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Effect of the ratio of incorporation of the date wastes at the end of gestation on the blood biochemical parameters in Oueld Djellal ewes

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ABSTRACT

The increase of the nutritive needs in ewes at the end of pregnancy, period where the feeding has a determinant action on the strength of lambs and on the preparation of ewes to lactating, emposes a food complementation particularly on extensive system. In order to determinate the effect of supplementation of date wastes on the variation of energetic and nitrogenic metabolism parameters, 45 pregnant ewes were distributed randomly in three groups; two experimental groups (25%R et 50%R) received during the last two months of pregnancy, a complementation. During the incorporation of date wastes at 25% mixed with concentrate, the females showed high plasmatic level of cholesterol (p<0.001) and triglycerides (p<0.001) and a low level of glucose (p<0.001) comparatively to the group 50%R and to the control group 0%R that did not vary significantly. However, the low plasmatic levels of total proteins (p<0.0001), of albumin (p<0.001) and of urea (p<0.01) were observed in females receiving a complementation of 50%. The date wastes remain protein's deficient, which could be corrected by a simple protein intake making them interesting in their incorporation in animals feed. The replacement of date wastes to concentrate classically used would be of an economical interest.

Keywords: End of gestation, ewes, date wastes, biochemical parameters, and incorporation rate.

INTRODUCTION

In the arid and semi-arid zones where the dry periods are long and the rainfall is low, the food intake is generally deficient in digestible energy and in proteins [1]. The end of gestation is one of the key periods of the ewe cycle, where feeding has a determinant action by conditionning the lamb weights at birth as well as milk yield of ewes. The recourse to complementation based on barley, cereal, is used in animal feeding.

This main food composing concentrate food is almost imported from Europe and America with a large amount of foreign currency, which could penalize the production systems of ovine based on barley.

The date palm production in Maghreb is dominated by Algeria with a production of 470 000 tones, followed by Tunisia with 125 000 tones and finally by Morocco with 69 400 tones [2].

The date wastes, results of sorting after harvesting, are dates of bad quality, of low value, improper of human consumption either due to their low gustative quality, or because to their hard texture [3]. They could be valorized, by their incorporation in the animals food rations [4].

Beside the local production, the date wastes are characterized by their high sugar content that could constitute an energetic raw material as an alternative to barley. The date wastes used in sheep are of hachef categories which are dehydrated dates, of the same variety "Mech Degla" and coarsely ground [5]. In the context of the cost reduction of animals feed, the aim of this experiment is to compare the effect of different levels of energetic substitution (date wastes vs. barley) at the end of pregnancy on the variation of blood biochemical parameters of ewes of Ouled Djellal breeds.

MATERIALS AND METHODES

1. Animals and farming methods

The study was conducted at the experimental farm of the Technical Institute of livestock of Aïn M'Lila (ITELV) at the North east of Algeria.

This semi arid region is recognized by rigorous climatic conditions characterized by a continental climate in cold winter with an average minima varying from 1 to 5° C and hot summer with average maxima from 33 to 40° C.

The study involved 45 ewes of Ouled Djellal ewes, clinically healthy, multiparous, with an average weights of 53,65 \pm 4,22 Kg. The rams are permanently present in the herd and the fight is free. The lambing takes place mostly in full autumn but start since September with a minimum lactating period of 30 days. The young and adults use the same pastures.

2. The food and water

The ewes are distributed randomly in three groups of 15 females. The composition of concentrate varied according to the group:

0% of date wastes and 100% of concentrate for the control group (0%R), 25% of date wastes and 75% of concentrate for the group (25%R) and 50% of date wastes and 50% of concentrate for the group (50%R). The three diets are different only by the nature of the given energetic complements (date wastes vs. barley). The concentrate distributed in the sheepfold is composed mainly of crushed barley, of wheat bran, soybean oilcake, and CMV with respective proportions of 80, 10, 7, 3 %.

All the ewes were similarly fed during gestation: the pasture is ensured from permanent grassland.

Moreover, all the females pastured also cereal stubbles (barley) during the summer period (mainly in August) coinciding with the last two months of gestation. During this period, the ewes of the experimental groups 25% R and 50% R received, after grazing, a daily complementation based on date wastes with respective proportions of 25% and 50% of date wastes mixed to concentrate. After batching, an adjustement period was applied; the proportions of date wastes were gradually increased in order to allow the ruminal microbial fermentation to adapt to the diets.

	0%R	25%R	50%R ⁽¹⁾		
Ingredients	4	4	4		
Estimated Pasture (kg/d)					
Hay of vetch oat (kg/d)	1	1	1		
Concentrate (g/d)	350	263	175		
Date wastes (g/d)	0	88	175		
⁽¹⁾ Date wastes					

Table 1: Composition of food diets distributed to ewes at the end of gestation

3. Biochemical sampling

Blood sampling were done by puncturing the jugular vein the morning before the food intake. The blood samples were collected in dry vacutainer tubes, centrifuged immediately at 3000tr/mn, during 15mn. The serums corresponding were stored at -20°C. The assay of biochemical parameters were realized by spectrophotometry UV in an automate (Siemens ADVIA 1800) of the university hospital center of Constantine. The blood analyses were carried on the energetic parameters (glucose, cholesterol and triglycerides) and nitrogen (total proteins, albumin and urea).

4. Statistical analyses

All the data were expressed by the mean \pm mean standar error (m \pm S.E.M). The results were submitted to the variance analysis of one factor (ANOVA1) followed by a multiple comparaison by the Newman-Keuls test. The relations between the different studied parameters were checked by the significance test of the Spearman and

Pearson coefficient correlation. All these analysis were done by mean of the softwear GraphPad Prism (version 5.03). The statistic threshold of significance chosen is less to 5%.

RESULTS AND DISCUSSION

The biochemical parameters obtained of ewes are shown in table 2. It has to be noticed that the plasmatic concentrations of the studied parameters are in the range of the standard references reported by Ramos et al. (1994); Dubreuil et al. (2005); Kaneko et al. (2008); Dimauro et al. (2008); Simpraga et al. (2013).

During the incorporation of dates at 25% in the diet of the pregnant ewes, the glycemia decreased significantly (p<0.01). On the other hand, triglycedemia increased significantly (p<0.01) in comparison to the two other groups 0%R and 50%R.

 Table 2: Variation of the plasmatic levels (g/l) in glucose, cholesterol, triglycerides, total proteins, albumin and urea related to the incorporation level of date wastes in then ewes diets at the end of gestation (mean±SEM)

	Incorporation levels				
	0%R	25%R	50%R	P value	
Glucose	0,43±0,01 ^{ac}	$0,31 \pm 0,04^{b}$	$0,43 \pm 0,03^{ac}$	0,0087	
Cholesterol	$0,54 \pm 0,03^{ab}$	$0,64 \pm 0,04^{ab}$	$0,42 \pm 0,04^{\circ}$	0,0070	
Triglycerides	$0,10\pm0,01^{\rm ac}$	$0,24 \pm 0,03^{b}$	$0,10\pm0,02^{\rm ac}$	0,0010	
Total Proteins	$61,41 \pm 2,27^{ab}$	$60,40 \pm 2,01^{ab}$	$35,61 \pm 5,64^{\circ}$	< 0,0001	
Albumin	$27,54 \pm 1,15^{ab}$	$30,09 \pm 0,94^{ab}$	$18,78 \pm 3,10^{\circ}$	0,0022	
Urea	$0,22\pm 0,02^{ab}$	$0,18\pm0,03^{abc}$	$0,13\pm0,02^{\rm bc}$	0,0144	

Different miniscule letters (a, b, c) in the same line indicate a significant difference.

The hypoglycemia of the group 25% R would be explained by the increase of the urine permeability and the massive use of the maternal glucose by one or many fetus [11; 12; 13; 14].

The high level of triglycerides of the group 25%R could be attributed to an important hydrolysis of the adipose tissues to cover the energy needs [15].

However, the females of the group 25%R present a high cholesterolemia (p<0.001). Hamadeh et al. (1996) reported higher level of cholesterol in blood in pregnant ewes than non pregnant and non lactating ewes. This observation is maintained by other studies that showed cholesterolemia (HDL-cholesterol and VLDL-cholesterol) high at the end of the gestation [15; 17]. This decrease is particularly intense in pregnant ewes having double broughts [18; 16].

According to Judson et al. (1968) and Sobiech et al. (2008), the percentage of glucose, synthesized from the ruminal propionate decreased from 46 to 27% with the increase of the proportion of food starch in the diet. With diets rich in grains, a certain amount of starch, escaping the ruminal degradation, will show an increase of the intestinal absorption of glucose that consequently, will decrease the liver glucogenesis from propionate. This observation was demonstrated by Freetly et Klindt (1996) and would be regulated after insulin secretion [22] and could be due to metabolic changes induced by a reorientation of neoglucogenesis precursors towards lipid synthesis [23]. This is confirmed by an established negative correlation for the group 25%R between glucose and cholesterol (P=0,0012; r = -0.9466).

When the glycemia of the group 25%R decreases, all the parameters of nitrogen metabolism increase significantly (proteinemia (p<0,001), albuminemia (p<0,001) et uremia (p<0.05)).

This result could be explained by the glucose deficit that might be compensated by an increase of protein catabolism [24]. Which means, that during a prolonged energetic deficit where the food intake is limited, the ruminants will use mostly amino acids, mobilized from body proteins, to increase net production of glucose [25]. According to Jainudeen and Hafez (2000), the fetus synthesizes the whole proteins from amino acids from the mother. This finding is similar to those reported by Batavani et al. (2006) and Balikci et al. (2007).

The plasma levels in cholesterol and triglycerides registered in the group 50%R are significantly low comparatively to groups R0% (p<0.05) and R25% (p<0.001).

On the other hand, the pregnant ewes complemented at 50% of date wastes show the lowest plasmatic levels in total proteins show (p<0,0001), in albumin (p<0,001) and in urea (p<0.05) in comparison to the other groups R0% et R25% that show higher levels.

In ewes complemented at 50% of date wastes, a positive correlation between total proteins and albumin (P< 0,0001; r = 0.9790), urea (P= 0,0043; r = 0.8126), cholesterol (P= 0,0001; r = 0.9288) as well as the triglycerides (P= 0,0180; r = 0.7236).

However, a negative correlation is noticed between glucose and triglycerides (P=0.0285; r=-0.686). This result could be explained by the fact that at the end of gestation, the sensitivity of tissues to insulin decreases drastically.

Therefore, the uptake of glucose by the muscles and adipose tissue and the insulin-dependent of lipolysis decrease significantly, in comparison to empty ewes, hence the increase of lipolysis.

As a result, an increase of plasmatic concentration in non-esterified fatty acid is observed. Which prones the ewes to an increase in blood level of cholesterol, triglycerides and lipoproteins [29]. However, Mebirouk-Boudechiche (2010) proposed the hypothesis that a part of the date carbohydrates are protected, coming thus intact in intestine and increasing consequently the glycemia and muscular anabolism.

In our study, the low plasmatic levels of albumin and urea are registered for group 50%R. Moreover, these two parameters are significantly high at the end of gestation for group 0%R and 25%R. These results are in accordance to those reported by Antunovié et al. (2004) and Deghnouche et al. (2011) who observed high values of uremia during the last trimester of gestation. Some authors did not note any effect of the gestation on uremia [31; 32]

According to Haffaf et al. (2012), urea is a better indicator of the level of body reserves; its concentration is correlated to the amount of the organism's proteins. Nevertheless, for the small ruminants, the important fluctuations of uremia dependent to protein input of the diet and to the protein efficiency could contribute to hide the differences related to physiological stages of the females [33].

The albuminemia is considered as a delicate criterion to interpret. Many circumstances conduct to a decrease of the albuminemia, a prolonged food deficit in nitrogen or an increase of glucose synthesis from amino acids (neoglucogenesis) [34, 35]. Also, the low registered levels of albumin and urea of 50%R during the end of gestation could indicate some dietetic deficiency or a certain troubles in the liver function [15].

Since then, the incorporation of date wastes at % in the diet has no significant effect on the energetic parameters of the metabolism.

However, we have noted a significant effect on the parameters of the studied nitrogen metabolism. This effect might be due to the fact to the date wastes have a good energetic value

(1,06 UFL/Kg of DM) because of their high level of total sugar comparing to certain cereals as barley (1,09 UFL/Kg of DM), but poor in crude proteins (3.24% DM) in comparison to barley (12,66% DM) where the necessity to a nitrogen complementation in order correct this deficit [36; 37].

CONCLUSION

The particularity of date wastes lies in the level of total sugar, providing them a high energetic power, favorable to peripartum requirements allowing to reduce and to intensify the production cycle of ruminants.

Nevertheless, this penalizes their use in big amounts and imposes a certain restriction towards acidosis problem induced by them. However, the dates remain deficient in proteins, which could be corrected by a simple input of proteins making thus, interesting the incorporation in animals feed.

The use of date wastes would be conceivable particularly in periods of non food availability in replacement of the whole or a part of the imported concentrate, reflecting both beneficially on national economy and allowing to constitute an outlet in the date sector.

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