

## INFLUENCE OF SOME MEDICINAL PLANTS AS FEED ADDITIVES ON DIGESTIBILITY, NUTRITIVE VALUE, FERMENTATION IN THE RUMEN AND REPRODUCTIVE PERFORMANCE OF MALE LAMBS

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### ABSTRACT

Forty crossbred (1/2 Finnish Landrace x 1/2 Rahmani) lambs aging 3-4 months with average body weight of 17.30 kg were divided into five similar groups to investigate the effect of some medicinal plants (MP) supplementation on daily gain, feed efficiency and reproductive performance. Lambs were fed randomly on one of the experimental diets. The first group received the basal diet, which was free from feed supplementation (FS) and composed of concentrate feed mixture (CFM) and berseem hay (BH) as control group D1. The tested groups were fed on control diet and with one of the following FS, *Majorme hortens* MH (150 mg/kg live body weight LBW), *Nigella sativa* seeds NS (100 mg/kg LBW), *Rosmarinas officinalis* RO (150 mg/kg LBW) or with supplemented medicinal plants mixtures MPM contained third dose of each of the tested MP, for D2, D3, D4 and D5, respectively. Five digestion trials were carried out, to evaluate the experimental diets and their effect on digestion coefficients, nutritive values and some rumen parameters.

The results showed that feeding medicinal plants had effect on digestibility coefficients of ruminants and nutritive values, groups D4 recorded the highest value in this respect. Total weight and average daily gain were higher of lambs fed NS or RO with basal diet. The different supplementations did not affect on the rumen pH values. Meanwhile, ammonia N concentration was significantly ( $P < 0.05$ ) decreased with (D3 and D4 groups) than the control group. The D4 group showed the highest proportion of propionic and the lowest of acetic and butyric in comparison with other groups. Lambs in group 4 expressed first ejaculation (puberty) younger by 80, 14.5, 55.5 and 8.5 days than those in groups 1, 2, 3 and 5, respectively. No significant differences in testosterone concentration (TC) in serum of lambs and scrotal circumferences in the five groups at all stages of sexual development.

**Keywords:** Medicinal plants, lambs, digestibility, daily gain, testosterone concentration, reproductive performance, sheep

### INTRODUCTION

Feed additives are important materials that can improve feed efficiency and animal performance. However, the use of chemical products especially antibiotics and hormones may cause unfavorable side effects. Moreover, there are evidence indicating that these products could be considered as pollution for human and threaten their health on the long-run. (Akhtar and Javed, 1991).

On the other hand, attempts to use the natural materials as alternative growth promoters such as medicinal plants are widely accepted. Such plants include *Nigella Sativa*; *Trigonella Foenum* and *Lepidum Sativum* have some properties as antiseptic, antibacterial activities against microorganisms treatment of gastro-intestinal complaints and tonic. Also, some studies indicated that such plants had favourable effects on nutrient digestibility, live

weight gain and feed efficiency with cows (Mira *et al.*, 1998, and Aboul-Fotuh *et al.*, 1999 and El-Saadany *et al.*, 1999). In addition some studies indicated that the medicinal plants improved rumen activity and nutrient digestibility (El-Saadany *et al.*, 1996 and Allam *et al.*, 1999).

It is generally known that reproductive performance of male is affected by level and source of nutrients in their diets as well as other factors including breeding and management of the herd. Nutrition is the major factor affecting the reproductive performance of males (Varvikko, 1986). El-Badawy (2003) found that the lambs fed on diet containing 75% *Nigella sativa* meal-protein expressed first ejaculate (puberty) at 23 days younger than that in control lambs.

The objective of this study was to investigate the effect of some medicinal plants as feed additives on nutrient digestibilities, feeding values and reproductive performance. Also the economical evaluation of the diets was considered.

### MATERIALS AND METHODS

Feeding trial was conducted by using forty crossbred (1/2 Finnish Landrace x 1/2 Rahmani) male lambs aged 3 - 4 months and averaged 17.30 kg live body weight, at Sahka Experimental Research Station, Animal Production Research Institute, Agricultural Research Center. Animals were divided into five similar groups, (each 8 animals). The feeding trials lasted 210 days and animals were fed according to recommended by NRC (1989). Animals of each group receive one of the tested diets. The control group (DI), received the basal diet, composed of concentrate feed mixture (CFM) and berseem hay (BH) which was free from feed additives.

The tested groups were fed on control diet, with *Marjoram hortens* MH (150 mg /kg live body weight LBW) according to Aboul-Fotuh *et al.* (1999), or with *Nigella sativa* NS (100 mg /kg LBW) according to Allam *et al.* (1999) or with *Rosmary* R (150 mg/kg LBW) according to Galistoo *et al.* (2000) or with supplemented mixtures MP&H contained third dose of each of the tested MP&H for D2, D3, D4 and D5, respectively. Fresh water was available and animals were under veterinary care during the whole experimental period. Animals body weight were recorded weekly before feeding morning. Feed conversion was calculated and expressed in terms of DM, TDN and ME and DCP required to produce one kg weight gain. At the end of the work, simple economical evaluation was calculated for the tested diets according to the prevailing prices of feeds during the experimental period (2001 - 2002).

Five digestion trials were carried out at 3 months from start of the experiment to evaluate the experimental diets and their effect on digestion coefficients, nutritive values and some rumen parameters. Three animals in each treatment were randomly selected and placed individually in metabolic cages for 10 days as preliminary period followed by 7 days as collection period. Animals were fed twice daily at 8.00 am and 4.00 pm and refusal were recorded every days. Daily feces was weighted, sampled and analyzed. Fresh water was available and animals were under veterinary care. Chemical composition of ingredients used and tested diets are presented in Table (1).



Table (1) Chemical composition of Ingredients and control ration

Chemical(%) composition	Item		
	CFM	BH	Control diet
DM	90.80	89.62	90.33
OM	90.63	87.84	88.83
CP	16.58	10.87	13.42
CF	13.32	27.64	19.68
EE	3.35	2.07	2.22
NFE	57.38	47.26	53.51
Ash	9.37	12.16	11.17

Lambs in the five treated groups were subjected to observation the detect changes in sexual behaviour, once every 10 days interval during the period from 3 months of age till the onset of puberty (first successful ejaculate with motile sperm). Libido test for each animal was carried out within 20 minutes test period using a female sheep in induced oestrus. Considering the following criteria: first mounting with erection (first penile protrusion) and puberty (age at first collected ejaculate containing motile sperm). To ensure the availability of at least two ewes in estrus at each time of libido test, four ewes were subjected to oestrus synchronization by hormonal treatment planned at a time suitable for the time of libido test.

Body weight, scrotal circumference measurements and blood sampling (for testosterone determination) were carried out biweekly. Scrotal circumference was measured to indicate testicular size for each lamb using a flexible plastic tape around the greatest diameter for the tests and scrotum according to Hann *et al.* (1969). Blood samples were taken into vacutainer tubes and incubated at room temperature for 2 hours, then centrifuged at 2500 rpm for 30 minutes to separate blood serum. Serum was stored in labeled cuvettes at -20°C till hormone assay. Direct radioimmunoassay technique was conducted for serum testosterone level determination using Immunotech kits (I<sub>125</sub>) Immunotech, France.

After the onset of puberty or the stage at which male ejaculated first sperm. Semen was collected by means of an artificial vagina. Ejaculated volume, mass motility of sperm were estimated by procedure of Melrose and Laing (1970). Live and abnormal spermatozoa percentage were estimated by the method of Hancock (1951). Sperm cell concentration ( $\times 10^9/\text{ml}$ ) was determined by the direct cell count using the Neubauer Haemocytometer. The total sperm output per ejaculate was calculated by multiplying sperm cell concentration by ejaculate volume.

#### Chemical analysis

Representative samples of feeds and feces were air dried and kept for chemical analysis according to A.O.A.C. (1990). The rumen liquor samples were strained for determination of pH using meter (Orion research, model 201/digital) Ammonia-N concentration was determined according to Conway (1963). The strained rumen liquor samples were prepared for volatile fatty acids (VFA'S) fractions analysis by high pressure liquid chromatography (HPLC) according to Bush, *et al.*, (1979).

The data were statistically analyzed to test the significant using one way analysis of variance according to Snedecor and Cochran (1967). Duncan's multiple range test was applied to test significant among means..

## RESULTS AND DISCUSSION

### Digestion coefficient and nutritive values.

Data of digestion coefficients and nutritive values for experimental diets are presented in Table (2) The digestion coefficients for DM, OM and CP were significantly ( $P<0.05$ ) increased with D3, D4 and D5 compared to control diet. The improvement ranged (7.63 – 17.91%); (7.90 – 17.67%) and (12.88 – 20.65%) for DM, OM and CP, respectively. In addition the digestion coefficients for CF and NFE were significantly ( $P<0.05$ ) increased with D3, D4 and D5 compared to control diet. Meanwhile, there were no significant differences among all groups concerning the digestion coefficient of EE.

Table (2): Effect of medicinal plants supplementation on digestion coefficients and nutritive values of tested diets.

Item	Experimental Diets				
	D1	D2	D3	D4	D5
<b>Digestion Coefficients %</b>					
DM	58.64 <sup>c</sup>	60.52 <sup>bc</sup>	63.83 <sup>ab</sup>	65.48 <sup>a</sup>	63.27 <sup>ab</sup>
OM	61.75 <sup>c</sup>	63.52 <sup>c</sup>	67.34 <sup>ab</sup>	68.76 <sup>a</sup>	66.57 <sup>ab</sup>
CP	67.53 <sup>c</sup>	69.28 <sup>bc</sup>	71.90 <sup>ab</sup>	74.52 <sup>a</sup>	70.47 <sup>b</sup>
CF	53.78 <sup>d</sup>	56.17 <sup>c</sup>	58.63 <sup>b</sup>	62.26 <sup>a</sup>	57.82 <sup>bc</sup>
EE	81.67	81.82	81.31	82.12	80.92
NFE	72.36 <sup>c</sup>	73.15 <sup>bc</sup>	76.45 <sup>ab</sup>	77.32 <sup>a</sup>	74.32 <sup>b</sup>
<b>Nutritive values %</b>					
TDN	62.48 <sup>c</sup>	64.13 <sup>bc</sup>	66.11 <sup>ab</sup>	67.72 <sup>a</sup>	65.18 <sup>b</sup>
ME	9.62 <sup>c</sup>	9.90 <sup>bc</sup>	10.50 <sup>ab</sup>	10.71 <sup>a</sup>	10.37 <sup>b</sup>
DCP	9.06 <sup>c</sup>	9.30 <sup>bc</sup>	9.65 <sup>ab</sup>	10.00 <sup>a</sup>	9.46 <sup>b</sup>

a, b, c Means in the same row with different superscripts differ ( $P<0.05$ )

Results herein agree with those reported by Wallace and Newbold (1992) who mentioned that feed additives might improve ruminal fermentation by increasing bacterial activity which in turn increases degradability of ligno-cellulere, and flow of microbial protein from the rumen to the next parts. Also, results obtained agree with El-Babo (1971) and Chevallier (1996) who reported that *Nigella sativa* seeds and Rosmary act as anti-diarrhea, anti-dysentery, anti-bacteria, protozoa-cidal, expelling to teepee and worms and antiseptic which decreases losses of digested feed due to parasites and save digested nutrients to improved production.

The nutritive values data are shown in Table (2). The nutritive values expressed as TDN, ME and DCP are improved significantly as a result of medicinal plants supplementation. The nutritive values for D4 as TDN, ME and DCP were 67.72, 10.71 and 10.55, respectively represent the highest nutritive value. Meanwhile, the D5 showed the lowest significant ( $P<0.05$ ) improvement of nutritive values than D1 diet. These results are in agreement



with results obtained by Aboul-Fotuh *et al.* (1999) and Salem and El-Mahedy (2001) and Mohamed *et al.* (2003) who observed that the medicinal plants additives improved the digestion coefficient and nutritive values

**Rumen liquor paramters**

Data of rumen pH values, ammonia -N concentration and VFAs are presented in Table (3). The effect of medicinal plants supplemented diets on rumen pH values showed that there were no significant differences between tested groups regarding rumen pH values. These results are in agreement with Abd El-Aziz *et al.* (1993) and Aboul-Fotuh *et al.* (1999) who reported that there were no significant differences among tested groups affected by post feeding regarding rumen pH values.

**Table (3): Effect of experimental diets on the rumen liquor parameters**

Item	Experimental Diets				
	D1	D2	D3	D4	D5
<b>Rumen liquor parameters</b>					
PH	6.56	6.45	6.20	6.27	6.38
Ammonia N. mg /100ml	27.44 <sup>a</sup>	26.32 <sup>ab</sup>	24.12 <sup>bc</sup>	23.83 <sup>c</sup>	24.82 <sup>b</sup>
T. VFA's meq/100 ml	9.27 <sup>c</sup>	9.63 <sup>bc</sup>	10.44 <sup>a</sup>	10.83 <sup>a</sup>	10.18 <sup>b</sup>
Acetic	47.52 <sup>a</sup>	46.83 <sup>ab</sup>	45.22 <sup>b</sup>	44.93 <sup>b</sup>	46.18 <sup>ab</sup>
Propionic	24.76 <sup>c</sup>	25.23 <sup>bc</sup>	27.32 <sup>ab</sup>	27.68 <sup>a</sup>	26.67 <sup>b</sup>
A/P ratio	1.93	1.81	1.64	1.60	1.73
Butric	18.43 <sup>a</sup>	16.87 <sup>ab</sup>	15.62 <sup>b</sup>	15.37 <sup>b</sup>	16.28 <sup>b</sup>
Valaric	6.83	7.08	7.18	7.32	7.12

Data show also , that ammonia-N concentration tended to decrease significantly (P<0.05) with (D3,D4 and D5) groups than control group. It could be suggested that these results might be attributed to acting NS and RO as buffer, Gatisto *et al.* (2000). Values of NH3-N concentration obtained agree with Ferdous *et al.* (1992), Salem and El-Mahdy (2001) and Mohamed *et al.* (2003) who mentioned that NH3-N concentration varied with type of feeds.

The molar proportion of individual VFAs are presented in Table (3). Differences in propionic and butyric acids were significant due to NS (D3) and RO (D4) supplementation. The D2 group showed the highest proportion of propionic and the lowest of acetic and butyric acids in comparison with other groups. The rank of groups in A/P ratio indicated an improvement of propionate production in diet with supplemented medicinal plants. In consequence, the highest A/P ratio was obtained of the D1 group.

**Feed intake , feed conversion and economical efficiency for experimental diets**

Results of feed intake, feed conversion and economical efficiency of the experimental diets are presented in Table (4). Lambs fed D4 diet had the highest value of feed intake as DM, TDN, ME and DCP intake followed by D5 group, while D1 diet had the lowest values of feed intake. These results are in agreement with the result observed by Aboul-Fotouh *et al.* (1999) and Salem and El-Mahdy (2001).

**Table (4) : Total dry matter (DM) intake, feed conversion and economic efficiency with lambs fed experimental rations .**

Item	Tested diets				
	D1	D2	D3	D4	D5
Initial Body weight, kg	17.00	18.00	17.60	17.10	16.80
Final Body weight, kg	44.10	47.50	51.40	54.30	48.90
Total body weight gain, kg	27.10	29.40	33.80	37.20	32.10
Av. daily gain, g .	129	140	161	177	153
Total DM intake, kg	236.25	243.20	248.85	259.35	253.10
Total TDN intake, kg / h	147.61	155.96	164.52	175.63	165.00
ME intake, MJ. Cal / h	227.30	240.75	260.13	277.76	262.41
DCP intake, kg/h	21.50	22.66	24.00	26.04	24.04
Feed conversion					
Kg DM/ kg. gain	8.72	8.27	7.36	6.97	7.89
Kg TDN /kg. gain	5.44	5.26	4.87	4.72	5.10
Mj. cal ME /kg gain	83.87	81.89	76.96	74.67	81.75
kg DCP / kg gain	0.79	0.77	0.71	0.70	0.75
Economic efficiency					
Av. feed cost LE/ head /day	0.63	0.68	0.69	0.72	0.70
Total feed cost LE/ head	132.30	142.80	144.90	151.20	147.00
Av. feed cost LE / kg gain	4.88	4.86	4.30	4.10	4.58

\*Economic of this study was evaluated on the light of market prices during the experimental period 2001-2002

Meanwhile, the lowest value for feed conversion the best was recorded with D4 diet, but the highest value was recorded with D1 diet calculated as DM, TDN, ME and DCP / kg gain. Feed conversion for tested groups were improved as a result of the improvement of digestion coefficients and nutritive values. Results obtained herein agree with Salem and El-Mahdy (2001) who found that the ration contained NS improved feed conversion by 17.40 % than control ration.

The economical efficiency are presented in Table (4). The economic return was calculated as the differences between the prices of total weight gain and total feed cost / head. The total feed cost recorded the highest value with D4 group, on the same time the return recorded the highest value with D4 group. Whereas, the lowest return was in the D1 group. Meanwhile, the average feed cost LE / kg gain was decreased by 11.90, 16.00 and 6.20 % for D3, D4 and D5 groups, respectively compared with D1 group.

#### Reproductive performance

The development in reproductive performance of the animals in the five groups during the pre-pubertal period up to stage of puberty are presented in Table 5. Mean age of the five groups at 1<sup>st</sup> mounting with erection were 184.5, 147.3, 181.7, 152.6 and 153.2 days and 1<sup>st</sup> ejaculation or puberty were 252, 186.5, 227.5, 172 and 180.5 days, respectively. The differences between treated groups in age at 1<sup>st</sup> mounting with erection and 1<sup>st</sup> ejaculation were significant (P<0.05).



Ram lambs in group (4) expressed first ejaculation (puberty) younger by 80, 14.5, 55.5 and 8.5 days than those in group 1, 2, 3 and 5, respectively. These results are in agreement with the results of El-Badawy (2003), who found that the lambs fed on diet containing 75% *Nigella sativa* meal-protein expressed first ejaculate (puberty) at 35 days younger than that in control lambs.

Table 5 : Pre-pubertal characters of reproductive performance of ram lambs as affected by the different rations.

Character	Tested groups					Overall mean
	1	2	3	4	5	
<b>1<sup>st</sup> mounting with erection:</b>						
age, days	184.5 <sup>b</sup>	147.3 <sup>a</sup>	181.7 <sup>b</sup>	152.6 <sup>a</sup>	153.2 <sup>a</sup>	163.6
	±9.8	±2.44	±12.9	±5.98	±1.65	±4.4
live body weight, kg	34.2	29.2	32.8	32.2	27.3	31.13
	±2.49	±2.34	±2.19	±1.73	±2.13	±1.044
scrotal circumferences, cm	18.3	18.3	19.5	16.7	17.5	18.1
	±1.14	±0.49	±1.66	±1.33	±0.34	±1.48
Testosterone concentration, ng/ml	0.953	1.805	1.789	1.013	1.975	1.504
	±0.31	±0.26	±0.318	±0.38	±0.88	±0.505
<b>1<sup>st</sup> ejaculation (puberty) :</b>						
Age, days	252.0 <sup>b</sup>	186.5 <sup>a</sup>	227.5 <sup>b</sup>	172.0 <sup>a</sup>	180.5 <sup>a</sup>	203.7
	±19.7	±9.06	±19.1	±4.23	±1.72	±8.04
live body weight, kg	42.3 <sup>a</sup>	35.0	39.0 <sup>ab</sup>	35.7 <sup>ab</sup>	36.0 <sup>ab</sup>	37.5
	±2.64	±1.52	±2.47	±1.03	±2.36	±1.03
scrotal circumferences, cm	23.5	21.5	25.2	21.5	21.6	22.6
	±2.27	±0.61	±3.31	±1.97	±0.66	±1.90
Testosterone concentration, ng/ml	1.287	1.873	2.717	2.018	2.266	2.032
	±0.48	±0.64	±3.22	±0.34	±0.60	±0.48

a, b values with different letters on the same row differ at 0.05.

Tharwat (1985) reported that the age of puberty for Barki ram lambs was 243 days when he the testicular histology method used for determination. However, Castrillejo *et al.* (1989) found that onset of puberty (expressed as morphologically established spermatogenesis) in corriedule ram lambs is attained at 180-216 days of age when scrotal circumferences reached 23 cm of and testis weight reached 191 g.

Ram lambs in the four treated groups reached puberty earlier (186.5, 227.5, 180.5 and 172 days, respectively) with a higher ADG (130, 148, 160 and 140 g/day, respectively) comparing with in control group (252 days puberty age and 130 g/day ADG). These results indicated that age at puberty was affected by ADG.

Data in table (5) showed that average overall mean of scrotal circumferences increased from 18.1 cm at first mounting with erection to 22.6 cm at first ejaculation (puberty) but the differences between treated groups in scrotal circumferences were not significant during the development reproductive performance of the animals.

The present results are in agreement with Perez-Clariget *et al.* (1998), who concluded that improved nutrition accelerated the testicular growth. Scrotal circumferences was increased with age advance in all treated groups (Figure 1).

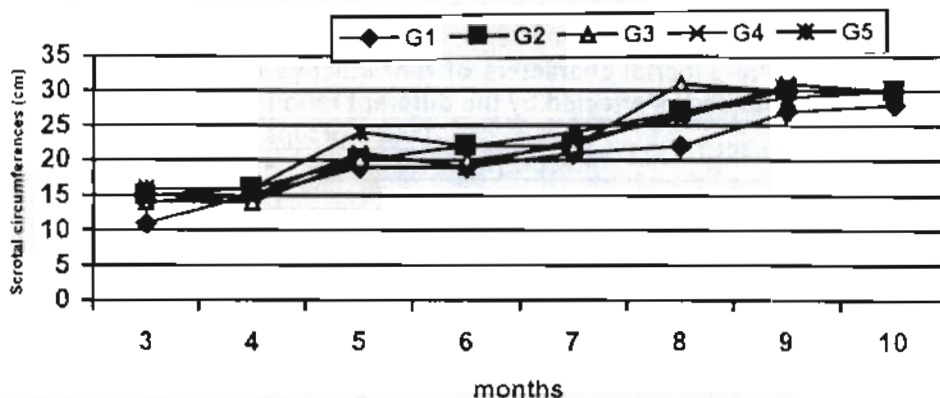


Fig. (1): Monthly scrotal circumference (cm) changes from 3 to 10 months of age for crossbred ram lambs as affected by the experimental rations.

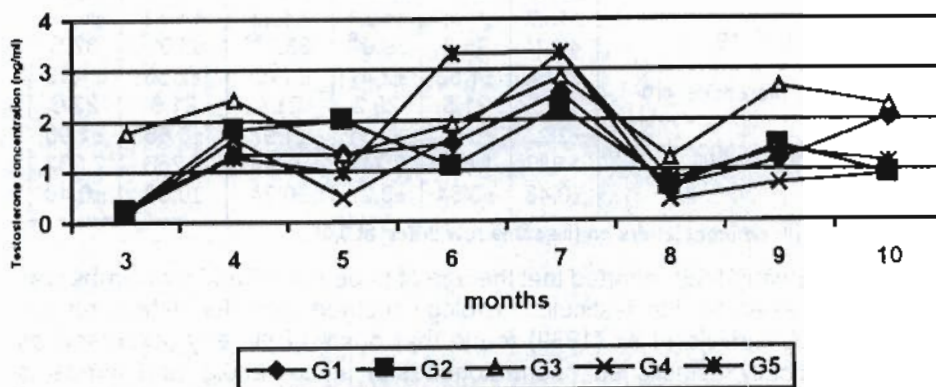


Fig. (2): Monthly blood serum levels of testosterone concentration (ng/ml) changes from 3 to 10 months of age for crossbred ram lambs as affected by the experimental rations.

However, TC at puberty increased by 7.3, 0.91, 0.69, 0.87 and 0.51% comparing with TC at first mounting with erection in the serum of five groups, respectively. Also, TC was increased with increasing age (Figure 2). These results are in agreement with that found by Skinner *et al.* (1968) who found that the total amount of testosterone increased steadily with advancing age. In addition, there was considerable variation in TC in the testes and the mean concentration of testosterone in the blood for ram lambs at 168 day of age was 17.4  $\mu\text{g}/100\text{g}$ . Gomes *et al.* (1971) reported that the TC in spermatic venous blood plasma from yearling rams was 8.2  $\mu\text{g}/100\text{ ml}$ . Schanbacher and Crouse (1980) found that there was fluctuation in blood serum testosterone in Suffolk



ram lambs (ranged between 0.8 and 3.4 ng/ml). On the other hand, El-Shamaa (2002) reported that TC ranged from 1.45 to 2.70 ng/ml at age of puberty in Romanov crossbred ram lambs. However, El-Badway (2003) reported that TC ranged from 2.06 to 2.54 ng/ml at age of puberty in Finnish crossbred ram lambs.

Semen characteristics at 1<sup>st</sup> ejaculation (puberty) in the five treated groups are shown in table 6. It is generally observed that the values of the seminal characters of the 1<sup>st</sup> ejaculates were mostly very small and below the normal values of the sexually mature rams. It is expected that these starting values will increase and reach normality by the advance of age and consequently the development of the sex organs.

Most of the mean values for semen characteristics of five groups (Table 6) within the range reported with previous studies (Chemineau *et al.*, 1991 ; El-Ashry *et al.*, 2000 ; El-Shamaa, 2002 and El-Badawy, 2003).

Table(6) : Mean values of semen physical characteristics at 1<sup>st</sup> ejaculation (puberty) for crossbred ram lambs as affected by the different rations.

Character	Tested groups					Overall mean
	1	2	3	4	5	
Ejaculate volume (ml)	0.275± 0.02	0.325± 0.04	0.40± 0.07	0.30± 0.09	0.20± 0.01	0.30± 0.05
Sperm motility (%)	52.5± 10.1	35.0± 2.50	57.5± 19.5	43.7± 14.9	20.0± 0.35	41.7± 9.5
Live sperm (%)	49.7± 11.0	31.2± 4.2	49.5± 17.3	51.7± 4.0	11.0± 0.70	38.6± 7.4
Abnormal sperm (%)	9.00± 1.80	8.5± 0.43	8.0± 2.8	8.0± 1.2	21.0± 1.1	10.9± 1.47
Sperm concentration x 10 <sup>9</sup> /ml	1.51± 0.18	1.39± 0.18	1.81± 0.01	1.60± 0.29	1.90± 0.09	1.64± 0.15
Sperm output x 10 <sup>9</sup> /ejaculate	0.412± 0.15	0.451± 0.14	0.724± 0.03	0.48± 0.21	0.38± 0.15	0.489± 0.15

In conclusion the Rosmarinas officinalis (RO) is more efficient to lambs reproductive performance followed by Nigella sativa seeds (NS) as compared to other tested groups.

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## تأثير اضافة بعض النباتات الطبية على معاملات الهضم ، والقيمة الغذائية ، تخمرات الكرش والاداء التناسلي لذكور الحملان.

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تم استخدام ٤٠ حولى نامى خليط ٢/١ ف ٢/١× ٢/١ رحمانى متوسط وزنها ١٧,٣ كجم ومتوسط عمرها ٣-٤ شهور قسمت الى ٥ مجموعات متماثلة وتم تغذيتها لمدة ٢١٠ يوم وكانت العلائق المستخدمة هي عليقة المقارنة وتتكون من مخلوط علف مركز ٧٠% ودريس برسيم ٣٠%. بالنسبة للمجموعات المختبرة فقد غذيت الحملان على عليقة المقارنة مع اضافة البردقوش أو الحبة السوداء أو حصا البان أو مخلوطهم للعلائق ٢ع، ٣ع، ٤ع، ٥ع على التوالي . وتم دراسة تأثير العلائق المختبرة على معاملات الهضم والقيمة الغذائية ومعدلات النمو وعلى الاداء التناسلي لذكور الحملان.

أظهرت النتائج تحسنا معنويا (احتمال ٠.٠٥) في معاملات الهضم للمادة الجافة والمادة العضوية والبروتين الخام والألياف الخام ومستخلص خالي الأزوت والقيمة الغذائية محسوبة كمركبات غذائية مهضومة كلية ومعادل نشا ووبروتين خام مهضوم لجميع العلائق المختبرة مقارنة بعليقه المقارنة. وأظهرت العليقه ٣ع، ٤ع أعلى قيم للتحسن لكل من معاملات الهضم والقيمة الغذائية . بينما كانت العليقة ٢ع أقلها تحسنا مقارنة مع العليقتين (٣ع & ٤ع) . بينما لم تؤثر العلائق المختبرة معنويا على درجة الحموضة والقلوية لسائل الكرش . بينما حققت كل من العليقتين (٣ع & ٤ع) انخفاضاً معنوياً (احتمال ٠.٠٥) لقيمة تركيز أمونيا سائل الكرش مقارنة بالمجموعة المقارنة . بينما ازداد تركيز الأحماض الدهنية الطيارة زيادة معنوية ( احتمال ٠.٠٥) بسائل الكرش لكل من المجموعتين (٣ع & ٤ع) مقارنة بالمجموعة الضابطة . وكانت أعلى القيم المتحققة للمجموعة ٤ع . كما أدت الإضافة إلى زيادة تركيز حامض البروبيونيك بينما خفضت تركيز حامض الأسيتك مقارنة بقيمها للمجموعة الضابطة..

أعطت حملان المجموعة الرابعة اول قذفة متوية (البلوغ) عند عمر ١٧٢ يوم وكان ذلك بحوالى ٨٠ ، ١٥ ، ٥٦ ، ٩ يوما عن المجموعة الاولى والثالثة والخامسة على التوالي ، لم تكن هناك فروق معنوية في تركيز هرمون التستستيرون في سيرم دم الحملان في الخمس مجموعات المختلفة في مراحل التطور الجنسى ، اذ لم تكن هناك فروق معنوية في حجم الخصية في الخمس مجموعات المختلفة . خلاصة البحث تظهر انه يمكن استخدام الحبة السوداء وحصا البان في تغذية الحملان لما لها من اثار ايجابية على الاداء التناسلي لذكور الحملان.