Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.5, No.13, 2015

Body Composition and Carcass Tissue Distribution of Karadi Lamb Maintained on Concentrate or Pasture

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Abstract
Fourteen weaned (90 days) entire male Karadi lambs were equally and randomly divided to be fed either on concentrate *ad lib* or on pasture supplemented with barley. All lambs were slaughtered when each animal reached its designed body weight (35 kg).
Result revealed that lambs raised on concentrate had significantly (P< 0.05) lower percentage of lean (63.90%) and higher proportion of fat (14.89%) than lambs fed on pasture supplemented with barley (66.12; 11.63%, respectively). It seems also that the greatest proportion of body fat is the carcass fat, followed by fat tail and finally the non-carcass fat.
Keywords: carcass, tissue, feeding system, Karadi lambs.

Introduction

It is well recognized that the primary value of a market animal is determined by the quality and proportion of lean meat in the carcass (Sents et al., 1982). Therefore, considerable interest has been generated at times in the use of muscle:bone ratio as a guide to carcass meat (Berg and Butterfield, 1976), as an index of maturity (Davies and Kallweit, 1979), and is potentially the most important function of conformation (Kempster et al., 1987). Moreover, carcass composition is determined by two principal factors : 1- Animal intrinsic factors, as breed, sex and age, and 2- Extrinsic animal factors, as production system and diet (Delfa et al., 1996).

It is known that diet have been shown to be one of the main factors influencing the carcass yield (Webb et al., 2005Wood et al., 2008). Moving weaned lambs directly to the feedlot results in faster, more efficient growth than does feeding animals forage for a period of time (Notter et al., 1991). Finishing meat animals on forage, rather than concentrate, may lead to the production of leaner carcasses (Ely et al., 1979). Thus forage-based production systems may offer the option of reduced daily costs of production, but may lead to increased number of days required to finish animals (Notter et al., 1991). Therefore. The aim of this study is to investigate the effect of feeding system on carcass composition of Karadi lambs.

Materials and Methods

Fourteen weaned (90 days) entire male Karadi lambs maintained at animal farm, Faculty of Agriculture and Forestry, University of Duhok were used in this trail. Lambs were equally and randomly divided to be fed either on concentrate (14.11 CP% and 2718 ME) *ad lib* or on pasture supplemented with barley. Animals were slaughtered when each individual lamb reached its designated body weight (35 kg). Following fasting for 18-hr with free access to water and weighed immediately before slaughter. After skinning, the carcass and non-carcass components were weighed. Omental, mesenteric, kidney and pelvic fat, cardiac fat and testes fat were separated and weighed. The digestive tract were removed, and weighed, then emptied of their content, washed drained and weighed to facilitate the calculation of empty body weight. Following chilling the carcasses at 4C° for 24 hrs, cold carcasses were weighed, then split along the vertebrate column into two halves. The left side was cut into leg, loin, rack, neck, shoulder, breast, foreshank, and the fat tail. Each cut was dissected completely into lean, fat and bone. These components were weighed separately to calculate their percentage.
General Linear Model (SAS, 2001) was used to study the effect of treatment on studied traits according to the following model:
$Yij= \mu + Ti + eij$
Where:
Yij= Observation value of jth animal.
μ = Overall mean.
Ti= Effect of feeding system (i= concentrate, pasture)
eij= Experimental error assumed to be NID (0, $\sigma^2 e$).

Results and Discussion

Tissue Distribution in the Carcass

Percentage of separable lean, fat and bone for individual cuts of the carcass are given in Table 1. It seems from the table that the lean percentage of all cuts was higher in lambs maintained on pasture supplemented with barley compared to lambs fed on concentrate either significantly (P< 0.05) in the leg and breast cuts or numerically on

all other cuts except shoulder. Conversely with respect to proportion of fat in different cuts, results indicate that lambs fed on concentrate excelled those of lambs kept on pasture and supplemented with barley. However, the proportion of bone in all carcass cuts was not differ significantly (P> 0.05) between the two feeding systems.

Table 1: Proportions of separable carcass tissues of cuts of karadi lambs maintained on different feeding regimen (mean ± s.e.).

		Concentrate	Pasture
Leg	Lean	67.24±1.05 [b]	70.12±0.69 [a]
	Fat	11.63±1.36 [a]	8.42±0.77 [a]
	Bone	21.11±0.60 [a]	21.44±0.30 [a]
Shoulder	Lean	68.04±0.40 [a]	66.61±0.81 [a]
	Fat	11.03±0.88 [a]	10.75±0.95 [a]
	Bone	20.91±0.84 [a]	22.6±0.41 [a]
Breast	Lean	51.14±1.78 [b]	56.67±1.11 [a]
	Fat	27.1±1.55 [a]	20.07±2.36 [b]
	Bone	21.73±1.03 [a]	23.24±1.50 [a]
Flank	Lean	73.54±2.38 [a]	78.66±3.18 [a]
	Fat	26.45±2.38 [a]	21.33±3.18 [a]
	Bone	-	-
Fore shank	Lean	59±0.79 [a]	60.06±0.70 [a]
	Fat	8.67±0.69 [a]	6.9±0.70 [a]
	Bone	32.3±0.93 [a]	33.02±0.91 [a]
Neck	Lean	62.6±4.32 [a]	66.35± 4.61 [a]
	Fat	12.54±5.50 [a]	7.58± 2.50 [a]
	Bone	24.83±1.51 [a]	26.04± 2.79 [a]
loin	Lean	60.66±1.76 [a]	61.43± 2.15 [a]
	Fat	15.61±1.35 [a]	15.11±1.91 [a]
	Bone	23.7±1.13 [a]	23.44±1.71 [a]
Rack	Lean	55.91±1.65 [a]	58.78± 1.31 [a]
	Fat	20.38±1.34 [a]	17.98± 1.81 [a]
	Bone	23.69±1.39 [a]	23.22± 1.70 [a]

Within a raw, means without a common superscript letter differ significantly(P< 0.05).

Additionally, muscle content varied according to its location in the carcass. For example, the highest muscle content was in the leg (70.12%), whereas the lowest (56.67%) was in the breast cut. Such variation in muscle mass is mainly due to differences in the total number of muscle fibers. Possibly the evolutionary increase in muscle fiber size is limited by physiological status in that normal cell function is maintained as long as certain limit in cell size is not exceeded (Rehefeldt et al., 2002).

The weight and the proportions of separable carcass tissue of the carcass side of Karadi lambs maintained either on concentrate or on pasture supplemented with barley are presented in Table 2. Result revealed although the weight of carcass of both feeding systems are almost the same (P> 0.05), yet lambs raised on concentrate had significantly (P< 0.05) lower percentage of lean as compared to those fed on pasture supplemented with barley (63.90 vs. 66.12%). Such result suggests that lambs raised on pasture and supplemented barley delayed physiological maturity and allowed continued lean growth beyond that noticed in lambs raised on concentrate (Borton et al., 2005). Also, comparisons of forage vs. concentrate finishing on carcass lean tissue content have been previously reported by other investigators (Mc Clure et al., 1994; Murphey et al., 1994a).

When fat expressed as a percentage of carcass side weight, lambs fed on concentrate had significantly (P< 0.05) higher proportion of fat (14.89%) compared to those maintained on pasture and supplemented with barley (11.63%) (Table 2). Also, the lean to fat ratio of lambs fed on pasture and supplemented with barley was significantly (P< 0.05) greater than those fed on concentrate (6.0;1 vs. 4.32;1) (Table 2). However, no significant differences was noticed in the percentage of bone between two feeding systems (21.20 vs. 22.24 %) (Table 2). Similarly, several investigators including Tatum et al. (1989); Mc Clure et al. (1994); Murphy et al. (1994b) and Borton et al. (2005) who found that lambs finished on pasture had lower proportion of fat than those finished on concentrate. Several studies have verified this for beef cattle (Burson et al., 1980; Schroeder et al., 1980) and goat (Daskiran et al., 2006; Dosky et al., 2009).

Table 2: The effect of feeding regimen on physical dissection of half carcass of Karadi lambs.

Item	Concentrate	Pasture
Carcass weight (kg)	15.66 ± 0.31 [a]	15.57 ± 0.37 [a]
Carcass Lean (gm)	4228.29 ± 8.66 [a]	4380.14 ± 10.35 [a]
Carcass Fat (gm)	2913.57 ± 10.70 [a]	2636.43 ± 18.42 [a]
Carcass Bone (gm)	1415.00 ± 6.79 [a]	1487.86 ± 10.89 [a]
Lean (%)	63.90± 0.31 [b]	66.12±0.73 [a]
Fat (%)	14.89±0.50 [a]	11.63±0.93 [b]
Bone (%)	21.20±0.38 [a]	22.24±0.56 [a]
Lean: Fat	4.32±0.15 [b]	6.01±0.68 [a]
Lean: Bone	3.02±0.05 [a]	2.98±0.08 [a]

Within a raw, means without a common superscript letter differ significantly.

Partitioning of Fat

It is well recognized that fat is the most variable tissue in the carcass and it varies not only in its amount but also its distribution between the various deposits which changed markedly during growth, and the proportion and location of the fat in the body are important in meat animals (Oramari et al., 2014). Although it seems from Table (3) that no significant difference exist in total body fat as well as in its partitioning in different locations, however, it seems that in both feeding regimen, the greatest contribution was the carcass fat (64.56 and 63.46 %) followed by fat tail (22.41 and 23.54 %) and finally the non-carcass fat (13.01 and 12.59). Moreover among the non-carcass fat, omental and mesenteric fat forms the greatest proportion of non-carcass fat followed by kidney and pelvic, cardiac and testes fat. Similarly, working with Awassi and Hamdani lambs, Oramari et al., (2014) found that the greatest proportion of the body fat was deposited in the carcass, followed by tail and on internal organs, as a non carcass fat.

Table 3: Partitioning of fat depots as a percentage of total body fat.

	Concentrate	Pasture
Omental and mesenteric fat	8.74±0.98 [a]	9.08±1.43 [a]
Cardic fat	1.15±0.28 [a]	1.15±0.13 [a]
Testes fat	0.10±0.01 [a]	0.13±0.02 [a]
Kidney and pelvic fat	3.01±0.35 [a]	2.62±0.25 [a]
Noncarcass fat	13.01±0.91 [a]	12.99±1.63 [a]
Carcass fat	64.56±0.68 [a]	63.46±1.19 [a]
Fat tail	22.41±0.55 [a]	23.54±0.51 [a]
Total fat (Kg)	3.49± 0.17 [a]	3.18± 0.31 [a]

Within a raw, means without a common superscript letter differ significantly.

Conclusion

It can be concluded that carcasses of lambs raised on pasture supplemented with barley are leaner and had higher lean-to-fat ratio than lambs fed on concentrate.

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