

## FATTENING AND SOME CARCASS CHARACTERISTICS OF MERIZ AND NATIVE GOAT MALE KIDS RAISED IN EITHER CONCENTRATE OR PASTURE CONDITIONS

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### ABSTRACT

The aim of this study was to determine the fattening and carcass characteristics of Meriz and goat kids raised in either intensive or pasture conditions. Twelve intact weaned male kids from each of Meriz and goat were weighed and blocked into three groups according to different feeding systems for 90 days. The 1<sup>st</sup> group was given *ad libitum* concentrate mixture (intensive), the 2<sup>nd</sup> was freely grazed on pasture for 45 days and then transferred to having *ad libitum* concentrate for 45 days (Semi-intensive), the 3<sup>rd</sup> one was freely grazed on pasture (extensive). At the end of the experiment, all kids were weighed, slaughtered and the weight of their carcass was recorded. Daily gain in weight averaged  $0.06 \pm 0.008$  kg, the difference between breeds was not significant. Kids raised intensively surpassed significantly ( $p < 0.05$ ) kids on semi-intensive and on pasture (0.10, 0.06 and 0.02 kg /day) respectively. Also breed has no significant effect on carcass and edible and non-edible organs weight or percentages (except the weight of pelt and the percentage of pelt and feet). Intensively and semi-intensively raised kids had significantly ( $p < 0.01$ ) higher carcasses, dressing percentages, larger eye muscle area and thicker of fat thickness than those raised on pasture.

### INTRODUCTION

Small ruminant animal husbandry is the most important living source for people inhabiting in regions not suitable for crop cultivation and cattle production. In addition, goat are well adapted to the environmental and limited feed and utilized marginal land to produce high protein product (Kadim *et al.*, 2003). The native goat with a population of 1.6 million head (FAO, 2000) is an important livestock species in Iraq and raised primarily for milk and meat which are consumed in most regions of Iraq particularly in Kurdistan. Also there is a world wide tendency for rapid increase in demand for goat meat (Stankov *et al.*, 2002) due to several reasons including the desire for leaner meat by consumer (Potchoiba *et al.*, 1990), a good source of desirable fatty acids (Banskalieva *et al.*, 2000) and reducing the risk of cardiovascular disease (Stankov *et al.*, 2002).

It is well known that the most significant variable cost in any livestock operation is the feed cost. However, Daskiran *et al.*, (2006) concluded that pasture group kids had similar slaughter and carcass characteristics values as intensively ones. Meriz goat is found in Iraqi Kurdistan region and raised primarily for its fine hair (Alkass and Juma, 2005). However, information related to the potential of this breed as well as native goat for meat production is scarce, therefore the aim of the present study is to establishment of their yield capacity and for the evaluation as a genetic resource, together with the effect of feeding system on fattening and carcass traits.

## MATERIALS AND METHODS

This experiment was conducted in the animal farm, College of Agriculture, University of Duhok when a total of 12 weaned male kids (3 months old) from each of native goat and Meriz obtained from commercial flock were used.

After an adaptation period for 7 days, the kids from both breeds were weighed and assigned to 3 groups according to different feeding systems for a period of 90 days. The first group (intensive) was given *ad libitum* concentrate mixture (Table 1). The second group of kids was freely grazed at commercial flock by the shepherd for 45 days and then transferred to have *ad libitum* concentrate mixture for 45 days. The third group of kids was freely grazed on pasture (Little cherry, Oriental Hawthorn, Valonia Oak, Kochi Thyme, Mediterranean Stinkbush and Meikle Shifshen) by the shepherd for all experimental duration. Drinking water was supplied *ad libitum* during the experimental period. All kids were weighed biweekly. Group one and two from each of goat and Meriz were kept in separate pens and fed on group basis. Concentrate was offered daily at 9.00 a.m after quantifying the refusal of the previous day.

Table (1): Ingredient and chemical composition of diet.

Items	% of diet	Chemical analysis % *	
Barley	53	Dry matter	93.89
Wheat bran	25	Crude protein	16.6
Soybean meal	15	Ether extract	3.68
Wheat straw	6	Organic matter	94.37
Salts	0.5	Ash	5.63
Limestone	0.5	Crude fiber	28.45**
Vitamins ***	0.5	NFE	65.44

\* Determined at nutrition lab., Animal Production Dept.

\*\* Calculated according to AlKhawaje *et al.*, (1978).

\*\*\* The vitamins were mixed with concentrate as an additive.

At the end of experiment, kids were weighed after fasting for 12 hrs with the free access to water, and slaughtered and dressed according to commercial practices followed in Iraq at the College of Agriculture abattoir. The dressed carcass comprised the body after removal of the head, skin, fore and hind feet, kidney, kidney fat, and viscera. The weights of head, skin, feet, testes, some visceral organs (lungs, liver, heart, spleen and kidneys) were recorded. The gastro-intestinal tract was weighed, emptied, washed and weighed to facilitate calculation of empty body weight.

Carcasses were weighed before chilling and hot dressing percentage was calculated from the ratio of hot carcass weight to slaughter weight or empty body weight. After 24hrs of chilling (4°C), all carcasses were weighed and joined into whole sale cuts. The *Longissimus dorsi* muscle area (Rib eye area) at the 11<sup>th</sup> and 12<sup>th</sup> ribs was determined by tracing the muscle on semi-transparent waxed paper, and the area was measured using the compensating planometer. Fat thickness over the *Longissimus dorsi* muscle was measured by verernia.

The data obtained was analyzed by using the GLM (General Linear Model) within SAS (2001) program as in the following model:

$$Y_{ijk} = \mu + B_i + F_j + BF(ij) + e_{ijk}$$

Where:

$Y_{ijk}$  = Observational value of  $k^{th}$  animal.

$\mu$  = Overall mean

$B_i$  = Effect of  $i^{th}$  breed ( $i$ = Meriz, goat).

$F_j$  = Effect of  $j^{th}$  feeding system ( $j$  = intensive, semi-intensive, extensive).

$BF(ij)$  = Effect of interaction between  $i^{th}$  breed and  $j^{th}$  feeding system.

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

Since the results reveal no significant effect of interaction on all studied traits, therefore the data was re-analyzed without interaction.

Duncan multiple range test (1955) also used to test the difference between the subclasses of each factor.

## RESULTS AND DISCUSSION

**Growth performance:** The findings related to fattening performance (initial and final weight, empty body weight and average daily weight gain ) are presented in Table 2- The overall mean of daily gain in weight was  $0.060 \pm 0.008$  Kg (Table 2). This value is within the range (49.0- 110g/day) reported earlier for Iraqi native goat (Ayied, 1996 and Mayi ,2009 ). Moreover, as MC Gregor (1985) had stated that growth rate of goat can vary from 30g/day for the small tropical breeds to over 200g/day for large European breeds and South African Boer breed.

The growth rate of both Meriz and goats was almost the same (0.06 Kg/day). However, Mayi (2009) found that the growth rate of Meriz was insignificantly higher than that of goat (98.73 vs. 75.98 g/day). Similarly, Kanaujia *et al.* (1985), Lu and Potchoiba (1990) Anous *et al.*, (1993) and Kadim *et al.* (2003) noticed that the effect of breed on growth rate was not significant.

In the present study, significant differences ( $p < 0.05$ ) was found among kids raised on different feeding regime on growth rate and consequently on final and empty body weights. The highest gain in weight was attained by kids raised intensively on concentrate ( $0.100 \pm 0.01$  Kg/day) followed by semi-intensive kids ( $0.060 \pm 0.008$  kg/day) and finally kids raised on pasture ( $0.02 \pm 0.005$  Kg/day). Similarly, Oman *et al.* (1999) found that feedlot goats had heavier ( $P < 0.05$ ) live weights (38.17 kg) than did range goats (20.51 kg).

Table (2): Means and S.E. for fattening performance of Meriz and native goat raised in different feeding regimen.

Traits	No.	Initial wt. Kg	Final wt. Kg	Daily gain. Kg	Empty body weight kg
Overall mean	24	$11.9 \pm 0.29$	$17.94 \pm 0.81$	$0.06 \pm 0.008$	$14.41 \pm 0.18$
<b>Breed</b>					
Meriz	12	$11.7 \pm 0.47a$	$17.97 \pm 1.36a$	$0.06 \pm 0.01a$	$14.69 \pm 1.39a$
Goat	12	$12.10 \pm 0.37a$	$17.92 \pm 0.96a$	$0.06 \pm 0.01a$	$14.12 \pm 0.91a$
<b>System</b>					
Intensive	8	$11.68 \pm 0.73a$	$21.08 \pm 1.61a$	$0.10 \pm 0.01a$	$17.73 \pm 1.37a$
Semi-Intensive	8	$12.03 \pm 0.45a$	$18.28 \pm 0.52a$	$0.06 \pm 0.008b$	$14.84 \pm 0.61a$
Extensive	8	$12.00 \pm 0.33a$	$14.46 \pm 0.74b$	$0.02 \pm 0.005c$	$10.66 \pm 0.85b$

Within a column and comparison, means without a common superscript letter differ significantly.

Also Al- Doori (2006) indicated that the growth rate of Awassi lambs fed a concentrate diet surpassed significantly those raised on stubble grazing supplemented with barley (294 vs. 116g/day).

**Carcass characteristics** Carcass characteristics are presented in Table 3. Dressing percentage based on full and empty live body weight averaged 38.24 and 47.36%, respectively for Meriz and 37.28 and 47.44% for goat in the same order. The difference between them was not significant. Dressing percentages were lower than those reported by Mayi (2009) for Meriz and goat slaughtered at a heavier weight (25.08 Kg for Meriz and 39.31Kg for goat). The non-significant differences in dressing percentage were in accordance with those reported earlier by Mokhtar et al (1996), Dhanda *et al.* (1999) and Al-Doorri (2006). However, breed differences in dressing- out percentage based on empty body weight or lack of them are influenced by degree of gut fill at slaughter (Kadim *et al.*,2003).

The dressing percentage based on live body weight and empty body weight of intensively raised kids (42.42 and 50.41%) and semi-intensive group (40.24 and 49.66%) were significantly ( $p<0.01$ ) higher than that of kids raised on pasture (30.61 and 42.14%) (Table 3). This result was in accordance with the finding of Kor (1991) and Ertugrul (1994) who noticed that the dressing percentages of goats raised in pasture conditions was lower than that of intensively raised ones. On the other hand, Daskiran *et al.*, (2006) reported that the dressing percentage of intensively raised Norduze male kids (42.94%) was 3.32% lower than that of kids raised on pasture. Such difference may be attributed to variations in weight of digestive tract content (Dhanda *et al.*,1999).

Differences between breeds in rib eye area, fat thickness and shrinkage percentage lacked significance. Similarly, Oman *et al.*, (1999) indicated that there were no significant differences between the Boer× spanish range goats and the Spanish range goats in rib eye area and fat thickness. Al-Doorri (2006) also, reported that genotype (native goat and their crosses with Saanen or Shami ) had no significant effect on the studied traits.

Kids raised on concentrate diet possessed significantly ( $p<0.01$ ) larger rib eye area, greater fat thickness ( $p<0.01$ ) and lower shrinkage percent ( $p<0.01$ ) than those raised on pasture. Also, Oman *et al.* (1999) reported that feedlot goats carcasses had larger rib eye area and greater fat thickness than did range goat carcasses. Diets have been found to affect carcass traits in other species. Tatum *et al.* (1985) reported that lambs fed in a feedlot produced fatter carcasses than lambs fed limited or no grain. Several studies have verified this for beef cattle as well (Burson *et al.*, 1980; Schroeder *et al.*, 1980).

In contrast, Norduz goat male kids raised in pasture had larger *Musculus longissimus dorsi* than intensively raised ones, while fat content of intensively raised kids was higher than that of other group (Daskiran *et al.*,2006). A significantly ( $p<0.01$ ) greater loss in shrinkage percent of kids carcasses raised on pasture compared to other groups can be attributed to their thin subcutaneous fat cover (Table 3).

Table (3): Means and S.E. for some carcass traits of Meriz and native Goat raised in different feeding regime.

Traits	No.	Hot carcass wt. (kg)	Chilled carcass wt (kg)	Dressing percentage *		Shrinkage percentage	Rib eye area (cm <sup>2</sup> )	Fat thickness (mm)
				ˆ	ˆ			
Overall mean	24	6.93±0.48	6.66±0.47	37.76±1.20	47.40±0.96	4.05±0.32	5.66±0.48	0.17±0.04
Breed								
Meriz	12	7.09±0.81a	6.83±0.79a	38.24±1.86 a	47.36±1.36a	3.82±0.47a	5.75±0.76a	0.20±0.09a
Goat	12	6.77±0.56a	6.49±0.54a	37.28±1.58 a	47.44±1.42a	4.28±0.46a	5.57±0.61a	0.13±0.03a
System								
Intensive	8	8.99±0.80a	8.65±0.77a	42.42±0.90 a	50.41±0.60a	3.77±0.45ab	7.40±0.69a	0.32±0.13a
Semi-Intensive	8	7.35±0.29b	7.12±0.29b	40.24±1.28 a	49.66±1.09a	3.25±0.54b	6.45±0.54a	0.15±0.009ab
Pasture	8	4.45±0.30c	4.21±0.28c	30.61±0.69 b	42.14±1.28b	5.13±0.53a	3.14±0.34b	0.04±0.006b

Within a column and comparison, means without a common superscript letter differ significantly.

\* 1. Based on full live body weight.

2. Based on empty body weight.

**Edible and non-edible organs:** Weights of edible and non-edible organs together with their percentages as a proportion of empty body weights are demonstrated in Table 4. With the exception of weight and percentage of pelt and percent feet, all other organs were not significantly affected by breed. Yet, Meriz had significantly higher pelt weight ( $1.66 \pm 0.09$  Kg) than goat ( $1.47 \pm 0.08$  Kg), and consequently had higher percent (13.00 vs. 10.49%) which may be attributed to heavier hair cover of the Meriz which resulted in heavier pelt than goats. Kadim *et al.*, (2003) also, reported significant differences between breeds for some organs including skin and feet. Also, the percent feet of goat were significantly higher than Meriz (3.34 vs 3.01%) the heavier feet of goat kids are partially explained in terms of the distinctly long legs of this breed. Previously, Mokhtar *et al.*, (1996) found that Jamnabary  $\times$  Aradi showed higher weight of feet than Damascus  $\times$  Aradi.

Table (4): Means and S.E. for some edible and non edible organs of Meriz and native Goat raised in different feeding regime.

Traits		Overall mean	Breed		Production system		
			Meriz	Goat	Intensive	Semi-intensive	Pasture
Head	Wt	1.16 $\pm$ 0.41	1.15 $\pm$ 0.061a	1.17 $\pm$ 0.04a	1.33 $\pm$ 0.04a	1.28 $\pm$ 0.04b	0.94 $\pm$ 0.03c
	%	8.33 $\pm$ 0.23	8.15 $\pm$ 0.30a	8.51 $\pm$ 0.35a	7.72 $\pm$ 0.34b	8.16 $\pm$ 0.17ab	9.11 $\pm$ 0.49a
Feet	Wt	0.44 $\pm$ 0.02	0.43 $\pm$ 0.03a	0.46 $\pm$ 0.02a	0.54 $\pm$ 0.03a	0.45 $\pm$ 0.02b	0.34 $\pm$ 0.01c
	%	3.18 $\pm$ 0.07	3.01 $\pm$ 0.01b	3.34 $\pm$ 0.10a	3.10 $\pm$ 0.12a	3.09 $\pm$ 0.12a	3.34 $\pm$ 0.15a
Pelt	Wt	1.66 $\pm$ 0.09	1.85 $\pm$ 0.15a	1.47 $\pm$ 0.08b	2.07 $\pm$ 0.18a	1.61 $\pm$ 0.10b	1.30 $\pm$ 0.05c
	%	11.75 $\pm$ 0.44	13.00 $\pm$ 0.68a	10.49 $\pm$ 0.27b	11.70 $\pm$ 0.58ab	10.85 $\pm$ 0.51b	12.68 $\pm$ 1.05a
Liver	Wt	0.38 $\pm$ 0.27	0.37 $\pm$ 0.04a	0.38 $\pm$ 0.03a	0.47 $\pm$ 0.03a	0.43 $\pm$ 0.03a	0.23 $\pm$ 0.02b
	%	2.62 $\pm$ 0.12	2.52 $\pm$ 0.17a	2.72 $\pm$ 0.16a	2.68 $\pm$ 0.14a	2.91 $\pm$ 0.18a	2.27 $\pm$ 0.25a
Heart	Wt	0.09 $\pm$ 0.20	0.07 $\pm$ 0.06a	0.11 $\pm$ 0.04a	0.14 $\pm$ 0.05a	0.07 $\pm$ 0.04a	0.05 $\pm$ 0.002a
	%	0.65 $\pm$ 0.16	0.49 $\pm$ 0.02a	0.81 $\pm$ 0.32a	0.98 $\pm$ 0.48a	0.48 $\pm$ 0.02a	0.49 $\pm$ 0.03a
Lung	Wt	0.22 $\pm$ 0.15	0.24 $\pm$ 0.02a	0.21 $\pm$ 0.10a	0.28 $\pm$ 0.02a	0.24 $\pm$ 0.01a	0.15 $\pm$ 0.07b
	%	1.60 $\pm$ 0.05	1.66 $\pm$ 0.08a	1.54 $\pm$ 0.08a	1.62 $\pm$ 0.03a	1.63 $\pm$ 0.11a	1.54 $\pm$ 0.14a
Kidney	Wt	0.66 $\pm$ 0.03	0.06 $\pm$ 0.05a	0.07 $\pm$ 0.04a	0.08 $\pm$ 0.004a	0.07 $\pm$ 0.03b	0.05 $\pm$ 0.02c
	%	0.48 $\pm$ 0.10	0.45 $\pm$ 0.02a	0.50 $\pm$ 0.02a	0.47 $\pm$ 0.02a	0.47 $\pm$ 0.02a	0.49 $\pm$ 0.03a
Spleen	Wt	0.03 $\pm$ 0.02	0.02 $\pm$ 0.003a	0.03 $\pm$ 0.003a	0.03 $\pm$ 0.002a	0.03 $\pm$ 0.003a	0.01 $\pm$ 0.002b
	%	0.22 $\pm$ 0.01	0.19 $\pm$ 0.01a	0.25 $\pm$ 0.02a	0.22 $\pm$ 0.01a	0.25 $\pm$ 0.02a	0.18 $\pm$ 0.03a
Testes	Wt	0.05 $\pm$ 0.01	0.06 $\pm$ 0.10a	0.04 $\pm$ 0.01a	0.09 $\pm$ 0.20a	0.04 $\pm$ 0.06b	0.03 $\pm$ 0.01b
	%	0.35 $\pm$ 0.05	0.36 $\pm$ 0.07a	0.33 $\pm$ 0.09a	0.49 $\pm$ 0.08a	0.31 $\pm$ 0.03a	0.25 $\pm$ 0.12a

Within a row and comparison, means without a common superscript letter differ significantly.

The proportions of various visceral organs reported in the present study were similar to those reported for different breeds of goats (Gibb *et al.*, 1993, Tahir *et al.*, 1994, Johnson *et al.*, 1995; Mahgoub and Lodge, 1996 and Kadim *et al.*, 2003). The weight of all visceral organs of kids raised intensively was significantly heavier than kids raised on pasture. However, only the percentages of head and pelt were significantly higher for kids fed on pasture compared to the other groups. Working with Norduz male kids, Daskiran *et al.*, (2006) on the other hand, stated that neither weight nor the percentage of head, feet and pelt differ significantly between kids raised intensively or on pasture conditions. However, the weights of heart, lung and liver were heavier significantly for kids raised intensively compared to those fed on pasture.

It can be concluded that feeding Meriz and goats on concentrate results in heavier live and carcass weights, higher dressing percentage and fatter carcasses when compared to those raised on pasture. Further research should focus on determining the cost and the net return for each system of production.

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التسمين وبعض صفات الذبيحة لجداء ذكور المرعز والماعز المحلي المرباة على العلف المركز او المرعى  
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### الخلاصة

يهدف البحث الحالي لدراسة بعض صفات التسمين والذبيحة للمرعز والماعز المحلي مرباة تحت نظم مختلفة من التغذية (مكثف، شبه مكثف او على المرعى). تم توزيع ١٢ من جداء كل من المرعز والماعز المفطومة بعد وزنها الى ثلاثة مجاميع حيث تم تغذية المجموعة الاولى على العليقة المركزة، اما المجموعة الثانية فقد تمت تغذيتها على المرعى لمدة ٤٥ يوما ومن ثم غذيت على عليقة مركزة للمدة المتبقية من التجربة (٤٥ يوما) اما المجموعة الثالثة فلقد غذيت على المرعى فقط. تم ذبح جميع الحيوانات لدى انتهاء التجربة وتم تسجيل البيانات الخاصة ببعض صفات الذبيحة والاحشاء الداخلية والخارجية. بلغ معدل الزيادة الوزنية اليومية  $0.06 \pm 0.008$  كغم، ولم يكن للسلالة تأثيرا معنويا في هذه الصفة، في حين تفوقت الجداء المغذاة على العلف المركز او المرعى والعلف المركز معنويا ( $0.05 >$ ) على نظيراتها الجداء المغذاة على المرعى ( $0.100, 0.06$  و  $0.02$  كغم/يوم على التوالي). كما تبين انعدام التأثير المعنوي للسلالة في جميع صفات الذبيحة والاحشاء باستثناء وزن ونسبة الجلد ونسبة الاقدام. الجداء المغذاة على العلف المركز او المرعى مع العلف المركز تفوقت معنويا ( $0.01 >$ ) في كل من وزن الذبيحة الحار او البارد، نسبة التصافي، نسبة الانكماش، مساحة العضلة العينية وسمك الطبقة الدهنية على نظيراتها من الجداء المغذاة على المرعى فقط.

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