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Original Research Article

Enhancing milk production in ewes through date pits valorisation and supplementation

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Abstract

The study's objectives are to determine the impact of adding date pits to pregnant and lactating ewes' diets on milk production and to value agro-industry byproducts. Twenty-four pregnant Algerian "Ouled Djellal" ewes were split into two groups at random. A meal consisting of 500g of concentrate and 1.5 kg of vetch-oat hay was given to the first group (75 CON). In addition to 500g of concentrate, the animals in the second group (75MIX-CON) were fed a diet consisting of 1.5 kg of vetch-oat hay and date pits at a ratio of 46.7 to 53.3%. The concentration is made up of 50% barley grains and 50% wheat bran. The lambs' live weight, the volume of milk, the physico-chemical analysis of the ration's feed components (dry matter, organic matter, mineral matter, crude protein, and crude fiber), and the physico-chemical analysis of the milk (fat and protein levels) were the main objectives of the study. The results of the statistical analysis (Minitab16) showed that the growth performance of the lambs in the experimental and control groups differed significantly (P=0.05) (147.2 vs. 185.73 g/day). With an average milk output of 0.59 l/d compared to 0.47 l/d, the experimental group's milk production significantly increased. In conclusion, it appears that supplementing females with date pits at the end of gestation improves both the mothers' dairy performance and the lambs' growth performance.

Keywords:
Date pits, ewes, average daily gain, milk production.

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1 Introduction

In Algeria, sheep farming with an estimated 29428929 heads remains a strategic sector for food security [1]. The arab white Ouled Djellel is the most numerous of Algeria's many sheep breeds, accounting for between 61% and 70% of the national sheep population [2]. However, the needs of sheep in terms of food to maintain a good health and express their potential have increased. The context of climate changes and a chronic or seasonal under-nutrition explains in large part a deficient productivity of this species [3]. Sagot (2007) [4] demonstrated that there is a direct relationship between maternal nutrition during the last month of gestation and birth weight, which affects milk production, growth, and weaning weight for all genetic types and animal species. It is therefore essential to develop this sheep production system by replacing conventional sheep feed with the use and promotion of locally available agri-food by-products. Date pits are one of the main by-products of date processing, and their use in sheep farming systems is essential for economic and environmental reasons [5,6,7,8]. In addition, Production performance can be estimated by measuring growth rate and, consequently, the theoretical quantity of milk produced [9]. There is a considerable amount of research on the chemical composition and nutritional value of date by-products, but the data available on their potential value as animal feed is rather limited. In this study, we have considered the effect of rationing of ewes of the Ouled Djellal breed with either vetch-oat hay or a mixture of vetch-oat hay and date pits, supplemented by concentrate at the end of gestation and during lactation.

2 Materials and Methods

2.1 Animals

This study was conducted at the pilot farm El baraouia, located in the south of the wilaya of Constantine, Commune of El Khroub (Figure 1), on 24 ewes Ouled Djellel of the breed. The females were aged of 2 years, and were divided into 2 groups composed of 12 ewes. Animals were separated into two boxes, a control lot (62, 67kg±5.10) received a feed ration composed mainly of a coarse feed (vetch oat hay) and concentrate (50% crushed barley + 49% bran + 1% coarse salt). In the second group (65.92kg±7.72) ewes were fed, in addition to this ration, a supplementation of 800 g DM of date pits/head/day. Subsequently, the lambs from these ewes once born were identified and weighed at the 1^{st} and $5t^{h}$ week of age to assess average daily gain (ADG) during the trial and the effect of the diets on ewe's milk production, the experimental period lasted 75 days and followed directly the adaptation period.

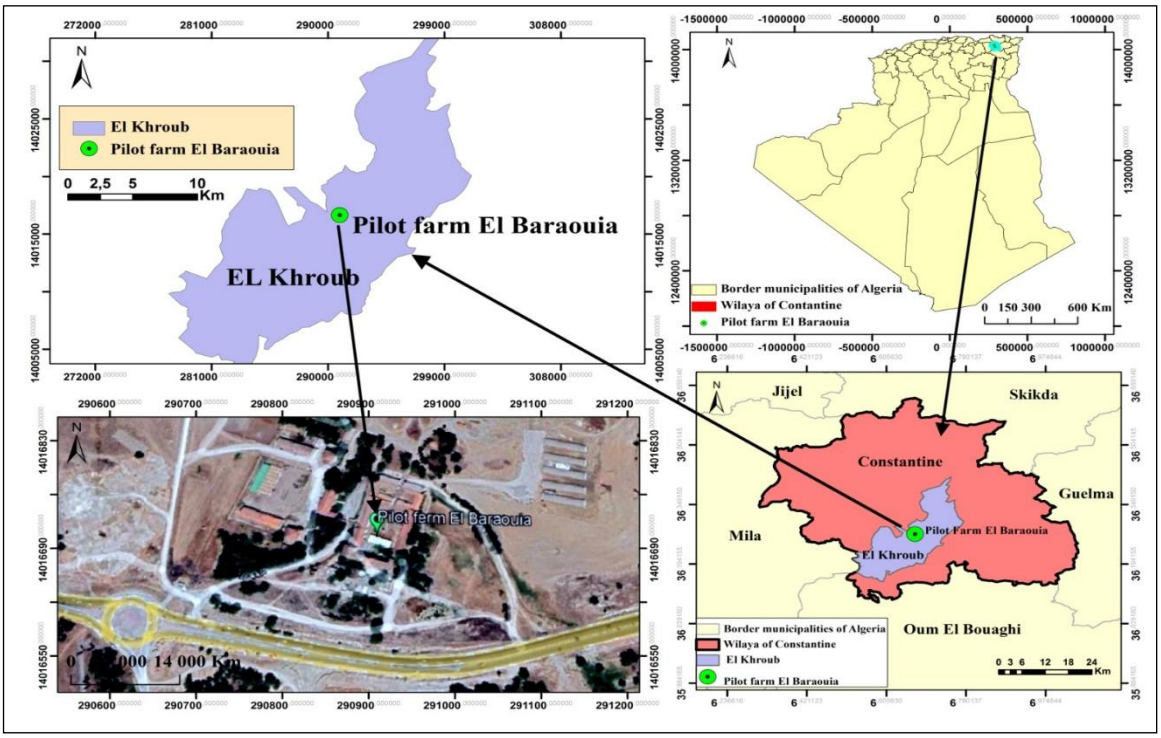

Figure 1. Location map of the pilot farm El Baraouia (Wilaya of Constantine)

2.2 Sampling

Samples of the three feeds were taken for physico-chemical analysis (Dry matter, Organic matter, Mineral Matter, Crude Protein which were determined according to the A.O.A.C [10]. standards, Crude Fiber analyses were determined according to Van Soest et al. (1991) [11].

2.3 Statistical analysis

The statistical analysis was performed using Minitab16 software. This software allows the determination of averages and standard deviations for quantitative variables, the determination of frequencies for qualitative variables, the comparison of percentages and averages, the statistical tests used are: descriptive statistics, analysis of variance ANOVA, the differences were considered significant when (p) is less than 0.05.

3 Results and discussion

From a nutritional point of view, livestock feed is characterized by its nutritional value, which can be determined using various methods for assessing its physicochemical composition, which is essential for optimizing livestock nutrition, formulating feed rations, and developing scientific research in the field of nutrition.

The chemical composition of the three foods distributed is shown in the table 1. Crude proteins varied from: 3.86% for date pits, 10.55% for concentrate and 9.08% for hay, because of this low protein level, it is important to add an adequate protein supplementation in diets containing this by-product. The same trends were reported by Rihani et al. (1988) [12]. and Abaidia et al. (2020) [13] for date waste. On the other hand, contents of 5.1% were recorded by Lakhdara et al. (2013) [6] and 5 to 7.27% by Boudechiche et al. (2009) [5]. Crude cellulose content of the analysed feeds is high in hay 38.25% compared to date pits 15, 41% and concentrate 6.66%.

Table 1. Chemical composition of the three feeds distributed (hay, concentrate, date pits)

	Moisture %	**Dry matter%**	**Mineral Matter%**	**Organic matter%**	**Crude protein%**	**Crude cellulose%**
Hay	7,88	92 ,12	8 ,82	83,3	9,08	38,25
Concentrate	9,29	90,71	1,89	88,82	10,55	6,66
Date pits	8,91	91,09	6,31	84,78	3,86	15,41

The second part of study is to determine the effect of date pits supplementation on the average daily weight gain of lambs and, consequently, on milk production. Chemmam et al. (2014) [14] indicate that growth rates are closely linked to the quantities of milk provided by mothers and their body condition. Similarly, Boudechiche et al. (2010) [15] report that the growth of lambs is a classic reflection of the milk yield of ewes. The quantity of milk produced by ewes is estimated by the following relationship quoted by Boudchiche et al. (2011) [9]:

MP(dx) = MNE+ 2297 x ADG(dx)/858

MNE (dx)= 80 x LWdx0.75

Where:

MP : Milk production in liters per day (dx)

MNE(dx) : Net energy for maintenance (kcal) of a non-weaned lamb, not a grazer over the period considered (dx).

LWdx : Live weight at dx.

Table 2 shows the average growth rates and variations in milk production in ewes according to the rate of concentrate substitution with date pits.

Table 2. The effect of supplementation on the ADG and milk production

Parameters	Control lot	Experimental lot	P	Signification
ADG (0 – 42 j), g/day	147,2 ± 42,8	185,73± 28,83	0 ,017	Significant
MP, L/d	0,47	0,59	0,026	Significant

The statistical study reveals that the lambs of the experimental lot recorded a significantly higher ADG (185 g/day) than the lambs of the control group (147 g/day) ($P > 0.05$) with an average difference of 38 g/day. In addition, the ewes of the experimental group recorded a significantly higher milk production (0.59 l/d) than the ewes of the control group (0.47 l/d). It seems that the addition of date pits had a positive effect on the quantity of milk production and the weight of their lambs. Milk yield increase in the experimental group could be explained by the high level of cellulose in date pits. It has to be noted that cellulose is a precursor of the synthesis of the acetic acid in the rumen, favouring the synthesis of the fat of the milk in the udder [15]. Boudechiche et al., 2011 [9], revealed higher values (252 g/day) on lambs from ewes ingesting date scraps as a supplement and higher values on milk production (1.14 l / d). In addition, Abaidia et al. (2020) [13] observed that the lambs fed with date waste showed a higher weight comparing to lambs from the control group at 28, 63 and 90 days.

Al-Suwaiegh, (2016) [16], reveals that milk production was not significantly affected by the addition of date pits to rations in proportions of 0, 10, 15 and 20% (1.40, 1.41, 1.43, 1.39l/d). Khattab (2013) [17], did not mention any significant effect of milk yield after substituting the ration of Barki ewes from 0 to 50 and 100 g/100 g of corn kernels with dates; the values varied from 559.8 g/day - 516.2 g/day- 483.8 g/day for D0- D50- D100. According to ITELV (2002) cited by Smaali and Chemmam (2017) [18], the average milk yield for the Ouled Djellal breed is 1.3 to 1.6 l/day during the first month of lactation.

Milk production in lactating ewes is also influenced by other factors, such as the ability to extract milk from the udder and the genetic group of the lamb [19]. According to Boujenane et al. (1996) [20], local breeds of ewes, such as Sardi, Beni Iguil, and Timahdite, adapt their milk production to the growth needs of their lambs, especially during the period of exclusive suckling (first month), and this adaptation decreases as lactation progresses. It is therefore essential to supplement lambs from the second month of age onwards to enable them to realize their growth potential and take full advantage of heterosis in terms of growth rate.

4 Conclusion

The crude protein value of the date pits is very low where the need to seek an adequate protein supplementation of the diets containing this by-product. This partial substitution of vetch-oat hay by the date pits contributed to a better growth of the lambs of the experimental group and a better milk production of their mothers.

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