

Effectiveness of Garlic Powder as Nutritional in Ouled-djellal Ewes

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Abstract

The aim of this study is to try the effectiveness of garlic powder to promote ewes performances replacing feed additives and antibiotics in livestock. Therefore, twelve Ouled-Djellal adult ewes at 5 months of gestation, clinically healthy, were allotted to two experimental lots to monitor their body condition, their milk production, and their growth. Ewes are fed with a basic ration dominated by oat hay and a limited share of barley straw. They were also supplemented with a control granular concentrate in the control group (C) and added with 2% garlic powder in the experimental group (E). The recorded data were processed with the STATISTICA V.6 program using a T-student test and its analogue test U-Mann Whitney to assess the effect of treatment. The treatment seems to have no significant effect on the body condition of ewes, lambs growth and milk composition. However, the cumulative milk yield during the first week and the first two months of suckling is significantly ($P < 0.05$) higher in the experimental group compared to the control (+40 and +34%, respectively). In light of this finding, garlic fails to promote the performances of ewes at the end of gestation.

Keywords: Ewes, garlic, lambs, productivity, performances.

Introduction

Nutrition is the pivotal factor in conditioning animal production. However, the uncomfortable situation of feeding in regions of low rainfall combined with the accentuated supply of concentrate and the low nutritional value of forage resources requires the use of nutritional additives to improve animal performances (Teferedegne, 2000; AFSSA, 2007). In this sense, antibiotics have been used for a long time in the field of breeding for therapeutic purposes and lately purely for zootechnical purposes. However, the emergence of antimicrobial resistance and chemical residues in meat products has led to the deprivation of

antibiotics use in the livestock sector (Simon *et al.*, 2005). In this case, phytobiotics or phytogenics, are growth-promoting additives, derived from a wide variety of herbs and spices since antiquity for their specific aromas and various medicinal properties (Alloui, 2011). This additives category has successfully proven their effectiveness in improving the zootechnical performance of animals, especially ruminants, by being incorporated into the ration (Jami *et al.*, 2015; Matloup *et al.*, 2017; Okali-Usur, 2019).

In Algeria, sheep breeding is concentrated in steppe region, for that, in order to enhance local natural resources valorization, as well as to improve

productivity as cited in literature, we have attempted to study the effect of incorporating garlic in ewes regimen at the end of gestation on their performances.

Material and methods

Region, animals and diets

The experiment was conducted in September 2019 in the demonstration farm of the Technical Institute of Breeding in Ain M'lila (Algeria). Twelve Ouled-Djellal adult ewes, clinically healthy, at the last month of pregnancy weighing on average 73.86 kg (± 8.81) with an average body condition score (BCS) of 2.86 (± 0.64) were used in this experiment. They were housed and separated equitably into two lots in a breeding hangar in order to visualize the effect of garlic powder on body condition, the quantity as well as the quality of milk, and on the other hand, their repercussion on their lamb's growth. The basic ration of the two groups was based on oat hay with a limited share of straw. They also receive supplementation (500 g/day/head) with a concentrate after a transition period of 10 days. The control group the control concentrate, while, the experimental group received a concentrate added with 2% of garlic powder (% of concentrate dry matter).

Garlic powder

The powder was prepared by peeling the bulbs of garlic, and then cutting them into small pieces before being sufficiently sun-dried for 10 days.

Feed analysis

Analysis of the feed chemical composition has been applied following the European directive (French Association for Standardization 'AFNOR', 1982). For minerals, the calcination method was applied. The results are reported in Table 1.

Table 1. The chemical composition of feed based on dry matter basis (%)

Aliments	Oat hay	Barley straw	Concentrate
DM ¹	91.62	90.28	90.50
OM	91.73	92.04	94.83
MM	8.27	7.96	5.17
CP	3.85	2.55	15.53
CF	17.97	31.60	3.04
Ca	0.13	0.11	0.07
P	0.28	0.27	0.55

¹DM: dry matter (% fresh matter); OM: organic matter; MM: mineral matter; CP: crude protein; CF: crude fiber; Ca: calcium; P: phosphorus.

Weight and BCS

The body weight and BCS of ewes were assessed at the start of the experiment (one month before lambing), on the day of lambing until the first month of suckling. The weight was always measured post-feeding using a weighing scale (MARECHALLE-weighing PM 150. France) with a maximum capacity of 200 kg with a margin of 500 g. BCS was evaluated by applying the lumbar palpation method according to the technique by Russel (1984).

For lambs, the weight was monitored every week from birth to 70 d of age with a weighing scale of 30 kg maximum and a margin of 5 g. The average daily gain (ADG) was calculated by the formula:

$$\text{ADG (g)} = \frac{\text{Weight (g) in t (days)} - \text{Weight (g) at t (days)}}{t \text{ (days)}}$$

Milk yield

Ewes milk cumulative yield was calculated during the first 8 weeks of Suckling using formulas (Table 2) proposed by Torres-Hernandez & Hohenboken (1980).

Table 2. Predicting equations for ewes cumulative milk yield (Torres-Hernandez & Hohenboken, 1980)

Age of lambs (wk)	Single birth		Twin birth	
	Equation ¹	R ²	Equation	R ²
1	MY(L) = 0.17+5.06×ADG	0.65**	MY(L) = 0.03+4.98×ADG	0.69**
8	MY(L) = 0.42+3.45×ADG	0.33*	MY(L) = 0.63+1.89×ADG	0.20*

¹MY: cumulative milk yield, ADG : Average daily gain; ** P< 0.01, * P< 0.05

Sampling and milk analysis

Milk was collected manually during the 1st and 8th week of nursing (to see the relation with potential elevation of lamb's body weight), transported with a cooler in glass tubes to the laboratory to assess Physico-chemical parameters as fat content (FC), protein rate (PR) and lactose rate (LR) through a LACTOSCAN (Ultrasonic Milk Analyzer, BQC®).

Statistical analysis

The variability of collected data was detected by a test by T-student and U-Mann Witney using the STATISTICA V.6 program.

Results and discussion

Ewes weight and BCS

Weight and BCS are two subjective parameters fairly correlated to the animal nutritional status and which allows a good way to monitor it, being considered as a key to optimal externalization of animals genetic potential, especially in periods with high nutritional needs (Drogoul *et al.*, 2004; Gaias, 2013)

The results of our study are reported in Table 3. It seems that the incorporation of garlic powder did not bring any significant effect (P>0.05) through the period going from the 5th month of gestation until the 1st

month of suckling. To our knowledge, our study is a first step in assessing the effect of garlic on the body condition of sheep. As a result, it seems to us that this data contrast with those reported in the literature where several authors (Meena *et al.*, 2015; Panthee *et al.*, 2017; Sahli *et al.*, 2018) indicating remarkable effects of phytobiotics on animal performances by interfering through their bioactive components in improving animal welfare by reducing the incidence of metabolic and nutritional diseases, as well as eliminating non-desirable microbes from the digestive tract, improving animal nutrition by enhancing the interaction between digestive microflora and its host which increases the digestibility of food and the bioavailability of nutrients as well as their absorption through the different segments of the digestive tract, therefore, this helps animals to grow better to reach their genetic capacities. However, this contradiction can be explained by the dose used in this study, which seems to be low.

Lactation

Lactation quantity and quality are conditioned basically by nutrition (Ilić *et al.*, 2011; Nudda *et al.*, 2014). Therefore, the presence of additives in feeds can make a difference. In our study, the incorporation of garlic powder was ineffective (Table 4) on milk quality during the 1st and 8th weeks of lactation (P>0.05). This consolidates the results of Serbest *et al.* (2012) and Rossi *et*

al. (2018) neglecting the effect of garlic or their bioactive molecules incorporated alone or mixed with other additives on cows milk composition.

When it comes to milk yield, it appears that ewes receiving garlic powder produced significantly ($P<0.05$) more milk during the first week and during the two first months of lactation (Table 4) comparatively with the control ones (+40%, +34% respectively). Our

findings consolidate those of several studies reported in the literature (EL-Ghousein *et al.*, 2010; Kholif *et al.*, 2017; Morsy *et al.*, 2018) indicating that phytochemicals are effective galactogenics, where many of authors explained that this effect is mostly modulated by increased intake, digestibility and absorption of nutrients and also by enhanced ruminal.

Table 3. Effect of garlic powder on ewes weight¹ and BCS¹

Physiological stage	Parameters	Control	Experimental	P-value
Last month of pregnancy	LW (kg)	74.17±11.08	73.5±6.35	0.9082
	BCS	2.83±0.82	2.9±0.42	0.8730
At lambing	LW	64.58±11.50	61.1±5.65	0.5541
	BCS	2.58±0.80	2.8±0.57	0.6253
1 st month post-lambing	LW	59.42±14.71	56.30±4.96	0.6637
	BCS	2.08±0.97	2.3±0.76	0.6946

^{a,b}. In the same row, means with different subscripts are significantly different at $P<0.05$

¹Mean and standard deviation; ²LW: Live weight in kg; BSC: Body condition score.

Table 4. Effect of garlic powder on cumulative milk quantity and quality

Parameters	Wk post-lambing	Control (Mean ± SD)	Experimental (Mean ± SD)	p-value	
Quantity (L)	1st wk	0.95±0.21 ^b	1.33±0.19 ^a	0.0392*	
	8th wk	0.85 ^b ±0.04	1.14 ^a ±0.23	0.0286*	
Quality	FC (%)	1st wk	8.73±1.64	8.80±0.72	0.9300
		8th wk	8.35±1.58	9.04±2.12	0.5526
	PR (%)	1st wk	4.02±0.26	3.94±0.20	0.5756
		8th wk	3.55±0.26	3.68±0.13	0.3378
	LR (%)	1st wk	3.47±0.13	3.45±0.11	0.7950
		8th wk	3.64±0.50	4.13±0.67	0.3095

^{a,b}. In the same row, Means with different subscripts are significantly different at $P<0.05$

FC: fat content; PR: protein rate; LR : lactose rate.

Lambs growth

When it comes to birth weight and lambs growth, data are recorded in Table 5. The productivity of a ewe is reflected in its ability

to maintain the viability and postnatal growth of its offspring by providing them with adequate behavioural and nutritional motherhood (reference needed). It should be

noted that lambs of the two groups were born with a similar weight with no significant difference, similarly for the other parameters, in particular the weight at 4 weeks, however, it was observed that lambs from ewes fed with garlic were remarkably and numerically heavier (+27%; $P > 0.05$) than those of control. Moreover, in the same mean, lambs of the experimental groups have numerically the highest ADG compared to those of the control (+37.5%; $P > 0.05$). These results go

in the same direction as the findings of several scientific studies in the literature (El-Ghousein, 2010; Smeti *et al.*, 2013; Biricik *et al.*, 2016) reporting the beneficial effect of garlic and other phytobiotics regimen incorporation on ewes productivity in late gestation and growth performances of fattening lambs. The absence of significant difference can be explained by the small number of subjects examined which accentuates the variability in the same group.

Table 5: Effect of garlic powder on birth weight and lambs growth (Mean \pm SD)

Parameters	Control	Experimental	<i>p</i> -value
BW (kg)	4.08 \pm 0.80	4.04 \pm 0.67	0.9209
W4w (kg)	8.39 \pm 1.36	8.99 \pm 2.75	0.6066
W70d (kg)	12.01 \pm 2.04	15.29 \pm 5.23	0.1208
ADG (g/d)	116.87 \pm 0.03	160.67 \pm 0.67	0.1034

^{ab}In the same row, means with different subscripts are significantly different at $P < 0.05$

BW: Birth weight; W4w: Weight at 4 wk after birth; W70d: Weight at 70 d of age; ADG: Average Daily Gain from birth to 70 d of age.

Conclusion

From our study, we conclude that the garlic powder has no significant effects on ewes performances nor on their offspring, except the cumulative milk yield during the first 8 weeks of suckling which was remarkably higher in the experimental group. The absence of effects can only be justified probably by the small number of animals tested as well as by the low dose of garlic incorporated into the diet which compromises probably optimal externalization of the animal's response in our test. Therefore, it is recommended to carry out other more thorough experimental studies, aiming to find the best dose which allows an optimal response of animals and to make a profit of this additive, preceded by studies of palatability of feed added with garlic which can give an astringent taste and

reduce intake, even more, in-vitro tests to visualize the effect of garlic on the dynamics of the ruminal ecosystem.

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