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BODY WEIGHT DEVELOPMENT, RUMINAL FLUID CHARACTERISTICS AND SOME BLOOD CONSTITUENTS OF LAMBS FED ON DIET SUPPLEMENTED WITH BOSPRO

(With 4 Tables)

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تأثير إضافة البوسبرو الى علائق الحملان على معدل النمو وخصائص سائل الكرش وبعض مكونات الدم

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اجريت هذه التجربه على عدد ٢٠ من الحملان لدراسة أثر اضافة البوسبرو على كل من معدلات النمو والتحويل الغذائى وكذلك على بعض الصفات الفيزيائيه والكيميائيه لسائل الكرش بالاضافه الى دراسة بعض مكونات الدم ومصله .

تم تقسيم الحملان الى مجموعتين متساويتين (عشرة بكل منها) حيث أعتبرت احداها مجموعه ضابطه والاخرى اضيف البوسبرو الى غذائها بمعدل ٣ جرام لكل حيوان .

وقد اتضح من التجربه ان اضافة البوسبرو لعلائق الحملان أدى الى زيادة معدل التحويل الغذائى ووزن الجسم حيث بلغت الزياده فى وزن الجسم فى المجموعه المعامله ٨ ر ٢١ ٪ من الوزن فى بداية التجربه بينما كانت ٧ ر١١ فى المجموعه الضابطه .

وبالنسبه لسائل الكرش وجد أن البوسبرو أحدث زياده معنويه فى الحموضه الكليه وحامض اللاكتيك والاحماض الدهنيه الطياره والأمونيا بينما أدى الى نقص فى تركيز الاس الايدروجينى ومعدل الترسيب فى سائل الكرش مقارنة بالمجموعه الضابطه .

كما انه لم يلاحظ أى أثر لاضافة البوسبرو على رائحة أو لون أو قوام سائل الكرش كذلك لم يؤثر على نشاط طفيليات الكرش وحيدة الخليه أو اختبارى الاندول وكبريتيد الهيدروجين .

بالنسبه لمكونات الدم ومصله أدت اضافة البوسبرو الى زيادة معنويه فى بروتين المصل الكلى والجلوكوز ونيتروجين اليوريا والدهنيات الكليه والجلسريدات الثلاثيه بينما لم تكن تلك الزياده معنويه فى الهيموجلوبين وحجم الخلايا المتراصه .

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SUMMARY

An experimental work was carried out to study the effect of Bospro on body weight development, food conversion as well as some physical and biochemical characters of rumen liquor and some blood & serum constituents. Two groups of healthy lambs (each of ten) were used for this purpose. One group was used as control, while the other received a diet supplemented with Bospro in the rate of 3gm per head daily for 45 days. Bospro improved the food conversion and body weight gain, whereas the body weight was increased by 21.8% of the initial body weight in 45 days, while the respective increase was only 11.7% in the control group. The ruminal fluid of lambs supplemented with Bospro showed significant elevation of total acidity, lactic acid, TVFA and ammonia, while the sedimentation rate and pH were decreased without any side effect on the animals. On the other hand, the odour, colour, consistency, protozoal activity, indol test and hydrogen sulphide test were not affected with the Bospro supplementation. Blood and serum constituents after supplementation showed a significant ($P< 0.05$) increase in total serum protein, glucose, serum urea nitrogen, total lipids and triglycerides, while haemoglobin and PCV were not significantly ($P< 0.05$) increased.

Keywords: Weight, ruminal juice, blood, lambs, Bospro.

INTRODUCTION

Rumen microorganisms play an important role in ruminal digestion specially for the fibrous carbohydrates. The main products of their digestion are the volatile fatty acids (acetic, propionic and butyric acids) which are utilized by the animals for the production of energy, body fat, milk fat and glycogen *(CHURCH, 1991)*.

Regarding the physical properties of normal ruminal juice in sheep, *WAFAA (1981)* described the normal colour to be olive green in winter and pure green in summer with viscous consistency and aromatic odour. She also recorded a period of 20 to 35 minutes that required for completion of sedimentation and floatation of particulate ruminal material.

Ammonia is produced in the rumen mainly as a result of bacterial action either on urea by bacterial urease *(PEARSON and SMITH, 1943)* or on protein, peptides, amino acids, amides, nitrates and some other non protein nitrogen compounds *ALLEN* et al., *1969)*. Large proportion of ruminal ammonia is used in the synthesis of microbial protein in the rumen that subsequently becomes available for digestion and absorption by animals. The normal range of ammonia in sheep ruminal juice was 26.2 to 29.24 mg% *(WAFAA, 1981) and IBRAHIm (1993).*

CHURCH (1973) recorded values for normal ruminal pH ranged from 6.8 to 7.8. This range was associated with differences in the intervals after feeding the nature of the diet and water consumption (related to rumen liquid dilution). *IBRAHIM (1993) recorded a mean value 7.42* ± 1.38 for ruminal pH in sheep. The normal range of lactic acid level in the rumen of sheep was zero to 33 mM/Liter ruminal juice *(SCARISBRICK, 1954) while IBRAHIM (1993)* recorded values from zero to 0.05%.

The total volatile fatty acids (TVFA) of the ruminal fluid in sheep were 82.8 ± 0.66m.Eq/L*(IBRAHIM, 1993)* however, *WAFAA (1981)* ranged them from 60 to 85 mEq/L. Regarding the total acidity, *IBRAHIM (1993)* obtained value of 15 ± 1.14 mg/L in sheep.

Concerning the blood and serum contents of lambs, *AHMED (1984)* recorded mean levels of Hb, 10.25 gm%; PCV, 33%; total serum proteins, 6.16 gm% and serum glucose 62.3 mg%, however, *GOODRICH* et al. *(1968)* recorded 12.1-12.5 gm%, 33.8-35.4% and 5.65-6.5 gm% for these criteria respectively.

The objectives of this study were to investigate the effect of Bospro supplementation on body weight development as well as the involuntary activities of some ruminal juice and blood contents of lambs.

MATERIAL and METHODS

Twenty lambs weighed 20-24Kg experimented on. They were completely healthy and free from parasites. Lambs were randomly divided into two equal groups each of 10 lambs. The first group was used as control while the second one (treated group) supplemented with 3gm Bospro daily along the experimental period (45 days). The daily amount of Bospro was divided to be fed to the animals 2 times/day mixed with concentrates.

Bospro® is a natural feed supplement (produced by Pet-Ag, Inc., Elgin, Illinois, U.S.A) and copmosed of dried Aspergillus meal on a carrier of distiller grains and solubles and contains in percentage 17.6, protein; 3.2 fat; 28.1 fiber; 5.2 ash; 9 moisture and 36.9 NFE. Aspergillus in Bospro contains high

levels of mycelial fiber and low level of nucleic acids which stimulate the growth of rumen and intestinal microflora.

Lambs were fed on diet composed of berseem hay (IKg) and commercial concentrate mixture (0.5Kg)per head daily to satisfy the needs recommended by *NRC (1975)*. The amount of food was divided to be offered twice a day at the times 8^{00}—a.m & 17^{00}—p.m daily. The commercial concentrate mixture was composed in percentages of: yellow corn, 17; cotton seed cake, 45; wheat bran, 26; rice polish, 7; molasses,s 3; limestone, 1 and common salt, 1.

Lambs were weighed at the start and at the end of the experiment to study the body weight development of these animals.

Blood samples and ruminal juice were obtained from the treated group for comparative studies before (as auto control) and after supplementation with Bospro. Blood samples were collected 8 hours post feeding, while the rumen liquor samples were collected at 0,4 and 8 hours post feeding, at the day before supplementation and at the 45^{th}— day of the experimental period.

Blood samples were collected for estimation of haemoglobin content and packed cell volume after *BENJAMINE (1970)*. Clear serum samples were used for determination of total protein *(KING and WOOTTON, 1959)*, glucose *(TORLOTON, 1966)*, urea nitrogen *(MARSCH et al., 1965)*, total lipids *(KNIGHT et al., 1972)* and triglycerides *(FLETCHER, 1968)*.

Ruminal samples were collected by a simple ordinary rubber tube (16 mm diameter connected with a suction plastic syringe 100ml capacity). Each sample was collected into a clean, dry and sterile flask, sieved and strained through 4 folds of sterile gauze then divided into three portions. One part was taken in a clean & dry test tube for detecting colour, odour and consistency. The second part was used immediately for estimating the ruminal pH (by electric pH meter), ammonia *(CONWAY, 1957)*, sedimentation activity test *(NICHOLE and PENN, 1958)*, Protozoal motility *(ROSENBERGER et al., 1979)*, total acidity *(SLANINA and ROSSOW, 1964)*, lactic acid *(VARLEY, 1954)*, Indol *(WOLF, 1964)* and hydrogen sulphide *(HACKEL, 1952)*. The third portion was used for determination of total volatile fatty acids (TVFA) by steam distillation method as described by *WARNER (1962)*.

The obtained data were statistically analysed using T. test after *SNEDECOR (1956)*.

RESULTS

Results are prsented in tables (1-4).

DISCUSSION

Regarding the body weight development of lambs in both the control and treated groups (Table 1), the supplementation of the diet with Bospro resulted in increasing the efficiency of fattening and rate of food conversion. The total gain in 45 days was 4.9 for the treated while respective gain for control group was 2.65Kg, so that the percentage of again in body weight of lambs receiving Bospro was 21.8% while the control lambs gained 11.7% of their live weight in 45 days.

The average daily gain in the control group was 0.059Kg while it was 0.109Kg for the treated group and each Kg gain required in this group 4.587Kg concentrate (with berseem hay) while it was about the double in case of the untreated group (8.475Kg).

Since the microbial digestion and fermentation of the ingestd are the main function of the rumen, the examination of the rumen juice is usually used as an indicator for ruminal activity. Table 2 revealed that there was no differences between the auto control group and the treated group regarding the colour, odour, consistency, protozoal activity, indol test and hydrogen sulphide test. The colour varied from olive green to greenish yellow, slimy to viscous in consistency with aromatic odour, also protozoa were active, highly motile and overcrowded. These findings were agreable with those reported by *WAFAA (1981) and IBRAHIM (1993).* All samples were positive for indol reaction and strong positive for hydrogen sulphide, similar observation was recorded by *WOLF (1964) and IBRAHIM (1993)* in healthy sheep.

Table 3 presents some ruminal Juice contents of the auto control group and the treated group at 0, 4 & 8 hours post feeding. Sedimentation rate was significantly lower ($P< 0.05$) at 8 hours post feeding in the treated group, although it was still within the normal range in the two groups as reported by *WAFAA (1981)* who mentioned that the sedimentation time ranged from 20 to 35 minutes.

pH values decreased significantly in the treated group ($P< 0.01$) at 4 & 8 hours post feeding. The lowest level of pH ($P< 0.01$) recorded at 4 hours post feeding in both groups which is in agreement with *DIRKSEN and SMITH (1987)* who reported pH values of 6.8, 5.7 and 6.3 at 0,4 and 8 hours post feeding on a

ration rich in concentrates. The same observation was supported by *STROKES* et al., *(1991)*. The decreased pH values in the treated group may be a reflection of the significant increase in lactic acid production and subsequently the total acidity in this group (Table 3).

The variation in TVFA concentration, lactic acid and total acidity due to time of sampling was highly significant indicating diurnal variation in the production. The peak concentration was observed at 4 hour post feeding which may be due to ample availability of nutrients and maximum fermentation activity during this period. There were significant ($P< o.o1$) variations between the two groups in the overall mean of pH, lactic acid, total acidity and TVFA ($P< 0.05$).

The changes in the concentration of ammonia nitrogen due to time of sampling were also significant ($P< 0.01$). The peak was observed at 4 hours post feeding which may be due to maximum proteolytic and deaminase activities at this period *(RAI* et al., *1972)*. The decline in the concentration after this time may be due to absorption and/or utilization of ammonia nitrogen in the synthesis activity of the rumen *(McDONALD, 1952)*. The increased ammonia concentration in treated group might be due to increased proteolytic activity, however Bospro may posses a protein sparing effect. Similar effect was recorded by *AHUJA* et al. *(1989)* with monensin. They also mentioned that the addition of monensin may result in more availability of starch for bacterial fermentation, thus resulting in increased TVFA production.

It is of interest to notice that the ruminal fluid of lambs after receiving Bospro showed a significant elevation (P, 0.01) of total acidity, lactic acid, TVFA and ammonia, meanwhile the pH was decreased. However, clinical signs of any side effects were not appeared, on the contrary the animals of this group were highly active and thrifty with a very good healthy condition.

Table 4 shows the blood and serum contents of lambs before and after supplementation with Bospro. There was non significant ($P< 0.05$) increase in haemoglobin and PCV in the treated group, while total serum protein, glucose, serum urea nitrogen, total lipids and triglycerides increased significantly ($P< 0.05$). Such elevation may be attributed to the effect of Bospro on ammonia, VFA and other rumen juice contents (Table 3), as a result of microflora stimulation which improved the utilization of the diet so that it was reflected on the good picture of the serum and increased body gain (Table 1).

It could be concluded that, supplementation of the diet for lambs with Bospro in the rate of 3gm/ head daily improves the body weight development with increasing the efficiency of growth and the rate of food conversion and has also a beneficial effect on ruminal juice contents and some blood parameters without any side effect.

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Table (1): Body weight development and feed conversion of lambs in the control and treated group.

Item	Control group	Treated group
Initial body wt., Kg	22.650±0.619	22.450±0.552
Finishing wt., Kg	25.300±0.599	27.350±0.672
Total gain in 45 days, Kg	2.650	4.900
Gain %	11.7	21.8
Average daily gain, Kg	0.059	0.109
Average daily Concentrate fed; Kg	0.500	0.500
Concentrate fed/Kg body gain	8.475	4.587

Table (2): Some characteristics of lamb ruminal juice before (auto control group) and after supplementation with Bospro (treated group).

Items	Auto control group	Treated group
Colour	Olive green to greenish yellow	Olive green to greenish yellow
Odour	Aromatic	Aromatic
Consistency	Slimy	Slimy
Protozoal activity	+++	+++
Indol test	Positive	Positive
Hydrogen sulphide test	Strong positive (+++)	Strong positive (+++)

+++ Highly active, motile and crowded.

Table (3): Some contents of lamb ruminal juice before (auto control group) and after supplementation with Bospro (treated group) at zero, four and eight hours post feeding.

Item		Auto control group				Treated group			
		Zero hour	Four hours	Eight hours	Overall mean	Zero hour	Four hours	Eight hours	Overall mean
Sedimentation rate (minute)		21.8±0.91	30.2±0.17	33.0±1.26	28.379±1.123	22.6±0.858	29.4±1.23	30.2±1.755*	27.4±0.972
pH		7.27±0.077	6.42±0.155	6.905±0.086	6.865±0.089	7.17±0.07	5.36±0.09**	6.13±0.08**	6.22±0.147**
Lactic acid	%	0	0.04±0.013	0.015±0.008	0.023±0.006	0	0.08±0.009*	0.065±0.008**	0.66±0.006**
Total acidity	mg/L	15.3±0.802	33.1±0.576	20.0±0.956	22.8±1.485	17.85±0.835	44.45±0.976**	38.1±0.823**	33.467±2.194**
TVFA	m.eq/L	78.3±2.378	91.15±2.749	84.95±1.809	84.8±1.603	81.949±2.908	100.75±4.275	96.3±2.45**	93.0±2.334*
NH_3-N	mg%	18.5±0.82	31.3±0.817	21.7±0.59	23.833±1.103	20.1±1.444	34.0±1.397	26.9±1.116**	27.0±1.31

** Highly significant ($P<0.01$)

* Significant ($P<0.05$)

Table (4): Some blood and serum contents for lambs before (auto control group) and after supplementation with Bospro (treated group).

Items		Auto control group	Treated group
Haemoglobin	**gm%**	10.63±0.183	11.03±0.156
PCV	**%**	32.2±0.734	34.2±2.049
Total serum protein	**gm%**	6.39±0.058	6.81±0.099*
Glucose	**mg%**	60.338±1.645	70.483±2.21*
Serum urea nitrogen	**mg%**	20.788±0.914	24.915±1.079*
Total lipids	**mg%**	229.55±3.563	255.0±5.773*
Triglycerides	**mg%**	61.466±2.399	70.982±1.866*

* Significant at $P < 0.05$.