INTERNATİONAL JOURNAL OF AGRİCULTURE & BİOLOGY
ISSN Print: 1560–8530; ISSN Online: 1814–9596
10–576/MSA/2011/13–3–423–426
http://www.fspublishers.org

Full Length Article

The Effect of Prina (Olive Cake) Feeding Methods on Growth Performance and Behaviour of Awassi Lambs

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ABSTRACT

This study was carried out to investigate whether prina (olive cake) affects growth performance when given in diet or separately in choice feeding. Twenty four Awassi lambs were divided into three groups control, prina and choice. Control lambs were fed on lamb grower conteined 18% crude protein. Prina lambs were fed on a diet that 20% prina diluted concentrate feed including 20% crude protein. Choice lambs were offered a choice of concentrate feed and prina simultaneously. Treatments did not affect lambs growth performance negatively. Prina in concentrate and choice feeding increased ruminating behaviour without affecting animal health, suggesting that prina can be used in lamb nutrition to lower feed cost. However, lambs voluntarily consumed prina in smaller amout about 3.6% of diet, most likely due to its wooden content.

Key Words: Lamb; Olive cake; Choice feeding; Feed cost

INTRODUCTION

In animal production, the feeding cost has the great importance about 70% and studies have been tried to decline it. Agricultural by-products have great importance to compensate feeding cost in animal farming. Mostly are used sugars, tomato and bear industry byproducts depending upon local produced area.

Olive farming mostly has been carried out in Aegean and Mediterranean sites of Turkey. Olive has been milled to produce oil. In Mediterranean countries, olive cake is called "prina", which has been used as a fuel in domestic and industrial purposes. However, at this time, its protein content is also burned, which is going to be protein source for animal nutrition.

Chemical content of olive cake was studie by Razzaque *et al.* (1980) in detail. They chemically analysed seed, pulp and whole cake and foud out respective crude protein 3.57, 9.18 and 6.37%; crude fiber 27.23, 17.36 and 22.29%; ether extract 7.58, 21.49 and 14.53%; crude ash 3.41,13.01 and 8.22%, NFE 58.21, 38.96 and 48.60%. Air dry whole cake (prina) included seed, membran and pulp has 75-80% dry matter, 3-5% dry ash, 35-50% crude fiber, 5-10% crude protein and 8-15% ether extract depending upon processing methods and its seed content (René Sansoucy *et al*., 1985).

Olive cake has 3770 kcal/kg total energy (Hepbaslı *et al.,* 2003). It contained 92-93% organic matter, 7-8% crude protein, 1-6% ether extract, 28-31% crude fiber, 6-7% crude ash, 67-72% NDF, 60-61% ADF, 31-32% ADL and 28-29% hemicelluloses. Also, they found that its digestibitiy was about 46-47% in ruminants (Canbolat *et al.,* 2003).

Filya *et al*. (2006a) used olive cake after milling and sifting. They calculated metabolisable energy for olive cake as 1193.75 (raw material) and 1188.36 (milled material) kcal and 1560.73 kcal (milled & sifted material) per kg dry matter. They concluded that olive cake can be used in ruminant nutrition after drying, milling and sifting. Filya *et al*. (2006b) used dried and sifted prina at 5-20% levels in Merino lamb diet. They found out that there was no difference between control, 5, 10 and 15% prina contained diet. A 20% prina contained diet included more crude fiber and crude ash. They suggested 15% dietary inclusion of prina can be used in lamb diet.

Settineri and Puppo (1998) studied prina in in vitro study and found out that the organic matter digestibility of oil extracted prina was 20-22%, which was the same as sugar cane and higher than grape byproduct. Feggeros and Kalaisakes (1987) olive cake can be used at 8% with its seed in sheep diet without affecting digestion.

Prina treated with urea at 30% ditary level can be used for Awassi lambs without affecting body gain (Al-Jassim *et al.,* 1997). However, Mioc *et al*. (2007) used prina in Pramenka lambs at 15 and 30% dietary level and took better results for former dietary inclusion.

Dietary prina at the rate of 15% can be used in lambs (Tayer *et al.,* 1987). Their prina contained 12.8% protein, 6% crude oil, 17.9% crude fiber and 6.8% crude ash, while Belibasakis (1985) found out that prina can be used in lamb diet at 20% level. However, Chabouni (1984) suggested that

To cite this paper: Beken, Y. and A. Şahin, 2011. The effect of prina (olive cake) feeding methods on growth performance and behaviour of awassi lambs. *Int. J. Agric. Biol*., 13: 423–426

prina can be used in ruminant diet at 30% level. Leto (1984) analysed prina and its nutritional contents, which had 7.03% crude protein, 12.63% crude oil, 54.94% crude fiber and 1.89% crude ash. They used this prina at 30% in lamb diet and found out that it caused poor feed efficiency but increased feed intake tried to gain body.

Aguilera (1987) reported that prina had higher lignin content and its N content linked with lignocellullosic links, consequently its nutritive value was lower than expected. Munnoz (1991) analysed prina and found out 94.19% dry matter, 6.64% crude ash, 9.53% crude protein and 33.56% crude fiber. Sadeghi *et al.* (2009) used olive cake in growing Zel sheep. They analysed olive cake and found out that 87.6 dry matter, 7.6% crude protein, 38.7% crude fiber, ether extract 5.7%, NFE 40.6%, NDF 68.9%, ADF 51.2% and lignin 31.3%. Also, they included 20% olive cake in Zel lamb diet and calculated 7.5 feed conversation ratio for 20% olive cake included diet.

Above studies showed that prina can be used in ruminant diet from 5-30% and the increased prina inclusion slowed the performance in general. However, there has been a lack of study regarding different feeding methods of prina, especially for choice feeding. Therefore, the present study was designed to evaluate the effects of different olive cake feeding methods on voluntary feed intake, olive cake prerefence, growth performance and behavior of growing Awassi sheep.

MATERIALS AND METHODS

The study was carried out in the Research Farm of Mustafa Kemal University, Hatay, Turkey. Two and half months, 24 Awassi lambs were divided into three groups with equal number (n=8), sex (6 males+2 females) and live weight (38.3±0.64 kg per lamb). Lambs were kept in individual cages sized 1×1.2 m. Experimental diets control and concentrate are given in Table I. Feeds and prina were analysed chemically by the procedure of AOAC (2002). Experimental prina contained 92.6% dry matter, 3.8% crude protein, 42.4% crude fiber, 9.6% crude oil, 1.4% crude ash and 36.7% nitrogen free extract (Table II).

Before starting experiment, the lambs were habituated with the organoleptic properties of experimental feeds for one week. Choice group was offered one day concentrate feed and another day prina for seven days. Feeds refereshening was done at 10:00 by using 2 g sensitive scale. Live weights of lambs were determined biweekly at 9:00 o'clock.

Behaviour observations by eye scanning were recorded for one hour 1:00-12:00 at 5 mins time intervals once in a week during experimental period 54 days. Behavioral elements were resting, ruminating, drinking, standing and etc. (Fraser & Broom, 1991). The first seen activitiy was mainly recorded.

The performance data were evaluated by using the One Way procedure of SPSS (Windows version of SPSS, release 10.01). Behavioural data were analysied using Chi Square Test using the same software. The means were compared using Duncan Multiple Range Test within this software.

RESULTS

Results showed that either prina inclusion or choice feeding did not affect the growth performance of lambs (Table III). All lambs increased feed intake by day to day during experimental period (Fig. 1). In the last period of experiment, both control and prina lambs consumed the same amount of feeds, while choice lambs decreased feed intake during this period. Choice fed lambs consumed daily 15-65 g prina voluntarily. There was no increase in its intake during experimental period (Fig. 2). Table IV shows that lambs increased concentrate intake when getting older, while prina consumptions were steady.

The effect of prina either in concentrate or in choice feeding on behaviour lambs is given in Table V. Control lambs ruminate less but rested more, while choice lambs ruminated more and rested less ($P<0.01$). Control animals ruminated less since their feeds were milled and no contained prina. Prina has lignocellulosic content within its seed. In this study, prina was not milled before the usage both prina and choice group since it was thought that farmers have no facility to mill prina. Unmilled prina caused more ruminating behaviour as seen in prina and choice group.

DISCUSSION

In the present study, there were no significant differences between treatments with respect to growth performance. Similarly, 20% dietary inclusion of prina did not affect animal performance as Belibasakis (1985), Filya *et al.* (2006b), Abou-Shloue and El-Sayed (1996), Chabouni (1984), Tayer *et al.* (1987), Omar and Gavoret (1995) found. When given a choice of prina and concentrate feed, lambs selected only about proportionally 3.6%. This was related to wooden material of olive seed. For this result, prina should be milled and sifted before using in animal nutrition as Filya *et al.* (2006 a,b) suggested.

Either prina inclusion or choice feeding did not affect the growth performance of lambs (Table III). When looked to feed consumption data, prina had no any adverse effect on appetite. However, Feggeros and Kalaisakes (1987) reported that prina's digestibility was lower; this was related to the higher amount of lignine with its tanin contents. Also, Yansari *et al*. (2007) tested the digestibility of protein content of olive cake in Zel sheep and found out that the lower digesbility rate was related to Mailard reactions or tannen–protein complexes. Filya *et al.* (2006a) argued that poor digestibility arises, because of the presence of proteins in lignocellulosic compound. Aguilera (1987) reported that prina can be used after its nutritional value is increased from

Table I: Feed ingredients of experimental diets, %

Feed ingredients	Control diet	Concentrate feed
Barley	50.0	54.0
Wheat bran	10.0	5.0
Cotton seed meal	10.0	10.0
Soya bean meal	15.0	23.0
Alfalfa meal	12.0	5.0
Limestone	2.6	2.6
Salt	0.3	0.3
Premix*	0.1	0.1
Chemical contents,%		
Crude protein (calculated)	18	20
Crude protein (analysed)	17.1	19.9
Ca	1.15	1.09
P	0.46	0.47

*Per kg premix contained 1.500.000 IU Vitamine A, 300.000 IU Vitamine D_3, 5000 mg Vitamine E, 100 mg Vitamine K_3, 100 mg Vitamine B_1, 250 mg Vitamine B_2, 20 mg Vitamine B_6, 2.00 mg Niacin, 500 mg Cal–D-Pantatenate, 100 mg Vitamine C, 5000 mg Mn, 5000 mg Fe, 5000 mg Zn, 1000 mg Cu, 80 mg I, 50 mg Co, 54.000 mg P, 311.000 mg Ca and 15000 mg antioxidant

Table II: Experimenta design

Groups	Number of animals	Feeding methods
Control	8	Lambs were fed on control diet contained 18 % crude protein
Prina	8	Lambs were fed on concentrate diet diluted with 20 % prina
Choice	8	Lambs were offered a choice of concentrate and prina in separate feeders

Table III: The growth performance of lambs

Parameter (kg per lamb)	Control	Prina	Choice	P values
Initial live weight	38.2±1.14	38.5±0.70	38.1±2.20	0.966
Total feed intake	71.6±0.62	69.3±3.16	67.5±3.31	0.611
Final live weight	48.5±1.27	48.6±1.03	47.9±2.34	0.939
Total live weight gain	10.3±0.71	10.1±0.72	9.8±0.22	0.891
Feed conversion ratio	7.2±0.53	7.0±0.22	6.9±0.29	0.903

Table IV: Daily concentrate and prina intakes of choice fed lambs, g per lamb

Experimental periods, days	Concentrate intake (g)	Prina intake (g)	Total feed intake (g)	Proportional intake of prina (%)
1.-15	1025.2±26.17^{d}	39.8±2.56	1065.0±25.80 ^{d}	4.4±0.35^{a}
15.-30	1172.9±25.93^{c}	36.6±3.30	1209.6±25.24 ^{c}	3.6±0.37^{ab}
30.-45	1320.6±32.48^{b}	40.8±2.75	1361.4±33.01 ^{b}	3.2±0.21^{b}
45.-54	1600.1±50.07^{a}	43.6±4.16	1643.8±50.35 ^{a}	2.9±0.29^{b}
Pooled	1244.1±18.46	39.8±1.55	1283.9±18.48	3.6±0.16
P values	0.000	0.515	0.000	0.008

a-c shows statistical difference between experimental periods for each parameter

Table V: The effect of olive cake on the behaviour of Awassi lambs (%)

Parameters/groups	Eating	Ruminating	Drinking	Standing	Resting	Others
Control	22.44	9.78	0.96	33.97	29.81	3.04
Prina	22.11	13.78	0.80	38.62	20.67	4.01
Choice	25.96	20.03	1.12	35.42	15.54	1.92
Chi Square (X^2)	2.418	22.949	0.333	1.961	29.597	4.536
P values	0.298	0.000	0.846	0.375	0.00	0.104

41 to 53% by sifting and mixing with alkali at the rate of about 10%.

Choice fed lambs consumed daily 15-65 g prina voluntarily. There was no increase in its intake during experimental period. However, the concentrate intake increased from day to day, paralleling with increased nutritional requirements of lambs since lambs have the ability to make their own diets when offered feeds in reasonable nutritional wisdom (Görgülü *et al.,* 1996; Şahin *et al.,* 2003).

In conclusion, both 20% prina dilution to concentrate feed and given prina with choice feeding did not affect the performance of lambs. However, in choice feeding, lambs pereferred concentrate feed rather than prina. Prina applications in lamb nutrition can be used in lamb nutrition. The dilution of concentrate feed by 20% will decrease feed cost since the price of prina is about one fourth of lamb grower diet.

Fig. 1: Daily feed intake of experimental lambs

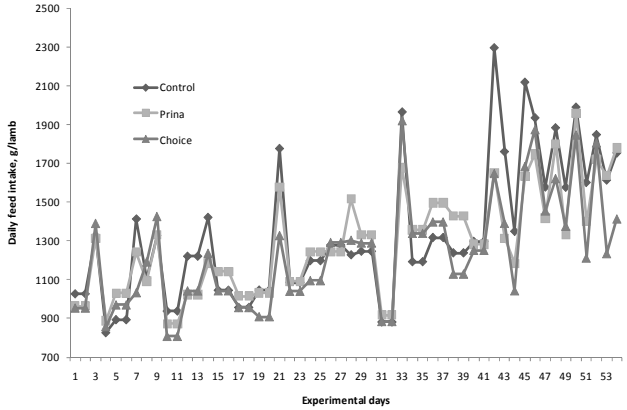
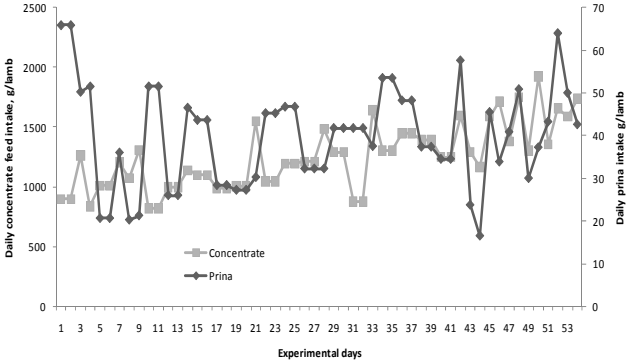


Fig. 2: Daily concentrate and prina intakes in lambs



Acknowledgement: We thank Resarch Funding Committee of Mustafa Kemal University for supporting the MSc Project registered 07M1201.

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(Received 03 November 2010; Accepted 11 December 2010)