuts	Muscle		Fat		Bone	
	Intensive $\overline{X} \pm S_{\overline{X}}$	Semi-intensive $\overline{X} \pm S_{\overline{X}}$	Intensive $\overline{X} \pm S_{\overline{X}}$	Semi-intensive $\overline{X} \pm S_{\overline{X}}$	Intensive $\overline{X} \pm S_{\overline{X}}$	Semi-intensiv $\overline{X} \pm S_{\overline{X}}$
Neck	65.76 ± 0.01	70.00 ± 2.83	8.46 ± 1.77[a]	3.60 ± 0.98[b]	20.98 ± 1.38	20.20 ± 1.53
Shank-breast-flank	60.76 ± 1.02	59.80 ± 1.64	16.80 ± 3.49	14.40 ± 1.94	21.24± 1.19[b]	24.80± 1.24[a]
Shoulder	65.24 ± 1.64	67.20 ± 1.28	14.88 ± 1.28[a]	10.40 ± 1.08[b]	17.84 ± 1.11	20.60 ± 0.97
Rack	61.78 ± 2.53	62.40 ± 2.52	15.38 ± 1.30[a]	10.20 ± 1.62[b]	22.30 ± 1.85	26.60 ± 3.47
Loin	65.82 ± 2.30	67.20 ± 2.62	15.56 ± 1.61[a]	9.20 ± 0.58[b]	17.52 ± 2.34	20.80 ± 2.50
Leg	68.04 ± 0.48	68.00 ± 0.95	10.44 ± 0.78	10.00 ± 1.10	20.92 ± 1.05	20.20 ± 0.66
Mean	64.60 ± 2.00	65.80 ± 1.80	13.60 ± 1.69	9.60 ± 1.20	20.10 ± 1.01	22.80 ± 2.11

In both groups the observed differences among the retail cuts in relation to muscle contents were found to be statistically insignificant. However it is worth mentioning that the highest muscle containing retail cut was leg in the intensively fattened group and the neck and leg in the semi-intensive group.The muscle contents of the whole carcasses were insignificantly higher in the semi-intensive group than in the intensive group.

As far as the total fat contents of the carcasses are concerned, the intensive group exceeded the semi-intensive group ($P<0.05$). Fat compositions of all the retail cuts were higher in the intensive goup. The differences between the neck, shoulder, rack and leg were statistically significant ($P<0.05$).

Bone tissue content of the intensive group was lower than the in semi-intensive group. The differences were insignificant. Rack was seen to be the highest bone incorporating retail cut. Converely leg was the least bone possessing retail cut of the male Kilis yearlings.

Gross returns. A very rough estimate of gross returns were made using the cost (value) of the weaned male kids, feed consumed, veterinary expenses (application of vitamin, drenching and external parasite control was not included in the traditionally manage group), opportunity cost of shepherd and the returns from the sales of the yearlings (Table 5). The intensively managed group had the highest net returns per kid followed by the semi-intensive group. Intensively managed group could not reach the market weight and the net returns was very poor.

Table 5

Costs and returns per kid for kid fattening in Yayladağı

Item	Production system		
	Traditional	Semi-intensive	Intensive
Feeder kid value (TL)	50.0	50.0	50.0
Feed cost (TL)	–	25.5	51.6
Shepherd cost (TL)	25.0	25.0	–
Vet. expenses (TL)	2.0	2.0	2.0
Total cost (TL)	77.0	102.5	103.6
Total return (TL)	90.4	158.7	180.6
Net return (TL)	13.4	56.2	77.0
Net return ($)	8.64	36.2	49.7

1 $: 1.55 TL (June, 2009).

4. DISCUSSION

Growth and feedlot performance

The Kilis kids subjected to intensive fattening ad libitum and supplemented at a high level in addition to grazing demonstrated that they could reach market weight of 40 kg in the same year of birth. The tradionally managed kids failed to grow satisfactorily and could only reach almost half the size of the intensively managed group. Due to the high altitude of Yayladağı the kids in the grazing groups performed fairly well within the first two weighings (1.31 and 1.40 kg/4 weeks) due to the lush herbacious and shrubs available in August and September. Then the productivity of the range

droppped due to lack of precipitation and annual cycle of herbaceous plants and shrubs. To be more precise the extensively managed group gained 0.59, 0.32, 0.69, and 0.68 kg/four weeks in the following four weighing periods. Mean daily gains of 30 g within 170 days were recorded for the traditional system. Kids were fairly ineffective in converting the high cellulose browsed shrubs. Similarly under extensive conditions, Aydın (1999) reported 27 g for the Kıl goats (commonly known as hair or black goats), in Antalya. Koyuncu et al. (1996) reported 9 g for Angora goats. Feeding crop residue rations to the West African Dwarf goats, Aregheora (1990) recorded 37–39 g/d and 14–24 g/d for bucks and goats. Raghavan (1988) pointed out great variation in growth rates and mature sizes of goats and cited very similar daily gains for the Bengal and Barbari breeds. Joemat et al. (2004) investigated changing plane of nutrition in Boer × Spanish crosses (BS) and Spanish (S) doelings and concluded that the maintenance of adequate nutrient consumption for steady growth was highly important for BS and S doelings, which exhibited daily gains of 26 and 29 g/d under no supplementation conditions. There were breed differences in response to unfavourable nutritional status that S being more adaptive than the BS. It was concluded that under short nutrition restrictions more adipose tissue was mobilized in comparison to longer restrictions where more proteinaceous tissue was lost following the loss of fatty tissue due to a negative energy balance. Previous studies showed that most of the goat breeds of Asia and Africa perform similarly under poor grazing conditions without supplementation (Devendra, 1988).

As far as the intensive and semi-intensive management is concerned the kids performed very satisfactorily in relation to daily gains of 116 and 135 g. These values are fairly low compared to the values obtained by Hadjipanayiotou et al. (1996) with the Damascus kids fed soybean and fishmeal as sources of protein. Daily gains ranging between 244 and 282 g for two month old kids weighing about 18 kg showed the potential of the Damascus breed under optimum feeding conditions. The Boer kids were seen to gain 176 g/d under extensive conditions and above 200 g/d under favourable nutritional conditions (Van Niekerk and Casey, 1988).

Slightly higher daily gains were reported by Kadim et al. (2003) for the Batina, Dhofari and Jabal breeds of Oman managed indoors, feeding Rhodes grass and 150 g of a concentrate mixture from weaning (74–78 g/d) to approximately 500 d of age.

In their studies on various crossbreds of the Boer, Saanen, Angora and Feral goats, Dhanda et al. (1999a,b) reported daily gains ranging between 128–162 g/d for capretto production kids slaughtered at 88 days and 95–140 g/d for chevon production slaughtered at 282 days. In Spain Marichal et al. (2003) reported very similar results for Canary Caprine Group breed raised indoors with balanced diets varying between 100–151 g/d in kids slaughtered between 34–154 days. Mahgoup and Lodge (1996) reported 118, 85 and 87 g/day daily gains for the buck, wether and doe kids of Batina breed fattened 24 weeks post weaning.

Atti et al. (2004) reported 84, 105 and 87 g/d for the Tunisian local male kids of 5 months age fed 10, 13 and 16% CP concentrate mixture and oat hay adlibitum for 12 weeks.

In USA Ott et al. (2004) achieved increased daily gains in the Spanish × Boer doe kids with 0.25 and 0.50% BW supplementation of peanut meal (45% CP) to grazing kids. The increases over the control group were 12 and 25% in the first year, 47 and 66% in the second year. In India Sen et al. (2004) reported 40g/d daily gain for kids weaned at 3 months of age and stall fed until one year of age. The low daily gains probaby was due to the genetic make-up of the breed.

Feed intake and feed conversion. Mean daily feed intake for the intensively managed group fed ad libitum was 0.641 kg/d. Individually penned West African Dwarf goats had a voluntary intake of 485–501 g/d crop residues (Aregheora, 1995). Sen et al. (2004) reported very low amounts of feed intake under stall fed conditions in India (0.380 kg/d).

Feed conversion rate (FCR) was calculated to be 5.23 for the intensively fattened kids. This was lower than for Kutlu (1990) who reported 7.4 and 7.3 for Akkeçi × Saanen and Saanen × Kilis crossbreds, and the findings of Koçak (1995) for German Fawn × Kil crossbreds, as well as the reported values of Aregheora (1995), Abdal-Rahman et al. (1998), Aydın (1999), Keskin et al. (2001), Çoban (2002), Sheridan et al. (2003), Sen et al. (2004).

Conversely the FCRs reported by Hadjipanayiotou et al. (1996) for Damascus kids ranging from 3.29 to 3.74 kg concentrate, by; Güney

(1984) for Kıl × Saanen and Kilis × Saanen crosbreds; by Kor (1991) for Damascus × Kıl crossbreds were significantly lower than what was found in this study. The differences were mainly due to the higher nutritional status offered and the genetic superiority of the feeder material used in the studies compared to this study.

In the case of the semi-intensive group the FCR was calculated on the basis of the concentrate offered on top of grazing. Since the extensively managed grazed only group gained 30 g/d the extra 0.534 kg/d concentrate offered together induced 116 g/d and the conversion rate should exclude what was obtained from grazing. Roughly the daily gains for the semi intensive group 86 g. If this argument holds true then the actual FCR would be 0.534 kg/0.0863 kg which is 6.19.

Slaughtering and carcass traits

Goat meat is quite common in the developing countries of Asia and Africa. They contribute by 93 % of the total goat meat production of the world (Devendra, 1988). Its preference and consumption has traditional, social, religious and economical background (Webb et al. 2005). It also is a very suitable livestock production in the resource poor areas due to the native breeds' favourable characteristics such as hardiness, resistance to diseases, ability to convert low quality feed resources to milk, meat, fibre, manure and skin (Acharya, 1986; Gutierrez-A, 1986; Gürsoy, 2006).

In Turkey the slaughter weights of yearlings is fairly high compared to European, African and some Asian states where the market preferences favour smaller and younger carcasses (Gall, 1982; Webb et al. 2005). In Turkey normal slaughter weights range between 35–60 kg. Under the extensive management conditions males reach these weights not before 20–24 months. In the very experiment the extensively managed group could only weigh 21.3 kg.at the age of one year approximately and was considered inappropriate for slaughter. Furthermore the quantity of meat is extremely important as meat generally is sold in very small quantities due to its high retail price. It is generally sold as ground or chopped pieces. In many Asian and African countries, species of meat is trivial as long as it is of conventional meat species. Goat is generally sold and consumed locally in mountainous areas (Gall, 1982). Generally goat meat is regarded inferior or less prefered compared to mutton and beef (Webb et al. 2005).

Slaughter data. Kids were slaughtered right after the termination of the feedlot experiment. There was significant live weight difference between the treatment groups. This could have been eliminated by prolonging the semi-intensively fattened kids. It would also be original to see the carcass traits of kids at 35 and 40 kg slaughter weights.

The mean dressing percentage was significantly ($P<0.05$) lower in the semi-intensive group. Dressing percentage calculated using slaughter weight of a meat animal is mainly effected by age, weight, sex, body condition and amount of gastrointestinal tract contents. Gall (1982) reviewed plenty of research results in all parts of the world and found that fattenning increases dressing percentage along with increased maturity favouring fat deposition. The Boer goats, Damascus, Somalia local goats and fattened Sudan local goats of high slaughter weights and ages were yielding high dressing percentages. Raghavan (1988) cited the results of many research work indicating increasing dressing percentages with increasing slaughter weights in Jamunapari, Osmanabadi, Katjang, Sudan Desert, Sirohi, Beetal, Jhakrana, Kutchi and Marwadi breeds.

Smith et al. (1982) characterized the slaughter and carcass merits of the Angora and the Spanish goats and reported very high dressing percentages for young intact wethers as well as aged females. Johnson and McGowen (1998) studied the effect of the management system on carcass merits of the Florida native kids and recorded 56.0 and 53.7% as dressing percentages for the intensively and semi-intensively managed groups. Similarly Tshabalala et al. (2003) reported very high values for Boer and the indigenous breeds as well as Manfredini et al. (1988) who reported values ranging between 55.3–57.5% for the Alpine kids slaughtered at different ages. In other exotic breeds Acharya (1988), Kirton (1988), Nagpal et al. (1995), Atti et al. (2004), Sen et al. (2004), Marinova et al. (2001) and Mahgoup et al. (2005) documented very similar dressing percentages for goats of India, Tunis, Bulgaria and Oman.

In Turkey the dressing percentages reported for the Akkeçi × Saanen and Kilis × Saanen crossbred kids by Kutlu (1990), for the Angora × Kıl crossbred kids by Koyuncu and Tuncel (1996), for the Kıl kids by Aydın (1999), for the Angora kids

by Daşkıran and Ertuğrul (1994) were found to be very similar. The findings of Çoban (2002) for the Angora kids and Kor (1997) for Angora, Klı and Akkeçi kids goats were lower than the dressing percentages of this study.

The offal weights and non-carcass tissues, found significantly different, were in reality very similar percentagewise (Table 2). Only the internal fat contents (omental and mesenteric) were significant (P<0.05). The rest were very similar. Mahgoup and Lodge (1996) reported different proportions of head, pelt, feet, hearth, liver and lung weights to slaughter weight for the Omani Betina bucks. Similarly Rieley et al. (1989) also reported different offal percentages for the Angora and Spanish goats. These differences are due to the breed differences.

The head proportion is mainly effected by the size of horns and slaughter weight as well as the time allowed for fasting. The proportion of the pelt similarly is an expression of fleece, duration of fasting and body size which is significantly small in the Angora goats. In Turkey heart, liver and lungs are highly prefered and are sold bound for prices very similar to meat prices.

The intensively fattened yearlings had significantly (P<0.01) higher internal (viceral) fat contents. Sen et al. (2004) reported 4.98 % internal fat (omental and mesenteric) for the Indian yearling goats than the present study. Internal fat develops earlier than intermuscular, subcutanous and intramuscular fat depots depending on the level of nuritional status (Casey et al. 2003, as cited by Webb et al. (2005), Mtenga and Kitaly (1990) reported that supplementation induced higher dressing percentageand higher fat deposition.

Carcass measurements. As may be expected the carcass measurements for the intensively managed group were significantly higher with respect to carcass length, depth of chest, heart girth, width behind scapula mainly due to the significant difference between the carcass weights of intensively fattened and semi-intensively managed groups.. These values were found to be similar to the reportted values of Çayan and Güney (1988) for the Kıl and Kıl × German Fawn kids fed intensively. Oman et al. (2000) reported significantly higher values for the Angora kids.

Dorsal portion comprises the most valuable meat cuts due to the high palatability of the *m. longissimus dorsi* (MLD) and *m. psoas* muscles. It is therefore desirable to have high MLD area. Intensive fattening of the kids had a positive effect on the MLD area (P<0.01). The values found were fairly satisfactory for a non-selectected population of indigenous goats. The means for both intensive and semi-intensive groups were higher than the values presented by Gall (1982) for Malawi east African, Sudan Desert and the Desi × (Angora × Desi) breeds and crossbreds. Sen et al. (2004) also reported lower MLD area (9.2 cm^2) for the Indian yearling goats.

Carcass joints. Kidney and pelvic fat (KPF) is the portion of internal fat which remains on the carcass. Due to the high nutritional status of the intensively managed group kidney and pelvic fat was found heavier in weight (P<0.01) and higher in proportion (Gall 1982; Sen et al. 2004) reported KPF as 1.76 %.

As far as the differences between the mean weights of the standard cuts are concerned neck, shoulder, loin and leg were highly significant (P<0.01) and the remaining cuts were significant ((P<0.05). This arises from the slaughter weight differences leading to heavier sized carcasses for the intensively fattened group. The analyses made on percentages indicated that proportionwise the differences were not significantly different. Indicating that small carcasses have smaller joints, the percentage of the leg joint was found to be significantly higher (P<0.05) in the semi-intensive group. The percentage values of intensively fattened group were found to be very similar to Casey (1982) as cited by Webb et al. (2005). The values for both group were found to be fairly different from Sen et al. (2004) probably due to the breed difference and carcass disection.

Carcass composition. Muscle and bone tissue growth are fairly early maturing tissues as compared to the fat tissue. Fat tissue growth is a mobile tissue all through the life of the animal (Forest et al. 1977) and is highly dependant on the availability of high energy intake, degree of maturity (Hogg et al. 1992). There were significant differences among the retail cuts of each group with respect to muscle, fat and bone components.

The intensively managed group was offered a well balanced ration *ad libitum* the semi-intensively managed group therefore demonstrated less fat tissue growth which was apparent in all retail cuts. As the fat tissue growth progresses the percentage of muscle and bone declines relatively (Hogg et al. (1992).

Intensive fattening and feed supplementation both induced fairly good quality carcasses with 64.6 and 65.8% muscle components. Leg and loin excelled with 68 and 65.8 % separable muscle in the intensively managed group while neck and leg were the highest muscle containing joints in the semi-intensive group.

Mahgoub et al. (2005) reported very similar muscle components in the Omani Jabel akhdar male kids slaughtered at 28 kg (64.0 %). According to review of Devendra (1988), Sengar (1975) reported 63, 58 and 55% muscle in the carcasses of the Jamnupari male yearlings offered high, medium and low feeding status. Dhanda et al. (1999b) estimated the muscle tissue percentages in the Boer × Angora, Boer × Saanen, Feral × Feral, Saanen × Angora and Saanen × Feral crossbred kids 61.0, 60.7, 63.1, 59.8 and 63.6%, respectively. Pure Feral and Saanen × Feral kids had higher muscle tissues than the other three crosses. Gallo et al. (1996) studied the tissue contents of male and female Criollo breed of South Chile and reported 59.5% and 58.0 % muscle. They also recorded the highest muscle content in the leg standard joint. Much higher muscle contents were reported by Tshabalala et al. (2003) in the Boer and ındigenous breeds as 76.5 and 74.1 %, respectively. Sen et al. (1992) reported 68.4% in yearling indigenous Indian yearlings. In the Omani Batina goats slaughtered at 28 kg Mahgoub and Lodge (1996) found 68.2 % muscle .

Koçak (1995) studied the carcass composition of the German Fawn × Kıl (F1) crossbred male kids slaughtered at 25 and 30 kg and reported 58.7–64.7 and 56.7–64.5 % musle components in the neck, shoulder and leg joints.

Goats are known to have less fat on carcass as compared to sheep (Webb et al., 2005). Aside from the traditional eating habits, it is one of the main reasons for the preference of the highland people for the goat meat.

Yearlings of the semi-intensive group had less fat compared to the intensively managed yearlings (9.6 vs 13.6%). Breast-shank-flank joints in both groups had the highest fat content among all joings. was the most Mtenga and Kitaly (1990) concluded that supplementation increased fat content in the carcasses of the indigenous male tanzanian goats. Sex of the kids was found to be significantly effective on fat deposition of kids (Johnson et al. 1995; Mahgoub and Lodge 1996). Supplementation of sunflower oil was also found to be significantly effective on fat deposition and distribution in the carcass (Marinova et al., 2001).

Bone is the early developing and maturing tissue in the body and is the least wanted component in the carcass but is required for normal support of the body as a live animal. Bone content has close relation with the maturity and degree of fattenning. The bone contents of the semi-intensive and intensive groups were 20.1 and 22.8%, respectively. Rack being the most bony piece in both management groups (26.6 vs 22.3 %). Loin and shoulder were the least bony joints. The bone content of the Omani Batina goats probably has the least bone content (13.9 %) as reported by Mahgoub and Lodge (1996). Almost all research results on goats, sheep and cattle under extensive managed conditions exhibit slow growth rates and high bone contents in the carcasses (Atti et al. 2004). Similarly slaughter weights influence the fat, bone and muscle content of the carcass (Marichal et al., 2003).

5. CONCLUSIONS

Growth performances of the male Kilis kids were significantly improved via supplementation with well balanced concentrate ration in addition to the daily grazing of the Mediterranean shrubbs on the Anti-Taurus Mountains. The male kids performed still better with *ad libitum* feeding of the same ration.The experiment clearly exhibited that Kilis goats had very satisfactory growth performance and were proved to be good converters of well-balanced diets to 65 % lean carcasses.

Economical analyses indicated that both supplementation and intensive fattening increased gross returns by 75.5 % and 100 %. Otti et al. (2004) concluded that peanut meal supplementation to doe kids was economical but feed and goat meat prices must be taken into consideration. Further benefits of supplementating doe kids could be improved reproductive performance, higher birth and weaning weights.

Carcass data indicated that the Kilis male yearlings slaughtered at 35–40 kg produced good quality carcasses. Intensive fattening induced roughly 4% more fat compared to the feed supplemented yearlings having 2 percent more muscle and 2% more bone. Slaughtering at higher weights did not significantly alter the quality of carcasses.

As far as the releasing grazing pressure on the rangelands, it is recommended that male kids be intensively fattened until 35–40 kg and they generate net returnes 5–6 folds. This practice may be extended to most of the resource poor highlands for alleviating poverty.

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