

**EFFECT OF FATTENING PERIOD ON GROWTH RATE AND CARCASS CHARACTERISTICS OF MERIZ AND BLACK GOATS**

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**ABSTRACT**

This study was carried out at the Animal Farm, Animal Production Department, College of Agriculture, University of Duhok, where 10 Meriz goats averaged 13.65 kg weight and 3-4 months old and 10 Black goats averaged 30.3 kg weight and 6 months old were randomly divided into two groups and allocated to be fattened for either 90 or 150 days.

Result revealed that the daily gain, feed efficiency, dressing percentage based on live body weight, rib eye area and fat thickness, lean, fat and bone percentage averaged 98.73gm, 5.12 kg/kg, 46.96%, 9.44cm<sup>2</sup>, 1.15 mm, 64.07%, 16.89 % and 19.02 % respectively for Meriz, while the corresponding values for Black goat were 75.58 gm, 6.43 kg/kg, 49.42 %, 12.47 cm<sup>2</sup>, 1.75 mm, 63.73 %, 16.82 % and 19.44 %, respectively. No significant differences between 90 and 150 days fattening period was observed in all studied traits except some commercial cuts.

**Key words:** *Meriz, Black goat, growth, carcass traits.*

**INTRODCUTION**

Small ruminants and particularly goat, adapt well to environmental conditions prevailing in arid and semi-arid lands (**Gall, 1981**) and utilize poor quality feed stuffs to produce high protein product (**Delagdillo and Malpaux, 1996**). Goats had received relatively little scientific attention compared with sheep and cattle (**Warmington and Kirton, 1990**). However, recently, there is a world wide tendency for rapid increase in demand to goat meat (**Stankov et. al., 2002**) due to several reasons including; the increased consumer desire to leaner meat compared to other types of red meat (**Potchoida et al., 1990**), development of subcutaneous fat is slow in goat (**Warmington and Kirton, 1990**), a good source of desirable fatty acids, since goat deposit higher polyunsaturated fatty acids than other ruminants (**Banskalieva et. al., 2000**) and consequently reducing the risk of cardiovascular disease (**Stankov et. al., 2002**). Growth is a very important characteristic of animal for meat production and it

depends on factors such as breed, sex, nutrition and environmental condition (Murray *et. al.*, 2001).

Meriz goat is found in the Kurdistan region and raised primarily for its fine hair, and adaptation to survive under hard conditions of feed limitations (Alkass and Juma, 2005). However, information related to the potential of this breed as well as native goat for meat production is very scarce. Therefore, the objective of this study is to determine the effect of slaughter age on fattening performance and some carcass characteristics of Meriz and Black goats.

## MATERIALS AND METHODS

This experiment was conducted at the Animal Farm, Department of Animal Production, College of Agriculture, University of Dohuk, over the period from September 5<sup>th</sup>, 2007 to February 5<sup>th</sup>, 2008.

Ten Black goats aged 6 months, and averaged  $30.02 \pm 0.57$  kg weight, together with 10 weaned Meriz goat aged 3-4 months and averaged  $13.2 \pm 0.41$  kg weight were obtained from the local market to this study. Each breed of kids were weighed and divided randomly into two groups, 5 each, fattening trial extended for 90 and 150 days.

Accordingly, 4 groups, two for each breed were kept in separate pens and fed in a group basis. Clean water and mineral blocks were available all the day. Concentrate was offered *ad lib.* at 09.00 am daily after quantifying and discarding the residue of the previous day. The concentrate mixture consisted of 53% barley, 25% wheat bran, 15% soybean meal, 6% wheat straw, 0.5% salt, 0.5% limestone and 0.5% vitamins, and contained 15.5% crude protein and 2451 kcal energy. During the adaptation period for 10 days, all kids were protected against internal worms and vaccinated against external and internal parasites. Kids weight was recorded weekly where it implemented at 9.00 am before feed is offered by hanging balance (100gm sensitivity).

Kids were slaughtered when reached the assigned fattening periods (90 and 150 days). Kids were fasted for 18-h, and weighed immediately prior to slaughter. The dressed carcass comprised the body after removing the skin, head and fore and hind feet and the viscera. Hot carcass includes kidney and channel and kidney fat. The digestive tract was removed and weighed then emptied of its content, washed, drained and weighed to facilitate calculation of empty body weight. After chilling the carcasses for 24h at 4-6 C° they weighed then the kidney and kidney fat were separated and weighed. Then carcasses were split along the mid line by electrical saw and the left half was cut into leg, loin, rack, neck, shoulder, breast, fore shank, and flank. Each cut was weighed and calculated as a percentage of chilled carcass weight. Rib eye area was obtained by tracing the *longissimus dorsi muscle* (at 12th rib) upon acetate paper and measured with a planimeter, and the fat thickness over the *longissimus dorsi* was measured with

vernica. The right leg was weighed and dissected completely into fat, lean, and bone. The three components were weighed separately and determined as a percentage of total leg weight. Two kids (Black goat and Meriz) from the 90 days fattening group were excluded from the experiment because of their abnormal growth.

The statistical analysis of data within each breed group was carried out using the GLM (General Linear Model) with **SAS (2001)** program according to the following model:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where:  $Y_{ij}$  = observational value of the  $k^{\text{th}}$  animal,  $\mu$  = overall mean,

$T_j$  = effect of  $i^{\text{th}}$  treatment ( $I= 90$  or  $150$  day fattening period),

$e_{ij}$  = experimental error assumed to be NID with  $(0, \sigma^2e)$ .

## RESULTS AND DISCUSSION

### *Growth rate*

In the present work, the average daily gain of Meriz was  $110.49 \pm 25.45$  and  $89.33 \pm 7.78$  g/day during 90 and 150 days of fattening period, respectively. The corresponding values for Black goats were  $79.00 \pm 17.12$  and  $72.84 \pm 11.01$  g/day (Table 1). The growth rate of both breeds recorded in the current work was comparable to those reported earlier for native goat as well other breeds of goats (**Taha, 1990; AL-Doori et al., 2002; Kadim et al. 2003; and Dhanda et al. 2003**).

Although, the average daily gain of kids decreased as the fattening period advanced, the differences was not significant. This result has also been demonstrated by other workers (**Pattie and Restall, 1987; Dhanda et al., 1999 a**).

### *Feed Efficiency*

Efficiency of feed conversion to body weight over 90 and 150 days fattening period for Meriz was 5.12 and 6.43, respectively, whereas it averaged 8.99 and 9.66 for Black goat (Table1). It is worth to note that the data of feed efficiency was not subjected to statistical analysis because the animals were fed on a group basis. An average feed efficiency achieved for the Black goat in the present study was similar to the finding reported earlier on Iraqi native goat by **Taha (1990)**. However, **Waldron et al. (1996) and Cameron et al. (2001)** observed greater efficiency of feed conversion rate for improved breeds (i.e. Bore, Spanish and Saanen). Such differences among breeds due to genetic and possibly feeding regimes and other environmental factors.

Efficiency of feed conversion decreased as the fattening period advanced for both Meriz (5.12 vs. 6.43) and Black goat (8.99 vs. 9.66) (Table 1). Similarly, **Cameron et al. (2001)** noticed that efficiency of feed conversion decreased as the performance period advanced from more than 300g/kg at 11 to 12 weeks of age to less than 200g/kg at 23 to 24 weeks.

**Table (1) Fattening performance of Meriz and Black goats (Means  $\pm$  S. E.)**

Trait	Meriz(Cheer) goats		Black goats	
	90	150	90	150
Fattening period (days)				
No.of animals	4	5	4	5
Initial weight (kg)	13.65 $\pm$ 0.49	12.84 $\pm$ 0.62	30.3 $\pm$ 1.31	29.8 $\pm$ 0.38
Final weight (kg)	23.65 $\pm$ 2.47	26.24 $\pm$ 1.77	37.45 $\pm$ 2.46	40.80 $\pm$ 1.86
Total gain (kg)	10.0	13.4	7.5	11.0
Daily gain (g)	110.49 $\pm$ 25.4 5	89.33 $\pm$ 7.78	79.00 $\pm$ 17.1 2	72.84 $\pm$ 11.0 1
Total feed intake (kg)	52.14	86.25	64.34	106.86
Daily feed intake (g)	580	575	715	710
Feed Conv. efficiency (kg intake/kg gained)	5.12	6.43	8.99	9.66

#### *Dressing percentage*

Slaughter traits of Meriz and Black goat kids are given in Table 2. Dressing percentages (1 and 2) averaged 46.96  $\pm$ 1.3 and 53.16 $\pm$ 0.77, for Meriz and 49.42 $\pm$ 0.40 and 54.36 $\pm$ 0.33, for Black goat respectively (Table 2). This result is in accordance with those of **Yacoub *et. al.*(1985) and Taha (1990)** on Iraqi local goat and within the range reported for other breeds of goat (**Potchobia *et. al.*, 1990; Mahgoub and Lodge, 1996 and Dhanda *et. al.*, 1999a** ).

The increased slaughter weight accompanied the increased fattening period from 90 to 150 days, showed slight increase in dressing percentage though being not significant. Similarly, **Yacoub *et. al* (1985), Singh *et. al.* (1987) and Tahir *et. al.* (1994)** pointed out that dressing percentage of goat increased as live body weight at slaughter increased.

In the current work, shrinkage percentage averaged 3.47 $\pm$ 0.54 and 2.56  $\pm$ 0.13% for Meriz and Black goats, respectively (Table 2). Moreover , a significantly ( $P<0.05$ ) greater loss in weight on chilling Meriz carcasses. slaughtered at 90 days compared to Meriz carcasses slaughtered at 150 days was observed. Such loss can be possibly attributed to their thinner subcutaneous fat cover (Table 2).

#### *Rib eye area and Fat thickness*

## NUTRITION & HUSBANDRY

Result showed that rib eye area averaged  $9.44 \pm 0.76$  and  $12.47 \pm 0.57$  cm<sup>2</sup> for Meriz and Black goat, respectively (Table 2). A similar value have been reported earlier for the same breeds (**Yacoub *et. al.*, 1985 and Taha, 1990**). Back fat thickness averaged  $1.15 \pm 0.07$  and  $1.24 \pm 0.08$  mm for Meriz and Black goat, respectively (Table 2).

The increase in age and body weight was not accompanied with a significant increase in eye muscle area and fat thickness for both breeds (Table 2). This could be possibly due to lesser rate of gain during the 150 days of fattening periods (Table 2). Similar results have also been reported by **Taha (1990) and Tahir *et. al.* (1994); Dhanda *et. al.* (1999 a); Dhanda *et. al.* (2003)**.

### *Commercial cuts*

Commercial cuts for both breeds as well as for their two fattening periods are presented in Table (3). For Meriz, shoulder and leg weights, as percent contributed to carcass side weight, were significantly ( $P < 0.05$ ) more (26.43 vs. 22.60 %) and less (28.89 vs. 30.92%) for animals slaughtered at 90 days compared to 150 days. Whereas, for Black goats, loin and neck percentages were significantly more (8.85 vs. 7.98 %) and less (6.53 vs. 8.04 %) for animals slaughtered at 90 days compared to 150 days of fattening.

**Table (2) The effect of fattening period on some carcass characteristics of Meriz and Black goats (mean  $\pm$  S. E.).**

Trait	Meriz goats			Black goats		
	Mean	90	150	Mean	90	150
No. of Animals	9	4	5	9	4	5
Slaughter weight (kg)	25.08 $\pm$ 1.45	23.65 $\pm$ 2.47 a	26.24 $\pm$ 1.77 a	39.31 $\pm$ 1.52	37.45 $\pm$ 2.46 a	40.80 $\pm$ 1.86 a
Empty body weight (kg)	22.19 $\pm$ 1.37	20.48 $\pm$ 2.36a	23.55 $\pm$ 1.54 a	35.74 $\pm$ 1.40	33.73 $\pm$ 2.23 a	37.35 $\pm$ 1.63 a
Hot carcass weight (kg)	11.84 $\pm$ 0.80	10.82 $\pm$ 1.38 a	12.66 $\pm$ 0.90 a	19.44 $\pm$ 0.80	18.25 $\pm$ 1.20 a	20.40 $\pm$ 0.97 a
Dressing % 1	46.96 $\pm$ 1.03	45.39 $\pm$ 1.95 a	48.22 $\pm$ 0.80 a	49.42 $\pm$ 0.40	48.72 $\pm$ 0.43 a	49.98 $\pm$ 0.55 a
Dressing % 2	53.16 $\pm$ 0.77	52.56 $\pm$ 1.62 a	53.65 $\pm$ 0.67 a	54.36 $\pm$ 0.33	54.09 $\pm$ 0.41 a	54.57 $\pm$ 0.51 a
Chilled carcass w. (kg)	11.45 $\pm$ 0.81	10.34 $\pm$ 1.39 a	12.34 $\pm$ 0.88 a	18.94 $\pm$ 0.78	17.82 $\pm$ 1.20 a	19.84 $\pm$ 0.94 a
Shrink %	3.47 $\pm$ 0.54	4.68 $\pm$ 0.90 a	2.51 $\pm$ 0.21 b	2.56 $\pm$ 0.13	2.35 $\pm$ 0.16 a	2.73 $\pm$ 0.18 a
Rib eye area (cm <sup>2</sup> )	9.44 $\pm$ 0.76	8.19 $\pm$ 1.07 a	10.45 $\pm$ 0.92 a	12.47 $\pm$ 0.57	12.42 $\pm$ 0.74 a	12.51 $\pm$ 0.93 a
Fat thickness (mm)	1.15 $\pm$ 0.07	1.00 $\pm$ 0.08 a	1.27 $\pm$ 0.08 a	1.75 $\pm$ 0.08	1.63 $\pm$ 0.08 a	1.84 $\pm$ 0.12 a

Means with different letters within each raw for Meriz and Black goat differ significantly ( $P < 0.05$ ) according to Duncan's test.

Dressing percentage 1( based on live body weight)

Dressing percentage 2( based on empty body weight)

Leg, loin and rack cuts are considered most valuable by industry standards (Cameron *et. al.*, 2001). These cuts make up nearly 60% of lamb carcass (Hale and Griffin, 1992). However, goat deposits relatively more tissue in the fore quarters compared with cattle or sheep. In the present experiment and other reports (Hale and Griffin, 1992; and Cameron *et. al.*, 2001) leg, loin and rack cuts made up 48.9 and 47.7% for Meriz and Black goat, respectively.

## NUTRITION & HUSBANDRY

**Table (3) The effect of fattening period on proportion of wholesale cuts of Meriz and Black goats to carcass side weight (%Mean  $\pm$  S. E.).**

Trait	Meriz(Cheer) goats			Black goats		
	Mean	90	150	Mean	90	150
No. Animals	9	4	5	9	4	5
Shoulder%	24.30 $\pm$ 0.83	26.43 $\pm$ 0.35 a	22.60 $\pm$ 0.88 b	28.00 $\pm$ 0.67	28.88 $\pm$ 0.96a	27.29 $\pm$ 0.90 a
Rack%	9.88 $\pm$ 0.27	10.45 $\pm$ 0.43 a	9.42 $\pm$ 0.21 a	9.96 $\pm$ 0.37	9.28 $\pm$ 0.28 a	10.50 $\pm$ 0.52 a
Loin%	8.99 $\pm$ 0.37	9.25 $\pm$ 0.74 a	8.78 $\pm$ 0.37 a	8.37 $\pm$ 0.19 a	8.85 $\pm$ 0.27 a	7.98 $\pm$ 0.12 b
Leg%	30.01 $\pm$ 0.46	28.89 $\pm$ 0.54 b	30.92 $\pm$ 0.35 a	28.38 $\pm$ 0.48	28.02 $\pm$ 0.68 a	28.67 $\pm$ 0.71 a
Tail%	0.36 $\pm$ 0.01	0.38 $\pm$ 0.01a	0.35 $\pm$ 0.01 a	0.39 $\pm$ 0.02	0.35 $\pm$ 0.01 a	0.42 $\pm$ 0.03 a
Breast%	8.97 $\pm$ 0.48	8.25 $\pm$ 0.55 a	9.55 $\pm$ 0.69 a	8.32 $\pm$ 0.62	8.69 $\pm$ 1.30 a	8.03 $\pm$ 0.56 a
Flank%	5.07 $\pm$ 0.16	5.09 $\pm$ 0.23 a	5.05 $\pm$ 0.24 a	3.93 $\pm$ 0.18	3.80 $\pm$ 0.11 a	4.03 $\pm$ 0.33 a
Fore shank%	6.35 $\pm$ 0.43	5.53 $\pm$ 0.36 a	7.00 $\pm$ 0.61 a	5.24 $\pm$ 0.17	5.55 $\pm$ 0.27 a	5.00 $\pm$ 0.19 a
Neck%	6.02 $\pm$ 0.22	5.68 $\pm$ 0.32 a	6.29 $\pm$ 0.26 a	7.37 $\pm$ 0.36	6.53 $\pm$ 0.11 b	8.04 $\pm$ 0.47 a

Means with different letters within each row for Meriz and Black goat differ significantly (P<0.05)

### *Physical dissection*

In the current investigation, lean, fat and bone contents of the leg of Meriz and Black goat as well as lean: fat and lean: bone ratios are presented in Table (4). Though Meriz kids fattened for 150 days had slightly and insignificant more contents of

muscles ( $64.15 \pm 0.66$  vs.  $63.98 \pm 1.85$  %) and bone ( $19.32 \pm 0.34$  vs.  $18.65 \pm 0.95$  %) and less content of fat ( $17.36 \pm 1.14$  vs.  $16.51 \pm 0.86$  %) compared to those fattened for 90 days, the findings of **Dhanda et. al. (1999 b)** and **Marichal et. al. (2003)** concluded that the proportion of muscle in prime cuts increased with age in most genotypes they studied.

For Black goat, there were no significant differences between age groups for the percentage contribution of lean (64.49 vs. 63.12 %), fat (15.93 vs. 17.54 %) and bone (19.57 vs. 19.33%) in leg weight. However, in contrast, in Meriz breed, there is a tendency, but insignificant, for a decrease in lean and bone content, and an increase in fat content in kids fattened for 150 days compared with those fattened for 90 days. These findings are in agreement with those reported by **Ruvuna et. al. (1992)** and **Al-Doori et. al. (2002)**. The muscle: bone ratio of 3.38 for Meriz and 3.29 for Black goat in the present study is comparable to those of meat goat breeds like Boer with muscle: bone ratio around 3.0 (**Birkammer, 1986**).

**Table (4) The effect of fattening period on physical dissection of legs contents of carcasses of Meriz and Black goats (Mean  $\pm$  S.E.).**

Trait	Meriz(Cheer) goats			Black goats		
	Mean	90	150	Mean	90	150
No. of Animals	9	4	5	9	4	5
Lean %	$64.07 \pm 0.83$	$63.98 \pm 1.85$ a	$64.15 \pm 0.66$ a	$63.73 \pm 0.99$	$64.49 \pm 1.73$ a	$63.12 \pm 1.25$ a
Fat %	$16.89 \pm 0.67$	$17.36 \pm 1.14$ a	$16.51 \pm 0.86$ a	$16.82 \pm 1.12$	$15.93 \pm 1.38$ a	$17.54 \pm 1.77$ a
Bone %	$19.02 \pm 0.44$	$18.65 \pm 0.95$ a	$19.32 \pm 0.34$ a	$19.44 \pm 0.50$	$19.57 \pm 0.70$ a	$19.33 \pm 0.77$ a
Lean: fat ratio	$3.85 \pm 0.19$	$3.75 \pm 0.34$ a	$3.93 \pm 0.25$ a	$3.96 \pm 0.34$	$4.16 \pm 0.477$ a	$3.80 \pm 0.52$ a
Lean: bone ratio	$3.38 \pm 0.11$	$3.47 \pm 0.26$ a	$3.32 \pm 0.05$ a	$3.29 \pm 0.1$	$3.31 \pm 0.19$ a	$3.27 \pm 0.11$ a

Means with different letters within each row for Meriz and Black goats differ significantly ( $P < 0.05$ )



## NUTRITION & HUSBANDRY

### *Chemical composition*

Analysis of variance indicate that there were no significant differences among the two groups fattened for 90 or 150 days (Table 5). Though significant but very slight differences were noticed in fat content for Meriz breed and ash content in Black goat.

**Table (5) Chemical composition of meat samples of Meriz and Black goats slaughtered after the two different fattening periods (Means  $\pm$  S.E.)**

Trait	Meriz goats			Black goats		
	Mean	90	150	Mean	90	150
No. of Animals	9	4	5	9	4	5
Moisture %	63.56 $\pm$ 0.35	63.82 $\pm$ 0.66 a	63.10 $\pm$ 0.53 a	63.28 $\pm$ 0.77	63.79 $\pm$ 0.78 a	63.39 $\pm$ 0.25
Dry mater %	36.43 $\pm$ 0.35	36.17 $\pm$ 0.66 a	36.89 $\pm$ 0.53 a	36.71 $\pm$ 0.77	36.20 $\pm$ 0.78 a	36.61 $\pm$ 0.25 a
Ash %	0.86 $\pm$ 0.03	0.85 $\pm$ 0.04 a	0.94 $\pm$ 0.04 a	0.94 $\pm$ 0.05	0.87 $\pm$ 0.08 b	0.85 $\pm$ 0.02 a
Protein %	17.05 $\pm$ 0.33	17.01 $\pm$ 0.50 a	16.93 $\pm$ 0.31 a	16.88 $\pm$ 0.45	17.36 $\pm$ 0.74 a	16.79 $\pm$ 0.16 a
Fat %	18.37 $\pm$ 0.21	18.13 $\pm$ 0.83 b	18.83 $\pm$ 0.35 a	18.67 $\pm$ 0.82	17.85 $\pm$ 0.06 a	18.78 $\pm$ 0.25 a

Means with different letters within each row for Meriz and Black goats differ significantly ( $P < 0.05$ )

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تأثير فترة التسمين على معدل النمو و بعض صفات الذبيحة للمرعز و الماعز الأسود

فهيل جلادت طه مايي و جلال ايليا القس

كلية الزراعة / جامعة دهوك- العراق

الملخص العربي

أجريت هذه الدراسة في مشروع تربية الحيوانات / كلية الزراعة / جامعة دهوك حيث تم توزيع عشرة جداء مرعز بوزن ابتدائي 13.65 كغم و بعمر 3-4 أشهر و كذا عشرة جداء من الماعز الأسود بوزن 30.3 كغم و بعمر ستة أشهر، قسمت عشوائيا إلى مجموعتين لتذبح الأولى بعد مدة تسمين 90 يوما و الثانية بعد 150 يوما من بدء التسمين .

أشارت النتائج بان معدل الزيادة الوزنية اليومية و كفاءة التحويل الغذائي و نسبة التصافي منسوبة لوزن الجسم و مساحة العضلة العينية و سمك الطبقة الدهنية و نسبة اللحم وكذا الدهن والعظم قد بلغت 98.73غم، 0.12 كغم/كغم، 46.96%، 9.44سم<sup>2</sup>، 1.15ملم، 64.07%، 16.89%، 19.02% على التوالي للمرعز، بينما بلغت 75.58غم، 6.43 كغم/كغم، 49.45%، 12.47سم<sup>2</sup>، 1.75ملم، 63.73%، 16.82%، 19.44% في الماعز الأسود، كما لم تؤثر مدة التسمين معنويا في جميع الصفات قيد الدراسة باستثناء بعض قطعيات الذبيحة.