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in

Baumont R. (ed.), Carrère P. (ed.), Jouven M. (ed.), Lombardi G. (ed.), López-Francos A. (ed.), Martin B. (ed.), Peeters A. (ed.), Porqueddu C. (ed.).
Forage resources and ecosystem services provided by Mountain and Mediterranean grasslands and rangelands

Zaragoza : CIHEAM / INRA / FAO / VetAgro Sup Clermont-Ferrand / Montpellier SupAgro
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 109

2014
pages 355-358

Lamb's growth and carcass characteristics as affected by herbaceous or woody pasture in Tunisian North West

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Abstract. The aim of this work was to study the effect of rearing system of two mountainous areas, Ain Draham of Woody Pasture (WP) and Fernana of Herbaceous Pasture (HP) on growth and carcass composition of lambs. The WP is characterized by an uneven distribution of plant biomass, with *Quercus suber* dominates the shrubby stratum which in turn dominates the herbaceous during the period of low rainfall, by cons HP is characterized by grasses and clover. Animals of both regions were fed exclusively on pasture which amount and value depends on the production potential of the rearing systems. They were weighted monthly from birth until 4 months age where 10 lambs from each region were slaughtered and the left shoulders were dissected. The final live weight and average daily gain were affected by pasture type. The slaughter body weight was 28.6 kg and 23.8 kg for HP and WP respectively. The carcass weight was higher (p = 0.003) on HP than WP (14.1 *vs* 10.9 kg). Consequently, the commercial yield was 49% for HP and 46% for WP. Fat content was 11 and 15% for WP and HP, respectively, while bone content was higher for sheep from WP. The WP group presents a higher quantity of muscle than HP group (64% *vs* 62%). This composition resulted from the difference in the slaughter body weight.

Keywords. Pasture – Forest – Lamb's growth – Carcass – Tissues importance.

Croissance et caractéristiques des carcasses d'agneaux pâturant des parcours herbacés ou ligneux dans le Nord ouest de la Tunisie

Résumé. *L'objet de cette contribution est d'étudier l'effet du système de production de deux régions montagneuses, parcours ligneux (WP) et Herbacé (HP), sur la croissance et la composition de la carcasse des agneaux. Le système WP est caractérisé par une distribution irrégulière de la biomasse du couvert végétal dominé par le chêne vert et une strate arbustive qui domine elle aussi le parcours herbacé durant les saisons à faibles précipitations. Le système HP est caractérisé par une strate herbacée particulière de graminées et de légumineuses. Le calendrier alimentaire des troupeaux des deux régions est constitué exclusivement de parcours avec des performances quantitatives et qualitatives variables. Les animaux ont été pesés mensuellement de la naissance à l'âge de 4 mois. Une dizaine d'agneaux de chaque système de production a été abattue et l'épaule droite a été disséquée. Nous avons observé des différences du poids final et du gain quotidien moyen entre les agneaux du système WP et HP. Le poids vif à l'abattage est différent (p = 0,007) avec 28,6 kg pour HP et 23,8 kg pour WP. Le poids de la carcasse était plus élevé (p = 0,003) pour les agneaux élevés sur HP que WP (14,1* vs *10,9 kg). Par conséquent, le rendement commercial, était de 49% pour HP et 46% pour WP. Le pourcentage de matière grasse était respectivement, de 11 et 15% pour WP et HP, alors que, la teneur en fraction maigre était plus élevée pour les agneaux du WP comparés à ceux du HP (64%* vs *62%). Cette composition résulte des différences du poids vif à l'abatage.*

Mots-clés. *Parcours herbacé – Parcours forestier – Croissance des agneaux – Carcasse – Importance tissulaire.*

I – Introduction

The parameters as lamb growth, carcasses characteristics and meat quality vary according to the production system (Moron *et al*., 1999). It was observed that lambs reared on pasture have generally more carcass muscle and bone and less fat than those of feedlot (Diaz *et al*., 2002; Santos-Silva *et al*., 2002). For feedlot there are many results concerning lamb's growth and carcass characteristics in relationship with feed level, protein level or resource, some additives, etc. However, to our knowledge within pasture there is no information concerning lamb's performance reared in different types, particularly the forest or woody pasture and land or herbaceous pasture. Livestock in the mountainous region of the Tunisian Northwestern is characterized by the use of different types of Mediterranean natural pasture. Lambs in this region are reared mainly with their dams on pasture until they reach 15 to 30 kg when they are slaughtered or weaned. The aim of the present contribution is to assess the effect of pasture type (herbaceous and woody) on the lamb's growth and carcass characteristics.

II – Materials and methods

Feeding system and animals. Sheep from local breed were fed on two rearing systems: (1) Woody pasture (WP) dominated by a stratum of trees as Aleppo pine, *Quercus ilex* and *Quercus suber* intercalated by shrubs as *Erica arborea*, Myrtre*, Asparagus aphyllus, Phillyrea latifolia* and *Olea europea* with herbaceous layer that depends on the seasonal rainfall, and (2) Herbaceous pasture (HP) based on mixed intercropping of grass and legume species as *Genera Lolium* (ryegrass), *Lotus* (trefoil), *Trifolium* (clovers) and *Medicago* (alfalfa). For the present study, 20 male lambs were randomly chosen, 10 from WP and 10 from HP. They were weighed monthly, from birth to slaughter.

Slaughter and dissection procedure. Lambs from each rearing system were slaughtered in two different days when they were weaned after 120 ± 20 days old. The animals were weighed before slaughter. After they have been slaughtered, they were skinned and eviscerated. After overnight stored at +4°C, carcasses were weighted and divided into halves. The left half-carcass was cut into six joints (leg, lumbar region, flank, thoracic region, neck and shoulder). The left shoulders were stored at -20°C. Frozen shoulder was thawed at ambient temperature (10-20°C) for approximately 18 h prior to dissection into muscle, bone, fat, and waste. Percentage of each component was calculated for tissue composition study given the shoulder composition is representative of the carcass composition.

Statistical analysis. The analyses of variance were performed using GLM procedure (SAS, 2004) to study the effects of rearing systems on the lamb growth performance, carcass characteristics and carcass composition.

III – Results and discussion

1. Growth performance

Table 1 reports growth performance analysis. With the design followed in our study, differences between the two groups essentially reflect differences between production systems. HP lambs tended ($P<0.10$) to have more important birth weight than WP lambs. The higher frequency of ewes to grass of the herbaceous pasture system may have improved their body conditions which are reflected in lambs as compared to the woody system. For the former the content of soluble carbohydrate, lignin cellulose and hemicellulose is higher than in herbaceous pastures consumed. This may cause lower intake and explain the difference in growth between HP lambs and WP lambs (Bocquier *et al*., 2002; Olafur 2001). It is most often the quantity rather than the qual-

ity of nutrition that is the limiting factor, as both protein and energy content are high in herbaceous pastures (Olafur, 2001). Nevertheless, differences (P< 0.05) were reported for the average daily gain and live weight even though the HP group showed higher values as compared to WP lambs. These results may result from the consumption of some grasses and clover feed by the HP lambs which improved the nutrient digestibility and the dry matter ingestion as compared to WP lambs that are affected by the tannin of forest vegetation (Faria *et al.,* 2012).

Table 1. Effect of rearing system on lamb's growth, carcass traits and composition

Production system	Woody pasture (AD)	Herbaceous pasture (F)	P	MSE
Birth weight (kg)	4.87	4.95	0.570	0.208
Average daily gain (g)	130	164	0.002	4.679
Slaughter body weight	23.87	28.62	0.007	1.085
Hot carcasse weight	10.95	14.10	0.003	0.608
Commercial yield (%)	45.75	49.00	0.001	0.570
Fat	10.54	14.65	0.019	1.101
Lean	64.55	62.35	0.227	1.233
Bone	23.47	21.88	0.023	0.443

2. Carcass characteristics

The effect of rearing system on carcass characteristics is presented in Table 1. The differences among rearing systems in terms of slaughter weight were significant (P<0.01). Lambs from HP system had higher values of hot carcass weight and commercial yield (P<0.01) than lambs from WP system. This is related to the slaughter body weight for HP lambs. These results are close to those observed by Sents *et al*., (1982) and Atti *et al*. (2003) who found that carcass weight and characteristics are correlated to slaughter body weight. In addition, Borton *et al.* (2005) observed, for forage-fed lambs, greater carcass weight compared to those complementation-fed.

3. Carcass composition

Table 1 reported the analysis of carcass composition. The rearing system did not affect (P > 0.05) lean proportion in shoulder; however, the fat and bone contents were different between groups (p<0.05). Compared to the herbaceous group, the woody group had higher proportion of bone (23.5 *vs* 21.9%) and lower proportion of fat (10.5 *vs* 14.7%). There was an augmentation in the percentage of fat for heavy lambs (HP) given this tissue have a late development. Fat depots depend on slaughter weight, nutritional level and nutrient utilization (Murphy *et al*., 1994; Mahouachi and Atti, 2005). In addition, lambs from woody system (WP) have more physical activity, which need more energy and result in less fat depot. While animals grazing herbaceous pasture did not accomplish a lot of displacement to find food, and they did not demand more energy to cover walking and climatic conditions requirements (Christopherson and Kennedy 1983; Smeti *et al*., 2014), so they may deposit more fat in their carcasses.

IV – Conclusions

The objective of this study was to investigate the effect of rearing system on the lambs' performances in terms of growth and carcass characteristics. The results show significant difference between the group of herbaceous pasture (HP) and woody pasture (WP).The HP lambs gained higher carcass weight (p = 0.003) and had higher (14% of fat) fat content compared to WP lambs.

However bone content was higher for WP lams. It could be concluded that although their higher fat proportion, the HP lambs are lean and more interesting in term of food supply, as WP lambs need food complementation. These first results suggest to analyze the chemical and sensory quality of the two lambs groups.

Acknowledgements

The experiment was carried out in the ODESYPANO-ESAK Research Development Project. The authors gratefully acknowledge the technical and financial assistance of their responsible and staff.

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