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Effect of ewe feeding on performance and meat quality of suckling lambs

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SUMMARY – To compare the effect of pasture or total mixed ration (TMR) in the diet of Massese ewes on performance and meat quality of lambs, 20 suckling lambs were considered: 10 animals were given milk by ewes reared in pen and fed a TMR (group A), while 10 lambs were fed by mothers grazing pasture (group B); all the lambs were slaughtered at the typical commercial weight (14 kg). Carcasses were evaluated according to the Mediterranean grid, some linear measurements were taken on them and the right proximal pelvic limbs were dissected into the main tissue components. The *longissimus lumborum* muscle was instrumentally analysed in order to assess some meat quality characteristics. Lambs of the group A reached the target slaughtering weight four days before the lambs of group B (P=0.03) and tended to have higher carcass compactness. Carcass weight, state of fattening and meat colour were comparable between groups. Lambs of group B had a higher chest depth (P=0.01) and pelvic limb length (P=0.03), confirmed by a higher pelvic limb percentage (30.93% *vs* 24.39% respectively). No differences were revealed for histological dissection of pelvic limb and for organoleptic and chemical characteristics of meat. In conclusion, it seems that the rearing technique and ewes' nutrition can induce some modification in lambs' performance without any changes in the analysed characteristics of meat.

Keywords: Meat quality, pasture, performance, suckling lambs, total mixed ration.

RESUME – *"Influence de l'alimentation des brebis sur le rendemnet et la qualité de la viande d'agneaux de lait". Vingt agneaux de lait de race Massese ont été élevés pour évaluer l'influence du lait, produit par des brebis élevées selon différentes techniques, sur la qualité de la viande. Dix agneaux ont reçu le lait produit par les mères alimentées selon une ration unique et en stabulation (groupe A) ; les 10 autres agneaux ont reçu le lait des brebis élevées au pâturage (groupe B). Tous ont été abattus au même poids vif prévu pour le marché (14 kilos). On a évalué les carcasses d'après la Grille Méditerranéenne, et des mesures linéaires ont été effectuées. On a divisé les principaux composants tissulaires des gigots droits, et examiné quelques caractéristiques qualitatives de la viande. Les agneaux du groupe A ont été abattus, à poids égal, quatre jours avant les agneaux du groupe B (P=0,03) et ont présenté des carcasses plus compactes en puissance. Dans les deux groupes, le poids des carcasses, les conditions d'engraissement et la couleur de la viande ont été semblables. Les agneaux du groupe B ont présenté le thorax le plus profond (P=0,01) et le gigot le plus long (P=0,03), ce dernier ayant une plus grande incidence (30,93%* vs *24,39% respectivement). La dissection histologique du gigot et les caractéristiques chimiques et organoleptiques de la viande n'ont présenté aucune différence. En conclusion, la technique d'élevage et l'alimentation des brebis paraissent être la cause de quelques modifications des rendements productives des agneaux mais non des caractéristiques examinées de la viande.*

Mots-clés : *Agneaux de lait, rendements productives, pâturage, ration unique, qualité de la viande.*

Introduction

Ovine meat production in central Italy is based on suckling lambs, derived from dairy sheep and reared with their mothers until the slaughtering age of about 30 days. This production is therefore strictly related to the quantitative-qualitative characteristics of milk that are influenced by ewe feeding, traditionally based on pasture. Alternative feeding system of dairy sheep may ameliorate milk production, with positive effects on growth of lambs.

To bring a contribute to this interesting topic, a trial was performed to compare the effect of pasture or total mixed ration (TMR) in Massese ewes diets on the performance and meat quality of suckling lambs. Preliminary results are reported.

Materials and methods

The experiment was conducted at a Tuscany farm that is converting its feeding system from pasture to TMR. A group of pregnant Massese ewes was reared in multiple pen and fed a TMR while another group of pregnant ewes was bred in a traditional system that includes the use of pasture. At birth, for each group ten Massese male lambs were weighed and reared with their mothers until the typical slaughtering weight for suckling lambs (14 kg). At slaughter, live weights were recorded and the carcasses were classified according to the EU Mediterranean classification system for carcass colour and fatness score by an experienced evaluator (EEC Regulation 2137/92 and 461/93). Linear measurements were taken on carcasses: pelvis width, chest width, half-carcass length, chest depth and pelvic limb length (ASPA, 1991). Carcass evaluation was supplemented by calculation of pelvic limb compactness (pelvic limb weight/pelvic limb length x 100) and carcass compactness (carcass weight/half-carcass length x 100) (Sarti *et al*., 1991). The right pelvic limb was removed from each carcass, weighed and its incidence on half-carcass weight was calculated. The pelvic limb was dissected into its main tissue components (lean, fat, bone and remainder) as it is considered to be the cut most representative of tissue composition of entire carcass (Gigli *et al*., 1982; Piccolo *et al*., 1993; Zezza *et al*., 1978). The percentage of various tissues to total weight of pelvic limb was calculated and the carcass muscularity was estimated in terms of lean/fat and lean/bone ratios. The day after slaughtering, m. *longissimus lumborum* was excised from each right loin for meat quality assessment. The pH was measured using a Hanna pH211 pH-meter, meat colour was determined by a Minolta CR300 colorimeter (source: D65) on a 2.5 cm thick freshly-cut slice of meat, allowed to oxygenate at 4°C for 1 h (Renerre, 1982). Water holding capacity was evaluated as drip loss (liquid lost from a meat sample refrigerated at 4°C for 24 h in a plastic container with a double bottom). Chemical composition was determined according to AOAC methods (1990).

Data underwent a variance analysis (SAS, 1994).

Results and discussion

The results of lambs productive performance are reported in Table 1. The lambs of group A (ewes fed TMR) were slaughtered, at the weight of about 14 kg, four days before the lambs of group B (ewes at pasture) (P = 0.03). This is probably due the higher weight at birth and to the higher daily weight gain of group A lambs. It seems that the TMR of ewes during pregnancy and lactation induced more weight increasing in the foetus and in the suckling lambs.

Table 1. Effect of ewes diets on lambs productive performance (mean ± SD)

	Group A (TMR)	Group B (Pasture)	P
N	10	10	
Weight at birth (kg)	5.63±0.72	4.61±1.71	n.s.
Weight at slaughtering (kg)	14.38±2.57	14.39±3.20	n.s.
Age at slaughtering (days)	23.83±2.40	27.80±3.39	0.03
Daily weight gain (g/day)	363.85±5.02	351.02±5.48	n.s.
Carcass weight (kg)	7.80±1.11	7.42±1.94	n.s.
Dressing percentage (%)	54.73±5.51	51.17±2.45	n.s.

Moreover, for both groups, the daily weight gain is very high in comparison to other findings on Massese lambs (Acciaioli *et al*., 2004; Martini *et al*., 1996). This result may be further investigated.

Dressing percentage tended to be higher for carcasses of group A compared to carcasses of lambs of the group B, even if the difference was not significant. All carcasses were classified in quality 1 in the EU Mediterranean classification system (pink meat and fatness score 2 or 3).

With regard to carcass measurements (Table 2) group B lambs had higher half-carcass length and

significantly higher pelvic limb length, thus less compactness of carcass and of pelvic limb. These results were confirmed by the significantly higher pelvic limb percentage observed for group B.

Table 2. Effect of ewes diets on lambs carcass measurements and on histological dissection of pelvic limb (mean ± SD)

	Group A (TMR)	Group B (Pasture)	P
N	10	10	
Pelvis width (cm)	13.83±1.60	13.10±1.97	n.s.
Chest width (cm)	14.17±1.17	12.83±1.63	n.s.
Half carcass length (cm)	48.17±3.60	50.40±3.89	n.s.
Chest depth (cm)	13.92±0.66	15.05±0.83	0.01
Pelvic limb length (cm)	23.58±6.87	29.20±1.77	0.03
Carcass compactness	16.15±1.38	14.55±2.79	n.s.
Pelvic limb compactness	4.25±1.23	3.90±0.85	n.s.
Pelvic limb (%)	24.39±3.80	30.93±0.93	0.01
Lean (%)	61.97±1.26	63.93±3.69	n.s.
Fat (%)	6.82±1.44	5.65±3.13	n.s.
Bone + remainder (%)	29.87±1.88	30.01±4.61	n.s.
Lean/Fat ratio	9.38±1.72	14.07±6.02	n.s.
Lean/Bone ratio	2.08±0.16	2.19±0.44	n.s.

The histological dissection of pelvic limbs did not show differences between the two groups of lambs; the high lean/fat and lean/bone ratios confirmed the good tissue composition of Massese lambs, slaughtered at the typical age of 25-30 days.

The quality characteristics of the meat as evaluated on m. *longissimus lumborum* are reported in Table 3: meat pH, colour and water holding capacity did not differ between groups, indicating that the different breeding system and nutrition of ewes had no effects on meat quality traits of suckling lambs.

Table 3. Effect of ewes diets on lambs meat quality and chemical composition (m. *longissimus lumborum*) (mean ± SD)

	Group A (TMR)	Group B (Pasture)	P
N	10	10	
pH	5.46±0.10	5.37±0.17	n.s.
Lightness	47.04±4.85	48.76±3.20	n.s.
Redness	12.60±2.37	12.47±2.95	n.s.
Yellowness	5.66±0.73	6.24±1.01	n.s.
Chroma	13.87±1.96	13.98±2.92	n.s.
Hue	24.78±6.67	27.14±4.90	n.s.
Drip loss (%)	4.09±1.12	4.49±2.78	n.s.
Dry matter (%)	24.32±1.12	23.14±1.46	n.s.
Ether extract (%)	1.40±0.33	1.39±0.40	n.s.
Crude protein (%)	21.78±1.18	20.66±1.22	n.s.
Ash (%)	1.14±0.04	1.08±0.09	n.s.

The chemical composition of the meat was similar between groups; the low content of ether extract testifies that the analysed meat was particularly lean: probably due to the very young age of the lambs, the intramuscular fat was not totally developed (Robelin *et al.,* 1977).

Conclusions

The results of this trial allow some comments to be made on the effect of breeding system and nutrition of ewe on suckling lambs performance and meat quality. The ewes reared in multiple pens and fed on TMR gave birth to heavier lambs that reached the slaughtering weight in fewer days compared to lambs born of pasture-fed ewes. It seems that carcass and meat quality are not influenced by the different ewe breeding systems, but the research should be deepened to confirm the results obtained and to evaluate the effect of dietary TMR on ewes milk composition and on fatty acid profile of lamb meat.

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