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Replacing Soya by Scotch Beans Affects Milk Production in Sicilo-Sarde Ewes Fed Concentrate During the Suckling Period

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Abstract: The objective of this study was to evaluate the effects of using scotch beans, a relatively low cost feed resource in Tunisia, as an alternative to soya beans in dairy ewes' rations. Milk production and quality were measured in Sicilo- Sarde ewes during the suckling period. Twelve ewes in the third lactation were divided into two groups homogenous for age (5 years±2 months), litter size (1.92±0.67) and live weight (42±2 kg). Ewes were fed twice a day (at 8:30 am and 15:00 pm) during 11 weeks and each animal was offered 1.5 kg of oat hay and 0.5 kg of one of two concentrates. The first concentrate (CSoB) contained 77% barley, 20% soya bean and 3% vitamin and mineral mixture (VMC). The second concentrate (CScB) contained 77% barley, 20% scotch bean (locally produced) and 3% VMC. Milk yield was measured daily by a direct method after oxytocin injection. Milk samples were taken each week to determine contents in fat, protein and lactose. The CScB and CSoB concentrates had similar energetic contents, while the contents in crude protein were lower in CScB than those in CSoB. The daily milk production was higher ($p<0.05$) in ewes fed the CSoB concentrate (1109±400 ml) than in those fed the CScB supplement (855±325 ml). Likewise, fat percentage was higher ($p<0.05$) in the CSoB group (7.85±0.8%) than that in the CScB group (6.75±0.66%). The protein content did not differ between the two groups (CSoB: 5.54±0.34%, CScB: 5.51± 0.27%). On the other hand, the amount of lactose was lower ($p<0.05$) in the CSoB group (3.48±0.21) than that in the CScB group (3.61±0.13). The weaning weight of lambs was comparable for both groups (CSoB: 12.8±1.3 kg, CScB: 10.7±1.5 kg). It is possible to replace Soya by Scotch beans in the Sicilo- Sarde ration without compromising either milk production or growth of lambs.

Key words: Ewes · Sicilo- Sarde · Scotch bean · Soya bean · Milk yield · lamb growth

INTRODUCTION

Sheep milk production in Tunisia comes essentially from the Sicilo- Sarde breed. The female population of this breed has declined from 200,000 in 1990 to 18,000 in 2004. This reduction was mainly caused by the low price of milk, which was not appealing for farmers having Sicilo-Sarde folks. Furthermore, milk production performances were limited under the current management circumstances [1]. Ewes are managed under a low to medium input production system. diets are based on leftovers from cereal harvests and ewes are occasionally fed imported expensive Soya concentrate during physiological critical phases. Levels of concentrate added during the milking period was not found to meet ewes requirements [2-4]. The objective of this study was to evaluate the effects of replacing Soya by Scotch beans in the Sicilo-Sarde ewes' ration on production performances.

MATERIALS AND METHODS

Animals and Diets: Twelve Sicilo-Sarde ewes lodged in sheep pen were used during the experimental period. Five (± 2 months) years old ewes were in their first eleven weeks of lactation. They were divided into two equally sized groups homogenous for live weight (42 kg±2 kg), lactation rank (third lactation) and litter size (1.92±0.67). Each animal was fed 1.5 kg of oat hay on a daily basis and 500 g of one of two concentrates in two meals (at 8:30 am and at 15:00 pm). The first concentrate (CSoB) contained 77% barley, 20% Soya bean and 3%vitamin and mineral mixture (VMC). The second concentrate (CScB) contained 77% barley, 20% Scotch bean (locally produced) and 3% VMC. Lambs received a creep feeding (hay and concentrate) from 30 days of age to the end of the experimrnt. Water was ad libitun for all animals. The trial was conducted at the experimental station of the

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Table 1: Chemical composition of aliments

	Concentrate		
Nutriments	CSoB	CScB	Oat hay
DM (%)	88.55	89.32	86.77
CP (% DM)	17.70	13.40	4.30
CF (% DM)	5.30	7.30	38.80
OM (% DM)	94.30	94.70	91.20

CsoB: 77% barley, 20% Soya bean and 3% VMC; CScB: 77% barley, 20% Scotch bean and 3% VMC.

School of Higher Education in Agriculture in Mateur (ESA Mateur), Tunisie". The lodging was oriented north-west- south-east. Density was 2.67 m^2/ewe.

Chemical Composition of Aliments: Chemical composition of various feed resources was determined in the animal nutrition laboratory at the ESA Mateur (Table 1). Chemical composition and nutritive values of experimental aliments were determined following the method described by Sauvant [5].

Feed Ingestion and Animals' Weights: Aliments were distributed on fixed times during the whole trial (8: 30 am and 15 pm) to avoid perturbing ruminal flora. Distributed and refused hay and concentrate amounts were weighed on a daily basis. Ingestion was then deduced by subtracting refusal from distributed amounts. Adult and young animals were weighed weekly on an emply stomatch. Weight measures served for following body weight variation of ewes and growth of lambs.

Milk Production: Milk production was recorded on every Thursday of each week during the whole experimental period. Milk yield was determined following two oxytocine injections. The first one (2.5 IU) at 9 am served for emptying teats. Lambs were then separated from ewes. The second injection (5 IU) at 11 am was followed by a complete milking of ewes. Recorded milk quantities obtained after the second oxytocine injection were multiplied by 12 to determine daily (24 hours) milk yield. Samples from mixed milk for each group were taken to determine pH, density, fat, protein, lactose, solids and the freezing point. Analysis of milk samples was carried out by an ultra sonic milk analyser, a lactoscan (Milktronic LTD, serial N° 4696, Hungary).

Statistical Analysis: Effects of diet on measured variables were compared following a one way analysis of variance using the Student T test [6].

RESULTS AND DISCUSSION

Dry Matter Intake and Evolution of Ewe's Live Weights: There were no significant differences ($p > 0.05$) in forage ingestion between CSoB and CScB groups during the suckling period. The mean ingestion was 1.221 and 1.226 kg DM/d/ewe. There were also no significant differences ($p > 0.05$) between weights of ewes in both groups and mean ewe live weights were 37 and 41.1 kg for CSoB and CScB group, respectively. The Soya complemented group showed the highest weights around the 10th week of lactation (39.1 kg) and the lowest weights around the 4th week from lambing (36 kg). Corresponding weights for the second group of ewes were 41.83 and 38.3 kg. Ewes loose weight due to mobization of body reserves to meet production requirements. These needs are high during the peak of lactation (4th week for dairy ewes). At the end of the suckling period, the complementation seems to turn ruminal fermentation towards the production of propionic acid which may lead to depositing fat. Growth curves of lambs were similar ($p>0.05$) for both groups.

Milk Production: Table 2 shows mean daily and total milk yields during the recording period. Ewes of the CSoB produced more total milk (70.994 l) than those of the CScB

Table 2: Milk yield production of ewes by diet

Parameter	CSoB	CScB	Pr	ES
Total milk yield (l)	71^a (19.6)	54.7^a (14.02)	0.182	7.58
Test-day yield (ml)	1109.3^a (479.1)	855.2^b (314.5)	0.0006	153.1

a, b: Means on the same lines with different superscripts are significantly different ($p<0.05$), ES: Standard error of the mean, ( ): Standard deviation, CSoB: 77% barley, 20% Soya bean and 3% VMC; CScB: 77% barley, 20% Scotch bean and 3% VMC, (.): Standard deviation

Table 3: Quality of milk produced by ewes fed CSoB and CScB concentrates

Group			Coefficient of		
Parameter	CSoB	CScB	determination	Pr	ES
pH	6.767^a	6.826^b	0.97	0.0003	0.01
Density	1031.4^a	1032.3^b	0.82	0.0065	0.25
SNF (%)	9.97^a	10.056^a	0.88	0.1591	0.05
Fat (%)	7.85^a	6.75^b	0.91	0.0001	0.15
Protein (%)	5.54^a	5.51^a	0.93	0.3195	0.02
Lactose (%)	3.49^a	3.61^b	0.82	0.0044	0.03
Solids (%)	0.91^a	0.92^a	0.85	0.2712	0.01
Freezing point (° C)	- 0.49^a	- 0.51^b	0.86	0.0551	0.00

CsoB: 77% barley, 20% Soya bean and 3% VMC; CScB: 77% barley, 20% Scotch bean and 3% VMC.

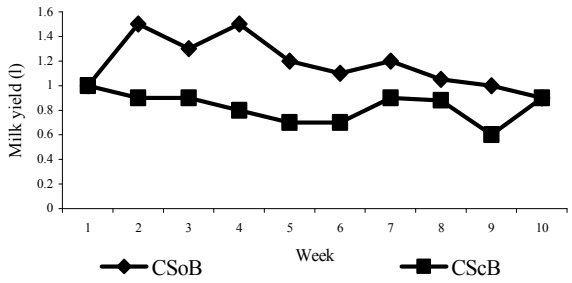

Fig. 1: Weekly milk production of ewes by diet (CSoB: 77% barley, 20% Soya bean and 3% VMC; CScB: 77% barley, 20% Scotch bean and 3% VMC)

(54.733 l) group. Daily milk production (Fig. 1) differed also between ewe groups. They were 1109.28 and 855.20 ml for the CSoB and CScB group, respectively. These results are in agreement with those reported by [2, 7, 8]. High contents in methionine and lysine of Soya beans compared to Scotch beans may explain differences in milk production by both ewe groups [9, 10].

Milk Quality: The main characteristics of milk produced by CSoB and CScB ewes are given in Tab. 3. The pH, lactose and density were higher ($p < 0.05$) in the milk produced by ewes of the CScB than that of ewes of the other group. On the other hand, milk fat content was higher for the CSoB ewe group (7.85% vs 6.75%). High contents of Soya beans in crude protein promote the formation of amino acids enhancer of some fat production. These results agree with those reported by Bocquier and Caja [8]. Protein contents were comparable for both ewe groups [11].

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