

Article

## Effect of the incorporation of date pits and orange pulp in rations composed of wheat straw and concentrate on the blood biochemical parameters of Ouled Djellal breeding

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Received 22 August 2014; Accepted 26 September; Published online 1 December 2014



### Abstract

Twenty four lambs of Ouled Djellal breeding from the region of Constantine, Algeria, were assigned randomly into 4 groups, the mean initial weights within the groups, ranged between  $37.6 \pm 4.27$  and  $39.8 \pm 5.41$  kg, to investigate the effect of the incorporation of two by-products of food industry, fresh orange pulp, ground date pits in rations composed of wheat straw as roughage, and concentrate as supplement. Four feeding groups were formed, the first group (T1) was fed with wheat straw and concentrate (60%/40%), the second group (T2) with wheat straw and orange pulp (60%/40%), for group 3 and 4 (T3-T4), the diet consisted on a mixture of 60 % wheat straw and date pits at a ratio of (80 to 20%) as a roughage in addition to 40% orange pulp for T3 and 40% concentrate for T4. Blood samples were collected from the jugular vein before morning feeding. Values of animal's plasma levels of Ca, glucose, proteins and urea were measured using a UV spectrophotometer. There was no significant difference in all the diets for Ca value, Ca values varied between 8.37 and 10.74mg/Dl. T4 showed the highest value. Glucose blood content was similar for all the animals with no significant differences. While a very significant difference  $<0.001$  was observed in blood proteins level in T3 and T4 comparing to the other groups. When date pits were incorporated in the diet containing wheat straw and concentrate, a very significant difference on urea blood content of lambs was observed ( $P < 0.001$ ).

**Keywords** Ca; dates pits; glucose; lambs; plasma; proteins; urea.

Environmental Skeptics and Critics

ISSN 2224-4263

URL: <http://www.iaees.org/publications/journals/environsc/online-version.asp>

RSS: <http://www.iaees.org/publications/journals/environsc/rss.xml>

E-mail: [environsc@iaees.org](mailto:environsc@iaees.org)

Editor-in-Chief: WenJun Zhang

Publisher: International Academy of Ecology and Environmental Sciences

### 1 Introduction

Concentrate ingredients are commonly used in ruminant feeding systems to supply both protein and energy to the animal (Woods et al., 2003). However the expensive costs of this foodstuff encourage the farmers to use low cost feeds. By-product feeds are increasingly important in ruminant feed systems (Moore-Colyer et al.,

2000) and its use is to increase in developing countries. It is well known that alternative feed sources have the potential to either maintain, or even to improve, the reproductive performance of the flock (Blache et al., 2007). In Algeria, cereals constitute the major vegetal production with more than 40 millions tones, fruit trees as well, showed a great development since 2000 with more than 6800 tones/year and 4900 tones/year for citrus products and dates respectively (INRAA, 2006). Therefore, these local by-products could be of great interest to promote ruminant's production in Algeria.

In the other hand, blood parameters can be good predictors of animal status (Gupta et al., 2007). Caldeira et al. (2007) reported that the best parameter for predicting energy balance and metabolic protein in sheep are glucose and urea level in blood respectively. Furthermore, Egan and Kellaway (1971) suggested that urea is a realistic predictor of both N utilization and nitrogen intake of sheep.

The aim of this study was to evaluate the biochemical parameters in blood of local Algerian breed (Ouled Djellal) fed with various agriculture by-products (wheat straw, date pits, orange pulp) in comparison with a wheat straw-concentrate based feed.

## 2 Materials and Methods

### 2.1 Animals

Twenty four lambs aged of one year of Ouled Djellal breeding were randomly assigned into 4 groups. Their live weights ranged between 28 and 47 kg at the beginning of the experiment.

The animals were accustomed to diets for 15 days before the starting of the experiment. They were fed once daily.

Water and minerals stones were available throughout the experiment.

### 2.2 Feed

The distributed diets were composed mainly of wheat straw (1.5 kg) with either concentrate for two groups of lambs or orange pulp (1 kg) for the other 2 groups. Wheat straw was substituted with ground date pits at a level of 200 g for the third and the fourth group.

### 2.3 Composition of diets

See Table 1 for composition of diets.

**Table 1** Diets composition.

Ingredients	T1	T2	T3	T4
Wheat straw (60%)	1.5	1.5	1.5	1.5
Orange pulp (40%)	-	1	1	-
Date pits (200g)	-	-	200g	200g
Concentrate (40%)	1	-	-	1

The concentrate was composed from barley, maize, wheat bran, soybean, NaCl and a mixture of minerals and vitamins at the following proportions 270, 270, 270, 180, 1.7 and 1 g/kg de DM, respectively.

Samples of blood were collected from the jugular vein prior to the morning feeding into Vacutainer tubes with anticoagulant, centrifuged at 1500 x g for 5mn, and frozen until further analysis.

The analyses were performed with a UV spectrophotometer using ready to use spectrophotometrical kits. The parameters measured were Ca, glucose, proteins and urea to study the effect of the diets in the blood parameters.

## 2.4 Statistical analysis

A one way analysis of variance ANOVA was carried out to determine statistical differences of the mean values of blood parameters using statistical software MINITAB 16.

## 3 Results and Discussion

Table 2 shows that Ca level in plasma did not differ in the entire diets group. The highest level of Ca was observed in diet 4 group with a mean value of 11.17mg/dl at the end of the experiment.

This finding is in agreement with the values reported in the literature with a Ca level comprises between 9.4 and 12mg/dl (Lane et al., 1967; Bostedt and Dedić, 1996).

**Table 2** Ca, glucose, protein and urea blood level of lambs according to the different diets.

	Diet1	Diet2	Diet3	Diet4	SEM <sup>1</sup>	P value
Ca1 (mg/dl)	8.96	8.37	9.14	10.74	1.78	0.157
Ca2 (mg/dl)	8.99	10.31	11.78	11.17	1.78	0.06
Glucose1 (mg/dl)	62.30	59.14	68.67	70.04	9.84	0.207
Glucose2 (mg/dl)	68.18	67.05	74.15	72.83	9.72	0.529
Protein1 (g/l)	7.76a	6.76a	7.18a	10.68b	0.79	<0.0001
Protein 2 (g/l)	11.07a	5.13b	7.84c	11.22a	1.39	<0.0001
Urea1 (mg/dl)	41.61	35.64	38.9	47.03	7.22	<0.07
Urea2 (mg/dl)	36.08a	31.11a	34.46a	48.16b	4.95	<0.0001

<sup>1</sup> standard error of the mean.

<sup>a, b, c</sup> mean values within a row with unlike superscript letters differ (P<0.05).

(Ca1, Glucose1, Proteins1, and Urea1: First blood sample; Ca2, Glucose2, Proteins2, Urea2: second blood sample).

Glucose level in blood of the lambs ranged between 59.14 and 74.15mg/dl, an increase of glucose level was noticed at the end of the experiment. No significant difference was observed in all the groups. It has to be stressed that all the diets used in this experiment are rich energy-feed. Concentrate is a common feed used to provide the required energy and protein to animals (Wood et al., 2003). Harris et al. (1982) reported that citrus pulp is a highly digestible source of energy and appears to affect the utilization of other components in ruminant rations.

In contrary, there was a significant difference in total proteins and urea between diet groups (P<0.001). Levels of total proteins in blood varied between 5.13 g/l, 7.84 g/l for T2 and T3 respectively and were higher in T1 and T4 with 11.07 and 11.22 g/l respectively.

Urea blood level was significantly different in T4 with 48.16 mg/dl. This level could be explained by the high content of diet 4 of proteins comparing to the other groups.

The general increase in blood urea is due to the increase of fermentation rates. NRC (2007) reported that supplemental grain starch, dried pulp provided as an energy sources, significantly increase urea nitrogen capture in the rumen.

## 4 Conclusion

In conclusion, the replacement of concentrate with orange pulp has no significant effect on the blood parameters of the lambs. Moreover, fresh orange pulp induced a high level of glucose and Ca in blood.

Date pits enhanced protein as well as urea blood level which can be a good indicator of a better use of proteins of both orange pulp and concentrate.

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