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Effect of the level of incorporation of olive cake in the diet on lamb fattening performance and carcass characteristics

M. Benbati[1], B. Belafqih[2], S. El Otmani[3], M. Mounsif[2] and A. Keli[2,*]

[1]INRA Tadla, B.P. 567, 23000 Beni Mellal (Morocco)
[2]Department of Animal Production, National School of Agriculture, BP S/40, 50001 Meknes (Morocco)
[3]INRA Tanger, 78 Bd Med Ben Abdellah, 90010 Tangier (Morocco)
*e-mail: akeli@enameknes.ac.ma

Abstract. An experiment was carried out to study the effect of incorporation of dried and partly destoned olive cake (OC) on lamb fattening performance and carcass characteristics. Twenty-four Moroccan synthetic breed lambs were randomly divided into four treatments of six lambs each: Control, OC10%, OC20% and OC30%. Lambs from the last three treatments were fed on a concentrate containing 10%, 20% and 30% of OC (DM basis), respectively. All diets were iso-nitrogenous and iso-energetic. After a 15-day adaptation period to the experimental diets the trial was run for 75 days. Lambs were weighed at the beginning and at the end of the trial, and fortnightly. At the end of the experiment all the lambs were slaughtered, and the carcass dressing percentage, fatness and conformation (SEUROP system) were measured. The incorporation of OC in the diet did not affect either the lamb fattening performance or carcass characteristics (P>0.05). Average daily gain during the whole period was 215, 244, 246 and 226 g/d for Control, OC10%, OC20% and OC30%, respectively, whereas the warm dressing percentage was 46.6%, 48.0%, 48.7% and 48.2%. Average carcass conformation was R, and fatness averaged 2.45 points on a 1-5 scale.

Keywords. Olive cake – Lamb – Fattening – Carcass.

Effet de l'incorporation des grignons d'olive sur les performances d'engraissement et les caractéristiques de la carcasse des agneaux

Résumé. *L'objectif de cet essai était d'étudier l'effet de l'incorporation des grignons d'olive séchés et partiellement dénoyautés (OC) sur les performances d'engraissement et les caractéristiques de la carcasse des agneaux. Vingt-quatre agneaux de race synthétique marocaine ont été répartis aléatoirement selon quatre traitements en quatre groupes de six agneaux chacun, appelés, respectivement "Control" ; "OC10%" ; "OC20%" et "OC30%". Les agneaux des trois derniers traitements recevaient des rations contenant, respectivement, 10%, 20% et 30% de grignons d'olive. Tous les régimes étaient iso-azotés et iso-énergétiques. L'essai a duré 75 jours précédé d'une période d'adaptation aux régimes expérimentaux de 15 jours. Les agneaux ont été pesés au début et à la fin du l'essai et tous les 15 jours. A la fin de l'essai, tous les agneaux ont été abattus et le rendement, l'état d'engraissement et la conformation de la carcasse (système SEUROP) ont été mesurés. L'incorporation de grignons d'olive n'a affecté ni les performances d'engraissement ni les caractéristiques de la carcasse des agneaux (P> 0,05). Le gain moyen quotidien durant toute la période de l'essai a été de 215, 244, 246 et 226 g/j, respectivement, pour les traitements "Control", "OC10%", "OC20%" et "OC30%", tandis que le rendement a été de 46,6% ; 48,0% ; 48,7% et 48,2%. La conformation et l'état d'engraissement des carcasses a été, respectivement, R et 2,45 en moyenne pour tous les traitements.*

Mots-clés. *Grignons d'olive – Agneaux – Engraissement – Carcasse.*

I – Introduction

In Morocco, small ruminant farming plays an important socio-economical role. It is considered as one of the main sources of income to farmers. However, the rainfall irregularity (drought), rangeland degradation and expensiveness of supplements affect negatively the productivity and there-

fore the farmers' income. The use of alternative feed resources such as local agro-industrial by-products can be considered as a solution to reduce feeding costs. Among these by-products, olive cake may be used and integrated in small ruminant feeding without affecting animal productivity (Ben Salem and Znaidi 2008; Molina-Alcaide and Yañez-Ruiz, 2008; Hadjipanayiotou, 2000; Chiofalo *et al.,* 2004; Keli *et al*., 2009). Despite the large amounts of olive cake produced in Morocco, its use in animal feeding is limited. The objective of the present work was to study the effect of the incorporation of olive cake in the diet of lambs on fattening performance and carcass characteristics in order to optimize its integration in small ruminants feeding.

II – Material and methods

Twenty four Moroccan synthetic breed weaned lambs (entire males), with an average initial live weight of 23.0 ± 0.52 kg and about 90 days of age, were randomly assigned to four treatments (6 animals per treatment) consisting in incorporation of different proportions of dried and destoned olive cake in the diet. Animals consumed a basal diet of alfalfa hay (0.55kg DM/head/day) and a concentrate composed of maize grain, barley grain, sunflower meal and mineral-vitamin premix. Barley grain was partially replaced (DM basis) by 10%, 20% and 30% of olive cake for OC10%, OC20% and OC30% treatments, respectively (Table 1). Diets were formulated to be iso-energetic and iso-nitrogenous and meet nutrient requirements of growing weaned lambs (Bocquier *et al*., 1988). After a 15-day adaptation period to the experimental diets the trial was run for 75 days. Free clean water was available at all times.

Table 1. Composition of concentrates

Ingredient (%, DM weight basis)	Treatment			
	Control	OC10%	OC20%	OC30%
Barley grain	57	50	42	35
Maize grain	16	16	14	13
Sunflower meal	26	24	22	21
Olive cake	0	10	20	30
Vitamin-mineral premix	1	1	1	1

OC10%: Concentrate containing 10% of dried and partly destoned olive cake; OC20%: Concentrate containing 20% of dried and partly destoned olive cake; OC30%: Concentrate containing 30% of dried and partly destoned olive cake.

Lambs were weighed before morning feeding, at the beginning and the end of the trial, and fortnightly.

At the end of the experiment, and after a fasting period of 24 h, all lambs were weighed (slaughter live weight: SLW) and slaughtered, and carcass weight was determined immediately (Hot Carcass Weight: HCW) to determine the dressing percentage (100* HCW/SLW). After an overnight chill (24 h at 4ºC), cold carcass weight (CCW) were recorded in order to determine the cold carcass dressing percentage (100* CCW/SLW), the fatness degree (1 to 5) and carcass conformation according to the SEUROP system (Cañeque and Sañudo, 2005).

The effect of different incorporations of olive cake on fattening performance and carcass characteristics was analyzed by means of a one-way analysis of variance according to the model: $Y_{ij} = \mu + Ti + \varepsilon_{ij}$ where Ti represents the treatment effect and ε_{ij} the experimental error. The PROC GLM procedure of the SAS statistical package (version 8.01) was used for the analysis. Comparisons among mean values were tested using the LSD test.

III – Results and discussion

1. Fattening performance of lambs

Initial and final live weights, as well as average daily gain (ADG), are presented in Table 2. No differences (P>0.1) in live weight were observed among treatments, although ADG during the first 30 days of fattening tended to be greater (P = 0.0517) for the lambs fed treatment OC20%. Lack of differences between levels of olive cake in the diet is in line with the observations of Tufarelli *et al.* (2013) and Sadeghi *et al*. (2009), although other studies have found that olive cake incorporation in lamb diets negatively affected ADG (Molina-Alcaide and Yáñez-Ruiz, 2008). Olive cake has also been incorporated in dairy sheep diets without negative effect on the production performance and milk quality (Chiofalo *et al.,* 2004; Pauselli *et al.,* 2007).

The feed conversion was also not affected by diet (Table 2). The absence of a significant effect may be is associated with a better feed efficiency of concentrates containing dried and partly destoned olive cake for LW gain (Sadeghi *et al.,* 2009). Similar results have been found by Vera *et al.* (2013) and Tufarelli *et al.* (2013) in lambs fed diets containing olive cake.

Table 2. Fattening performance of lambs fed with increasing amounts of dried and partially destoned olive cake

	Treatment					
	Control	**OC10%**	**OC20%**	**OC30%**	**SEM**	**P**
Live weight (LW, kg)						
Initial	23.3	22.8	22.8	22.9	1.10	0.9850
30 days	30.3	31.0	31.8	30.9	1.32	0.8695
75 days	39.4	41.0	41.3	39.9	1.62	0.8233
ADG (g/d)						
0-30 days	233	274	300	264	15.9	0.0517
30-75 days	203	224	209	200	13.8	0.6245
0-75 days	215	244	246	226	12.6	0.2765
Feed conversion ratio						
0-75 days	6.2	6.0	6.0	6.6	0.34	0.5420

OC10%: Concentrate containing 10% of dried and partly destoned olive cake; OC20%: Concentrate containing 20% of dried and partly destoned olive cake; OC30%: Concentrate containing 30% of dried and partly destoned olive cake; SEM: standard error of the mean; P: probability of the differences; ADG: Average daily gain.

2. Carcass characteristics

Carcass characteristics are given in Table 3. The analysis of variance revealed no significant effect of the level of olive cake in the diet. Similar results were obtained in other studies with fattening lambs fed a diet containing 20% (Tufarelli *et al.*, 2013) or 33% (Vera *et al*., 2013) olive cake.

IV – Conclusions

The results of this experiment showed that lambs may be fed dried and partly destoned olive cake at up to 30% of the concentrate during the fattening period without negative effects on fattening performance and carcass characteristics. However, further trials should be carried out involving aspects related to meat quality (chemical, physical and sensory parameters) in order to complete the results obtained in this study.

Table 3. Carcass characteristics of lambs fed with increasing amounts of dried and partially destoned olive cake

	Treatment					
	Control	OC10%	OC20%	OC30%	SEM	P
WCDP (%)	46.6	48.0	48.8	48.3	0.58	0.0902
CCDP (%)	45.4	46.8	47.2	46.8	0.61	0.1957
Fatness	2.4	2.5	2.4	2.5	0.11	0.8114
Conformation	R	R	R	R	–	–

OC10%: Concentrate containing 10% of dried and partly destoned olive cake; OC20%: Concentrate containing 20% of dried and partly destoned olive cake; OC30%: Concentrate containing 30% of dried and partly destoned olive cake; SEM: standard error of the mean; P: probability of the differences; WCDP: Warm Carcass Dressing Percentage; CCDP: Cold Carcass Dressing Percentage.

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