J. Agric. Sci. Mansoura Univ., 29 (10): 5567 - 5583, 2004

EFFECT OF FEEDING NATURAL AND/OR COMMERCIAL BIO-ADDITIVES ON THE PRODUCTIVE PERFORMANCE OF LACTATING EWES

El- Kady, R. I.*; A. M. Kandil and M. A. Boraie****

* **Department of Animal production, National Research Center, Dokki, Giza, Egypt.**

** **Department of Animal production, Faculty of Agriculture, El-Azhar, University, Cairo, Egypt.**

ABSTRACT

The aim of this study was to compare the effect of using Bospro milled fenugreek seeds and active dried yeast on milk yield and composition of lactating ewes. Sixteen multiparous Barki ewes (weighing in average 44.8± 0.49 kg were divided randomly into four equal groups (4 ewes each), belonging to the Agriculture Experimental and Research Station, Faculty of Agriculture, El-Azhar University, Cairo.

Animals were group fed according to (NRC, 1985). The control diet consisted of concentrate feed mixture and *ad-lib* bean straw with no feed additives (R_1). The second group received the control diet plus 15gm/ewe/day, Bospro (R_2). The third group received the control diet plus 15gm/ewe/day, milled fenugreek seeds (R_3) and the fourth one received the control diet plus 10gm/ewe/day live dried baker's yeast(R_4).

The experiment started 4 weeks before expected lambing date and continued till the end of the lactation period.

The results showed that:

- Ewes fed on different feed additives increased their roughage DMI by about 25, 41and 46 % for Bospro (R2) Fenugreek (R3) and yeast (R4) rations, respectively, compared with the control (R1) ration.
- Daily milk yield by ewes fed on different feed additives increased by about 10.5, 16.3 and 12.7% for R2, R3 and R4 respectively, compared with those fed on control ration.
- Total solids %, milk fat% , protein% and lactose % and gross energy per kg milk tended to increase with feeding different feed additives compared with the control ration.
- Feeding different feed additives significantly (P≤ 0.05) improved almost all values of nutrients digestibility compared with the control ration. Higher feeding values of different feed additives compared with control ration were obvious.
- The results of rumen parameters showed reduction in ruminal PH for different feeding treatments after 4 hrs of feeding. However, total volatile fatty acids concentrations were noticeably increased after 4 hrs of feeding with different feed additives compared to the control ration.
- Ruminal ammonia – N concentrations was noticeably increased with feeding different feed additives compared with the control ration.
- It could be concluded that Bospro, Fenugreek seeds and active dried yeast could be used in lactation ewes rations to improve their milk yield and milk composition with decreasing feed cost. The best economical return was achieved with the groups fed rations contained fenugreek, active dried yeast followed by the group fed ration contained Bospro and the lowest was the control.

Key words: Bospro, fenugreek seeds, active dried yeast, lactation, nutrients digestibility and rumen parameters.

INTRODUCTION

Many attempts has been done to identify the role of natural and bio-additives on the productivity of farm animals. The use of chemical products especially (hormones and antibiotics), may cause unfavorable side effects. Moreover, there are some evidence indicating that these products could be considered as pollutants for human and threaten their health on the long-run.

Attempts to use the natural materials such as medicinal plants as fenugreek seeds, Bospro or active dried yeast could be widely accepted as feed additives to improve the efficiency of feed utilization and animals productive performance.

Fenugreek is a leguminous plant cultivated in Egypt as well as in many other Mediterranean countries. Seeds of fenugreek contain alcoholic compound which acts as oxytocin hormone and also have hypocholesterolemic and anti diabetic action (Petit *et al.*, 1995 John and Sons 1996). Fenugreek seeds are also rich in protein, fat and minerals (Ca, Fe, Zn, and Mg) (James, 1984; Shrama. 1986 and Gupta *et al.*, 1996).

- Bospro is a natural feed additive based primary on fermentation (Aspergillus) of a mixture since they containing some herbs, edible plants, vegetables and seeds which has tonic and restorative effect such as *Trigonella, foenum, graecum, Sessamum, indicum and Lepilidium- sativum* (Boulos, 1983). Bospro enables cattle to utilize low quality roughage more efficiently (Martin and Nisbet, 1989) and alter the rumen microflora to favor increased VFA's production (Akin and Borneman, 1989).

Yeast had been used as supplements in animal feed for more than six decades. For the most part, early uses of yeast supplements in animal rations was based on empirical observations, which suggested that improvements in animal performance could be obtained by including small amounts of yeast in animal diet. Until the last decade, few attempts has been done to identify mechanisms which explain the beneficial activities associated with the preparation. Dawson, (1992) mentioned that yeast stimulates rumen bacteria to enhance lactate and ammonia utilization resulting in moderate PH and increase in microbial population which lead to increase in fiber digestion and protein synthesis in the rumen. Yeast cells maintain their metabolic activities under anaerobic conditions, and exposure to low pH (Dawson, 1992).

The objective of this study was to evaluate the effect of Bospro, milled fenugreek seeds and active dried yeast as supplements to the rations on the productive performance of lactating ewes.

MATERIAL AND METHODS

The field trials of the present experimental work were conducted at the Experimental Station of Department of Animal Production Department, Faculty of Agriculture, El-Azhar University, while the analytical work was completed at the laboratories of Animal Production Department, National Research Center.

Sixteen-3 to 4 years old pregnant ewes weighing an average 48.0 + 0.49 kg were used. They were divided into four equal and similar groups of four animals each.

Four experimental rations were tested, being:

1: a control ration (CR) which consisted of concentrate feed mixture (CFM) and been straw *ad-lib* without additives (R1).

2: the (CR) + Bospro at a commercial recommended level of level of 15g/ewe/day (R2). Bospro(Smerco- company) composition is given in Table (1).

3: the (CR)+ 15 g/ewe/day milled fenugreek seeds (R3).

4: the (CR) + 10g/ewe/day live dried baker's yeast (R4). The live dried baker's yeast was secured from Sugar Integrated Industry Company (Hawamdia Chemicals Factory), contained at least $20x10^9$ live cells/g of *Saccharomyces cerevisiae*.

Table (1): Formulation of Bospro

Ingredients	%
- Aspergillus meal fermentation solubles	30.0
- Wheat middling	16.0
- Concentrated steffen	15.0
- Filtrate condensed fermented corn extractive with germ meal and dehydrated bran	15.0
- Ground licorice root	6.0
- Corn distillers dried grains with solubles	5.80
- Torula yeast fermentation solubles	4.50
- Soybean meal	3.50
- Dried whey product	3.20
- Shark liver oil preserved with BHA and BHT *	0.919
- Natural and artificial flavors	0.05
- Calcium iodate	0.022
- Cobalt Carbonate	0.009
Total	100.00

BHA and BHT = anti oxidant * BHT = Butylated Hydroxy Toluene

The four animal groups were assigned at random to receive the four experimental tested diets which were offered to cover their requirements according to NRC (1985). The CFM was offered to animals once daily at 8.00 a.m. after animals consumed it, bean straw was offered *ad-libitum*. The residue of roughage was collected and weighed daily and recorded for each group. The intake of CFM were adjusted biweekly for each group according to change in body weight to meet the NRC (1985) requirements.

Each group was kept in separate pen under veterinary supervision. Salt blocks and fresh water were available throughout the experimental period.

Four digestibility trials were conducted on 12 ewes at the end of the lactating experiment (three ewes each). Each digestion trial lasted for 21 days of which the first two weeks were considered as a preliminary period followed by 7 days collection period, to determines the digestibility and

nutritive values of the tested diet in response to the tested additives. The chemical composition of different ingredients and experimental rations are given in Table (2).

Table (2): Chemical composition of feed ingredients and the experimental rations.

Item	DM%	DM composition %					
		OM	CP	CF	EE	NFE	Ash
CFM*	90.56	91.70	15.30	12.90	2.30	61.20	8.30
Milled fenugreek seeds	92.40	96.45	26.72	1.87	6.28	61.58	3.55
Dried live baker's yeast	91.00	92.70	41.20	3.10	8.77	39.63	7.30
Bospro	91.00	94.27	17.34	28.87	3.51	44.55	5.73
Bean straw	91.40	83.40	4.90	38.60	1.42	38.48	16.60
Experimental ration:							
Calculated value of consumed mixed ration according to intake:							
Control ration (R_1)	90.70	90.22	13.47	17.41	2.14	57.20	9.78
Bospro ration (R_2)	90.73	89.96	13.15	18.41	2.12	56.28	10.04
Fenugreek ration (R_3)	90.77	89.75	12.94	18.82	2.12	55.87	10.25
Yeast ration (R_4)	90.75	89.78	12.99	18.85	2.17	55.77	10.22

*** Concentrate feed mixture CFM consisted of:**
25% undecorticated cotton seed meal
+ 35% wheat bran +30% yellow corn
+ 4% rice bran + 3% molasses
+ 2% limestone + 1% sodium chloride

Price of kg Bospro = 16/L.E
Price of kg Fenugreek = 4/L.E
Price of kg live dried yeast = 10/L.E

Offspring were kept with their dams all the time except on the day of milk yield determination. The offspring were separated from their dams at 7 p.m. of the day prior to the recording day. Dams were hand milked (twice/day) at 7 a.m. and 5p.m. Representative milk samples (about 10.0% of total milk produced) were taken once weekly from each ewe. From the morning and evening milking of the same day. Milk PH was directly determined using Orion 680 digital PH meter. Then the samples were composed and analyzed for total solids % and ash according to A.O.A.C (1980) milk fat content was determined by Gerber's tubes as described by ling (1956) total protein was determined according to ling (1963) and lactose was calculated by difference.

Gross energy of milk was calculated according to the following values: 1 gm fat = 9.4 k cal; 1gm protein = 5.65 k cal and 1gm lactose = 4.15 k cal.

Fat corrected milk calculated according to the following equation

$$FCM = \frac{15x\ F\ x\ Y}{100} + 0.4\ Y$$

(FCM = fat corrected milk = 4% fat) (F = milk fat %) (Y = milk yield)

Rumen liquor parameters:

Rumen liquor samples were collected from all animals at the end of each digestibility trials at the end of each digestibility trials at 4 and 24 hours post feeding using a stomach tube.

The rumen liquor was extracted by filtering the rumen content through four layers of cheese cloth and tested for PH immediately. Ammonia-N and total volatile fatty acid concentrations. Were determined in the rumen liquor samples after being preserved in polyethylene bottles in a freezer (- 20° C) until analysis.

Chemical analysis:

Representative samples of feeds and faces were air dried and kept for analysis. Chemical analysis of feedstuffs and feces were determined according to the A.O.A.C (1980). The rumen liquor samples were strained for determination of PH meter (Orion 680 digital). Ammonia-N concentration was determined according to Conway and O'malley method (1963), while the total volatile fatty acids were measured according to the technique described by Warner (1964).

Statistical analysis:

Data collected were statistically analyzed by one-way analysis of variance according to Steel and Torrie (1980) using the MSTATC procedure. The means were tested for their significance using the least significance difference by (MSTATC, 1986), at ($P \leq 0.05$).

RESULTS AND DISCUSSION

Voluntary feed intake:

The influence of supplements on feed intake is presented in Table (3). Since CFM was fixed, the response were mainly on roughage intake. Groups fed Bospro, Fenugreek and yeast rations increased roughage dry matter intake (RDMI) by about 25,41and 46%, respectively compared to control ration. Abou Ammou and El-Hosseiny (1999) found that total dry matter intake (gm/h/d) was slightly increased by Bospro addition during summer season with crossbred male lambs than control ration. However, Kandil, *et al* (2003) found that the supplement of yeast or Bospro to the control ration with buffalo male calves increased total feed intake, the increase was higher with Bospro than that with yeast ration. All differences among rations in the present study were not significant.

However, Abo-Donia *et al* (2003) found similar insignificant decrease in dry matter intake when Baladi calves were fed ration contained fenugreek. This insignificant decrease in DMI could be attributed to the gum in fenugreek seeds (Udayasekhara and Sharma, 1987). In contrary Petit *et al.*, (1993) Tomar *et al.*, (1996) and Allam *et al.*, (1999) found increase in DMI with animals fed diet contained fenugreek seeds. However, Khattab *et al.*, (2001) found that dry matter intake was slightly ($P<0.05$) increased in fenugreek rations than the other groups.

The highest DMI value was obtained by dried live yeast (Table, 3), while the lowest DMI value was obtained by control group. These results are in accordance with those of Erdman and Sharma (1989); Arambel and Kent (1990); Mustvangwa (1992). Swartz *et al.*, (1994); Soder and Holden (1999);

Table 3. Effect of feeding the experimental rations on productive performance of ewes during 8 weeks of lactations

Item	Control ration R_1	Bospro ration R_2	Fenugreek ration R_3	Yeast ration R_4
Av. body wt (kg)	45.2	45.0	44.5	44.3
Total DM intake (g/h/day)	1720.3	1825.8	1885.2	1898.5
From CFM	1358.4	1358.4	1358.4	1358.4
From bean straw	$361.9^{b}\pm24.80$	$452.4^{a}\pm21.77$	$511.8^{a}\pm21.62$	$530.1^{a}\pm22.80$
From additives	-	15.0	15.0	10.0
TDMI g/kgw$^{0.75}$	98.7	105.0	109.4	110.5
TDMI % of L.B.W	3.8%	4.0%	4.2%	4.2%
Milk yield (g/h/day)				
1st wk	$372.50^{b}\pm17.97$	$422.5^{ab}\pm20.15$	$445.00^{a}\pm13.23$	$427.50^{ab}\pm21.75$
2nd wk	$340.00^{b}\pm20.41$	$402.50^{a}\pm18.87$	$400.00^{a}\pm10.80$	$415.00^{a}\pm22.17$
3rd wk	$312.50^{b}\pm17.97$	$365.00^{ab}\pm16.58$	$367.50^{ab}\pm13.15$	$387.15^{a}\pm27.80$
4th wk	$287.50^{a}\pm22.86$	$322.50^{a}\pm14.36$	$342.50^{a}\pm12.50$	$335.00^{a}\pm20.20$
5th wk	$272.50^{a}\pm7.50$	$282.50^{a}\pm13.76$	$307.50^{a}\pm12.50$	$300.00^{a}\pm17.79$
6th wk	$235.0^{a}\pm13.23$	$247.50^{a}\pm16.52$	$270.00^{a}\pm15.81$	$232.00^{a}\pm17.97$
7th wk	$195.0^{a}\pm11.90$	$197.50^{a}\pm13.67$	$222.50^{a}\pm14.36$	$195.00^{a}\pm11.90$
8th wk	$152.50^{a}\pm13.15$	$157.50^{a}\pm13.67$	$170.00^{a}\pm9.13$	$152.00^{a}\pm13.15$
Milk yield/ wk	$1896.25^{a}\pm90.04$	$2097.50^{a}\pm100.69$	$2209.00^{a}\pm81.49$	$2139.50^{a}\pm130.23$
Milk (g/h/d)	$270.75^{a}\pm12.78$	$299.17^{a}\pm14.49$	$315.00^{a}\pm11.64$	$305.25^{a}\pm18.71$
FCM* (g/h/d)	$298.75^{b}\pm14.97$	$347.25^{ab}\pm14.30$	$389.00^{a}\pm16.49$	$370.00^{a}\pm21.67$
Fat (g/h/d)	$12.70^{b}\pm0.68$	$15.20^{a}\pm0.59$	$17.52^{a}\pm0.79$	$16.50^{a}\pm0.98$
Gross feed efficiency				
Kg milk /kg TDMI	0.15	0.16	0.16	0.16
Kg FCM /kg TDMI	0.17	0.19	0.20	0.19
Feed conversion Kg TDMI/ kg milk	6.37	6.10	5.98	6.22

a,b, Means in the same row having different superscripts are significantly different (P≤0.05). * FCM = fat corrected milk (4%).

El- Waziry *et al.*, (2000); and El- Ashry *et al.*, (2001); Also these results agree with those found by Tarakanov (1993); who reported that yeast as probiotic increased the intake and efficiency of utilization of roughages. Supplementation with Bospro, fenugreek or yeast in diets might enhance roughage fermentation and / or prompt in emptying the rumen, which may lead to increasing roughage intake.

Efficiency of milk production:

Results of milk yield, gross feed efficiency and feed conversion of milk are given in Table (3). Also it was noticed that, animals of the supplemented groups increased milk yield of ewes (g/h/d) by about 10.5 , 16.3 and 12.7 % and FCM (g/h/d) by 16.2 , 30.2 and 23.8% for Bcspro, fenugreek or yeast over the control ration, respectively. However, these differences were non-significant, which may be attributed to the high variability among individual ewes within treatments in milk yield. This variability might be due to the different genetic ability of the individuals to the biosynthesis of milk. But these increases in milk yield may be attributed to the stimulus effect of available nutrients on the mammary gland secretion.

These results are in accordance with those reported by Huber *et al*; (1989). Yousef *et al*; (1996); Putnam *et al* (1997); Abo El-Nor and Kholif (1998) and El-Ashry *et al*; (2001); who reported that yield of milk and 4% corrected milk were significantly ($p<0.05$) improved by including probiotics in the lactating buffalos rations.

The highest milk yield was that of animals fed diets supplemented with yeast. This may be attributed to higher digestibility of DM, OM, CP, CF, and EE digestibility value than the control group. There were significant ($P<0.05$) differences in the fat (g/h/d) between treated group compared with the control group, Feed efficiency calculated as milk yield/DMI and 4% FCM/DMI were higher in natural and probiotics supplemented groups compared to the control. Fenugreek addition to beef and dairy animals found to increase growth performance and milk production, Abo-El Nor, (1999), Singh *et al*; (1991); El- Komy (1996); and Allan *et al*; (1991).; And Khattab *et al*; (2001); reported that lactating buffaloes fed a ration containing fenugreek had significantly higher milk yield than control. Kholif *et al*; (2001); and Khattab *et al*; (2001); found that fenugreek significantly ($P<0.05$) increased milk yield and 4% FCM when supplemented to lactating goats diet.

This improvement in milk yield may be attributed to the mode of action of probiotics which may operate by producing antibiotic substances and inhibiting harmful bacteria, altering microbial metabolism and decreasing intestinal pH (Sissons, 1998 and Makled, , (1991). In addition, Yung-Chih (1990) reported that, probiotics could enhance the metabolism and energy of animal body cells, raise the efficiency of feed utilization and induce and balance the secretion of various secretary glands.

Milk composition:

It is clear from Table (4) that in general total solids, fat and lactose were significantly ($P<0.05$) higher in the milk of ewes fed on the natural and probiotics supplemented diets compared with the control ration. The

increases in these parameters are in accordance with those reported by some authors (Yousef *et al*, 1996, Abo-El Nour and Kholif. 1998 El-Ashry, *et al*., 2001, Khattab *et al*., 2001); In addition yeast and fenugreek supplementation significantly (P< 0.05) increased protein content which may be due to stimulation of rumen microbes that cause altering microbial protein synthesis and increase protein in the milk (Dawson 1993)

Table (4): Mean composition of ewes milk as affected by feed additives in their rations

Item %	Control ration R_1	Bospro ration R_2	Fenugreek ration R_3	Yeast ration R_4
pH	6.62 ^{a} ±0.004	6.54 ±0.07 ^{a}	6.45 ±0.05 ^{a}	6.61 ^{a} ±0.06
Total solids	14.78 ^{b} ±0.38	15.90 ^{ab} ±0.58	16.92 ^{a} ±0.26	16.58 ^{a} ±0.54
Fat	4.70 ^{c} ±0.09	5.10 ^{b} ±0.10	5.57 ^{a} ±0.12	5.42 ^{ab} ±0.12
Solids not fat	10.08 ^{a} ±0.31	10.80 ^{a} ±0.67	11.35 ^{a} ±0.15	11.16 ^{a} ±0.44
Total protein	5.15 ^{b} ±0.17	5.45 ^{b} ±0.15	5.40 ^{b} ±0.21	6.50 ^{a} ±0.18
Lactose	4.00 ^{c} ±0.25	4.40 ^{b} ±0.24	5.02 ^{a} ±0.12	3.75 ^{c} ±0.13
Ash.	0.93 ^{a} ±0.01	0.94 ^{b} ±0.04	0.92 ^{a} ±0.06	0.91 ^{a} ±0.02
GEKcal/Kg milk	898.57 ^{c} ±6.98	969.80 ^{b} ±19.2	1037.63 ^{a} ±22.5	1032.78 ^{a} 11.8

a,b, and c means is the same row with different superscripts differ (P<0.05).

Generally percentages of milk constituents were improved with natural and probiotics supplements except solids not fat which was not significantly affected by such supplement. Gross energy per kg milk increased by 7.9 , 15.5 and 14.9 % over the control due to Bospro, Fenugreek and yeast supplementations, respectively. Milk gross energy is a good measure of the nutritive value of milk, which reflects the increase in milk components particularly, fat percent, which in turn reflects the superiority of diets containing natural and probiotics supplementation.

El-Ghusien *et al*. (2002) found that the percentage of fat was 6.68, lactose 4.25%, protein 5.59%, ash 1.03% and total solids 18.60%. with Awassi ewes milk. These results are similar to those reported by Kholif *et al* (2001) for Egyptian sheep breeds. The differences in milk components as reported by various authors, other than species and breeds, may be due to the different conditions affecting milk production such as environmental temperature, availability of feed and water, feed type along with age and stage of lactation (Alkanhal 1993).

Nutrients digestibility and feeding values of the experimental rations:

The data presented in Table (5) illustrated that diets supplemented with natural growth promoters improved ((P≤0.05) dry matter intake from the roughage and hence total DMI over the control diet. The digestibility coefficients of dry matter and crude fiber were increased (P≤0.05) by supplement of Bospro to the control ration, with non significant differences in OM, CP and NFE. However, EE digestibility was reduced by addition of Bospro. The animals fed ration supplemented with fenugreek had higher (P≤0.05) DM, OM, CP, and EE digestibility values than those of control

group. Nutritive values expressed in terms of TDN and DCP were significantly (P≤0.05) increased in fenugreek ration than the control ration, due to increase in the digestibility with fenugreek. The present data clearly showed that animals fed rations supplemented with yeast had higher (P≤0.05) DM, CP and CF digestibility with non significant increase with OM, EE and NFE digestibility than those of control group.

Table (5): Mean values of nutrient intakes, digestibility coefficients and nutritive value of the experimental rations.

Item	Control ration R_1	Bospro ration R_2	Fenugreek ration R_3	Yeast ration R_4
Dry matter intake g/h/d				
Concentrate	1358.40	1358.40	1358.40	1358.40
Bean straw	289.4^{b}±21.22	362.57^{a}±10.99	420.43^{a}±24.20	417.37^{a}±8.08
Feed additive	-	13.6	13.8	9.1
Total	1647.8^{b}±21.32	1734.6^{a}±10.96	1792.43^{a}±24.12	1784.8^{a}±8.03
Digestibility %				
DM	61.90^{b}±0.95	66.93^{a}±2.29	68.50^{a}±0.46	67.80^{a}±1.19
OM	67.53^{b}±0.78	71.00^{ab}±1.99	72.56^{a}±0.21	71.73^{ab}±1.80
CP	49.86^{b}±3.35	53.16^{ab}±3.33	59.53^{a}±0.41	58.06^{a}±1.20
CF	54.76^{b}±0.86	68.93^{a}±1.73	65.16^{a}±1.25	66.56^{a}±1.38
EE	59.63^{b}±2.54	52.93^{b}±6.30	69.76^{a}±3.58	64.10^{ab}±1.40
NFE	75.80^{a}±0.57	67.53^{a}±1.79	78.33^{a}±0.74	78.13^{a}±1.16
Nutritive Value % (DM basis)				
TDN	62.46^{b}±0.77	65.26^{ab}±1.91	67.20^{a}±0.32	66.10^{ab}±1.67
DCP	6.70^{b}±0.43	6.96^{a}±0.44	7.73^{a}±0.03	7.50^{a}±0.15
Nutrient intake, DM (g/h/d) basis				
TDN	1029.00^{b}±15.50	1132.20^{a}±29.91	1199.33^{a}±1.69	1184.87^{a}±33.47
DCP	110.63^{b}±7.59	121.23^{ab}±7.45	138.00^{a}±1.13	134.66^{a}±2.98

a, and b Means in the same row with different superscripts are different at (P<0.05).

Similar results of dry matter intake were reported by Wohlt *et al*; (1998) and El-Waziry *et al*; (2000) who also found that nitrogen intake tended to be greater for cows fed yeast and they suggested that it could be due to the increase of DMI.

However, Tomar *et al*, (1996), Allam *et al* (1999) and Khattab *et al*, (2001) found that dry matter intake was slightly (P<0.05) increased with Fenugreek rations than other groups. However, Kandil *et al*, (2003) found that feed intake and feed conversion were improved by the supplement of yeast or Bospro to the control ration, the improvement in feed intake and conversion may be related to improved nutrient digestibility or improved ruminal fermentative activity as indicated by the findings of Dawson and Hopkins (1999) who reported that the addition of yeast cells to in-Vitro ruminal cultures increased cellulose degradation.

Kandil *et al* (2003) found that the digestibility coefficients of OM, CF and CP were significantly (P≤0.05) increased by supplementation of yeast or Bospro to the control ration with buffalo calves. Reduction in EE digestibility by addition of Bospro was probably due to negative effect on activity of lipolytic bacteria.

The results with fenugreek ration are in accord with those obtained by El-Saadany *et al*, (1999) and Khattab *et al*, (2001) who found that with ration supplementing the ration with fenugreek increased ($P \leq 0.05$) nutrient digestibility (DM, OM, CF and NFE) and significantly ($P<0.01$) increased digestibility coefficient of CP and EE compared with control. The improvement of EE digestibility as a result of adding fenugreek to the ration could be attributed to the high content of EE and fatty acids in fenugreek and the fatty acid pattern in fenugreek.

The increases in nutritive value are in agreement with the previous results of El-Saadany *et al*, (1999), who found improvement in DM, CP and CF digestibility as well as TDN, and DCP of lactating buffalo fed on fenugreek seed as feed additive.

Similar results with yeast ration were obtained by Al-Dabeeb and Ahmed (2002) who found that the in vitro disappearance of DM and OM were significantly ($P<0.05$) increased with yeast supplementation, digestibility of CP followed the same trend, digestion coefficient of CF were also improved by the yeast supplementation and the effect was significant ($P<0.05$) and was more pronounced with the high roughage ration.

The increase in digestibility, especially for CF, may have been due to increase in the population (Wiedmeier *et al.*, 1987 and Newbold *et al.*, 1996) and/or activity (Erasmus *et al.*, 1992) and (Dawson, 1993) of rumen cellulolytic bacteria. Proteolytic bacteria count were also stimulated by yeast culture (Yoon and Stern, 1996).

Similar results were obtained by Al-Dabeeb and Ahmed (2002). they found that supplementation with yeast had no effect on the digestibility of NFE and EE. They found that the digestibility of NFE was non significantly lower with the high roughage than with the high concentrate ration. The increase in digestibility with yeast ration lead to an increase in the feeding values.

Rumen parameters:

Values of pH for rumen liquor were affected by supplements as shown in Table (6). The pH values before feeding and 4 hr post-feeding significantly ($P<0.05$) decreased with supplemented diets. The pH values obtained at all times were within the range 6 to 7 of farm animals given by Mertens (1997) and Rokha (1998). Tawila (1991) also found that the over all mean of PH in rumen liquor of sheep before morning feeding was 7.1 then decreased to 6.4 at 2 and 4 hrs after feeding. Yoon and Stern (1996) and Putnam *et al.*, (1997) have reported similar results due to the yeast supplementation. The high concentration rations caused a significantly ($P<0.05$) sharper drop in PH than the high roughage rations especially at 3 hr –post feeding. On the other hand Allam *et al.*, (1999) and Abo-Donia *et al.*, (2003) found that ration contained fenugreek decreased PH gradually till 4-hrs post feeding.

Concentration of VFA's as affected by the experimental diet are presented in table (6). The lowest level was reported before feeding for almost dietary treatments, at 4 hrs after feeding, ewes fed feed additive showed higher VFA's concentration. The increases in VFA's concentration at

4 hrs post-feeding lead to the decreases observed in PH values. The same trend was observed by Al-Dabeeb and Ahmed (2002) with yeast culture in sheep rations. For fenugreek, Allam *et al.*, (1999) reported that fenugreek ration fed to Zaribi doe had less TVFA'S compared with control. However, Abo-Donia *et al.*, (2003) found that with Beef steers fed ration- contained fenugreek increased TVFA'S after 4hrs post-feeding than that before feeding.

Table (6): Mean values of feeding the formulated rations on pH, ammonia – N (mg/dl) and total volatile fatty acids (m. equ/dl).

Item	Control ration R_1	Bospro ration R_2	Fenugrek ration R_3	Yeast ration R_4	Pooled ± SE	Means	Pooled ± SE
pH							
24hrs	6.96^{a}	6.89^{a}	6.96^{a}	6.83^{a}		6.91^{a}	± 0.01
4 hrs	6.81^{a}	6.69^{b}	6.76^{a}	6.62^{b}		6.71^{b}	
Means	6.89^{a}	6.78^{bc}	6.86^{ab}	6.73^{c}	± .032		
TVFA'S							
24hrs	8.63^{b}	12.06^{a}	11.90^{a}	12.70^{a}		11.32^{b}	± 0.22
4hrs	11.63^{b}	14.53^{a}	14.06^{a}	15.23^{a}		13.87^{a}	
Means	10.13^{b}	13.29^{a}	12.98^{a}	13.96^{a}	± 0.48		
NH_3 – N							± 0.38
24hrs	11.40^{c}	13.73^{b}	14.36^{b}	18.46^{a}		13.80^{b}	
4 hrs	13.56^{c}	15.66^{b}	15.93^{b}	15.70^{b}		15.98^{b}	
Means	12.48^{c}	14.69^{b}	15.14^{b}	17.08^{a}	± 0.51		

a, b and c means in the same row and column with different superscript differ (P<0.05).

Also Kandil *et al.*, (2003) found that TVFA's in rumen liquor before feeding and at 4hr. post feeding were significantly (P<0.05) increased with supplement of yeast or Bospro to the diet, increase TVFA'S in Bospro ration may be caused by alteration of rumen microflora to favor increased volatile fatty acids production.

Rumen ammonia – N concentration with ewes fed different diets is illustrated in table (6). NH3 – N concentration with ration supplemented with fenugreek was slight but significant increase at 4hrs post feeding than that before feeding. Allam *et al.*, (1999) found that NH3 – N concentration reached its maximum value after 4hrs post feeding then tended to decrease wasn't significant for fenugreek supplemented rations.

It could be suggested that the result might be attributed to acting fenugreek as buffers- values of NH3 – N obtained agree with Steger *et al.*, (1970) and Abdel-Hafez (1983) who mentioned that NH3 – N concentration varied with time post feeding depending on type of feed. Abo-Donia *et al.*, (2003) found that NH3 – N reached its maximum value after 4hrs post feeding for beef steers ration containing fenugreek and then tended to decrease at the 8hrs post feeding.

Ammonia – N concentration with ration supplemented with yeast was slight but not significant decrease. Wilson *et al.*, (1998) found that the addition of yeast in the diet did not affect on NH3 – N concentration in ruminal fluid. Also El-Badwi *et al.*, (1998) found that the insignificant reduction of NH3 – N concentration with lactating goats by the addition of yeast culture, which

is in agreement with the current study. Yeast culture supplementation tended to reduce ruminal NH3 – N (Harrison *et al.*, 1988; Newbold 1990).

Lower ammonia concentration in the rumen of animal fed yeast may reflect increased transportation of ammonia into microbial protein (Harrison *et al.*, 1988). New bold (1990) suggested that the reduction of NH3 – N in the rumen of animal fed yeast is not due to a reduction in the proteolytic, peptidolytic or deaminative activity of rumen microorganisms, but it is likely to be due to the increase of bacterial growth. Williams and Newbold (1990) suggested that the reduction of ammonia in the rumen appear to be the result of increased incorporation of ammonia into microbial protein and it may be the direct result of stimulated microbial activity.

In contrast, Newbold *et al.*, (1995) reported that the increase of in-vitro ammonia might be due to the high level of yeast inclusion. Kandil *et al.*, (2003) found that ammonia – N in rumen liquor at 4hrs post-feeding was significantly increased with Bospro and decreased but insignificantly with yeast than that before feeding with Buffalo Calves supplemented with Bospro or yeast ration.

It could be concluded that Bospro, Fenugreek seeds and active dried yeast could be used of lactation ewes ration to improve their milk yield and milk composition with decreasing feed cost. The best economical return was achieved with the groups fed rations contained fenugreek, active dried yeast followed by the group fed ration contained Bospro and the lowest was the control.

REFERENCES

Abdel-Hafez, G. A. (1983). Comparative nutritional studies between sheep and goats. M. Sc. Thesis. Fac. of. Agric. Cairo, Univ., Egypt.

Abou Ammou, F. F and Hoda, M. El-Hosseiney (1999). Performance and carcass characteristics of lambs fed Bio-Tonic and Bospro as feed additives, in summer and winter seasons. Egypt. J. Nutr and Feeds 2 (Special Issue): 57-66.

Abo- Donia, F.M; G. H. Zaza and A. M. Mansour (2003). Effect of using natural non-traditional growth promoters: 2-Effect of fenugreek and monensin as growth promoters on feed steers performance. Egypt. J. Nutr. and Feeds 6 (Special Issue): 1081-1093.

Abo El-Nor, S. A. H. and A. M. Kholif (1998). Effect of Supplementation of live yeast culture in the diet on the productive performance of lactating buffaloes. Milchwissenschaft. 53: 663-666.

Abo-El-Nor, S. A. H. (1999). Influence of fenugreek seed as galactagogues on milk yield composition and different blood biochemical of lactating buffaloes during mid lactation. Egyptian. Dairy Sci., 27(2): 231-238.

Akin, D.E. and W.S. Borneman (1989). The role of rumen fungi in fiber degradation. J. Anim. Sci 67: 474 (Supp. 1).

Al-Dabeeb, S. N. and B. N. Ahmed (2002). Effect of dry yeast (*Saccharamyces cerevisiae*) in sheep ration differing in their roughage to concentrate into ration on digestion, nitrogen balance and rumen fermentation. Egyptian. J. Nutrition and Feeds, 5 (1):11.

Alkanhal, H. A (1993). Goat and camel milk composition and freezing point. Egyptian. J. Dairy Sci, 21: 233-244.

Allam, M. Sabbah; Hoda, M. El-Hosseiny; A. M Abdel-Gwad; S. A. El-Sadany and A. M. M. Zeid (1999). Medical herbs and plants as feed additives for ruminants. 1. Effect of using some medical herbs and plants as feed additives on Zaraibi goat performance. Egyptian. J. Nutrition and Feeds. 2; 349.

A. O. A. C (1980). Association of official Analytical Chemists. Official Methods of Analysis, 13th Ed. Pub., A. O. A. C., Benjamin Franklin Station, Washington, DC, USA.

Arambel. M. J. and B. A. Kent (1990). Effect of yeast culture on nutrient digestibility and Milk yield response in early to mid-lactation dairy cows. J. Dairy Sci, 73: 1560-1563.

Boulos, L. (1983). Medical plants of North Africa References publication Inc. (Proc., 2nd Cong. Fac. Vet. Med. Cairo Univ.).

Conway, E. H and E. D. O'malley (1942). Micro diffusion methods. Ammonia and urea using buffered absorbents. Biochem. J., 36: 655.

Dawson, K. A. (1992). Current and future role of yeast cultures in animal production: A review of research over the last six years. In: Supplement to the proceedings of Alltech 8th Annual Symposium. 1: 23.

Dawson, K. A. (1993). Current and future role of yeast culture in animal production a review of research over the last seven years. Biotech. In the Feed Industry. T. P. Lyons, ed. Alltech Tech. Publ. Nicholasville, KY. 269.

Dawson, K. A. and D. M. Hopkins (1999). Differential effects of live yeast on the cellulolytic activities of anaerobic ruminal bacteria J. Anim. Sci., 69 (Suppl. 1: 531).

El-Ashry, M. A; A. Zeba Motagally and Y. A. Maareck. (2001). Effect of live dried baker's yeast and yeast culture on performance of growing buffalo calves. Egy. J. Nutr and Feeds. 4 (Special Issue): 607-617.

El-Badawi; A. Y.; H. M. Gado and M. A. Tawila (1998). Influence of dietary yeast culture on the lactation performance of goats. Arab. Univ. J. Agric. Sci., Ain-Shams Univ., Cairo, 6: 111.

El-Ghusien. S. S; M. M. Abdel-Rahman and W. Gazan (2002). Milk composition of grazing Awassi sheep and Baladi goats in the middle and northern regions of Jordan. Egyptian. J. Anim. Prod. 39(1): 21-28.

El-Saadany, S. A.; M. M. Mohey El-Din; I. A. Abu-Ismail; S. M. Mohamed and N. M. El-Kholy (1999). Effect of some medicinal herbs as feed additives on buffalo milk. Egyptian. J. Nutrition and Feeds 2 (Special Issue): 505-512.

El-Waziry, A. M; H. E. M. Kamel and M. H. M. Yacout (2000). Effect of Bakers yeast (*Saccharomyces cervisiae*) supplementation to berseem (Trifolium alexandrinum) hay diet on protein digestion and rumen fermentation of sheep. Egypt. J. Nutr and Feeds, 3: (2) 71-82.

Erasmus, L. J., P. M. Botha and A. Kistner (1992). Effect of yeast culture supplement in production, rumen fermentation and duodenal nitrogen flow in dairy cows. J. Dairy Sci. 75, 3056.

Erdman, R. A. and B. K. Sharma (1989). Effect of yeast culture and Sodium bicarbonate on milk yield and composition in dairy cows. J. Dairy Sci. 72: 1929-1932.

Gupta, K.; Thakral, K. K.; Arora, S. K and Chowdhary, M. L. (1996). Structural carbohydrate and mineral contents of fenugreek seeds. Indian- Coca, Arecenut- species Jouranl-1996, 20:4,120.

Harrison, G. A., R. W. Hemken. K. A. Dawson, R. J. Harmon and K. B. Barker (1988). Influence of addition of yeast culture supplement to diets of lactating cows ruminal fermentation and microbial population. J. Dairy. Sci, 71: 2967.

Huber, J. T.; J. Sallivan; B. Taylor; A. Burgos and S. Cramer (1989). Effect of feeding yea-Sacc on milk production and related responses in a commercial dairy herd in Arizona. In Biotechnology in the Feed Industry. Proceedings of Alltech's 5th Annual Symposium (Edited by Lyons, T.P.). Nicholasville, KY, USA, Alltech's Technical Publication, 35-38.

James, A.D. (1984). CRC Handbook of Medicinal Herbs, 490.

John. W. and Sons, Inc. (1996). Encyclopedia of Common Natural Ingredient. 24: 245.

Kandil A.M; Boraei; A. H. Etman and A.A. Abou-El-Ella (2003). Comparative study on utilization of yeast and Bospro by Buffalo calves Egypt. J. Appl. Sci; 18 (5).

Khattab, H. M.; H. A-El- Alamy; S. A. H. Abo El- Nor, F. A. F. Salem and M. M. A. Abdo (2001). Milk production reponse of lactating buffalo to ration supplemented with some medical plant feeds. Egyptian. J. Nutr and Feeds 4 (Special Issue): 521- 528.

Kholif, A. M.; Abd-El-Gawad, M. A. M. and El-Gawad. M. A. M-Abd (2001). Medicinal plant seeds supplementation of lactating goats diets and its effects on millk and cheese quantity and quality. Egypt. J. of Dairy Sci. 29: (1), 139-150.

Ling, E. R. (1956). Dairy Chemistry (Text book), Vol. 1. Chapman and Hall, Ltd., London.

Ling, E. R. (1963). Text Book of Dairy Chemistry vol. II Practical Chapman Hall. LTD, London, 4th ed. PP. 140.

Makled, M. N. (1991). The potentials of probiotics in poultry feeds. A review. 3rd Sci symp for Animal, Poultry and Fish Nutrition, Sokha, Kafr El-Shekh, Egypt, PP. 54.

Martin, S. A. and D. J. Nisbet (1989). Effect of Aspergillus Oryzae fermentation extract on the in-vitro ruminal fermentation of soluble starch, trypticase and coastal bemuda grass.J. Anim. Sci. 67:578 (Suppl. 1).

Mertens, D. R. (1977). Dietary fiber components: relationship to rate and extent of ruminal digestion Fed Proc. 36: 187.

MSTATC (1986). Computer software designed for statistical analysis. Vession O/Em. Copyright June, 1982-1986. Michigan State Univ. Revised 711/1986: Dept. of Crop and Soil Sci.

Mustvangwa, T. (1992). The effects of the inclusion of a yeast culture supplement in the diet on milk yield and milk composition of dairy cows and on digestion and pattern of ruminal fermentation in steers Zimbalwe Journal of Agricultural Research. 30: 21-31.

Newbold, C. J. (1990). Probiotics as feed additives in ruminant diets. Proceedings of the fifty-first Minnesota Nutrition Conference (ed. M. Stern, G. Wagner, J. Rodgers and R. Sellner). PP. 102-119. Univ. of Minnesota.

Newbold, C. J., R. J. Wallace and F. M. Melntosh (1996). Mode of action of the yeast (*Saccharamyces cerevisiae*) as a feed additive for ruminants. Brit. J. Ntur. 67, 249.

Newbold, C.J., R. J. Wallace, X. B. Chen and F.M. Mc Intosh (1995). Different Strains of Saccharomyces cerevisiae differ in their effects on ruminal bacterial numbers in vitro and in sheep. J. Anim. Sci., 73: 1811.

NRC, (1985). National Research Council. Nutrient Requirements of Sheep. Sixth Revised Ed., National Academy of Science. Washington, USA.

Petit, P.; Y Sauvaire; M.H. Jllaire; G. Ponsin and G. Ribes (1995). Steroid Saponins from fenugreek Seeds. Extraction, purification and pharmacological investigation on feeding behavior and plasma cholesterol. Steroids. 60: 674.

Petit, P; Y. Sauvaire, G. Ponsis, M. Monteghetti., M. Faue and G. Ribes (1993). Effects of fenugreek seed extract on feeding behavior in the rate metabolic endocrine correlate. Pharm. Bioch. and Behavior. 45, (2): 369.

Putnam, D.E.; C. G. Schwab; M. T. Socha; N. L. Whiteouse; N. A. Kierstead and B. D. Gorthwaite (1997). Effect of yeast culture in the diets of early lactation dairy cows on ruminal fermentation and passage of nitrogen fractions and amino acids to the small intestine. J. Dairy Sci., 80: 374-384.

Rakha, G. M. (1998). Studies on the effect of using agro-industrial by-products on health and production of some farm animal ph. D. Thesis, Fac of Vet. Med., Cairo, Univ.

Sharma, R. D. (1986). Effect of fenugreek seeds and leaves on blood glucose and serum insulin responses in human subject. National Research 6: 1353.

Sissons, J. W. (1998). The potential of probiotic organisms to prevent diarrhea and promate digestion. Proc. 4th Int. Seminar, Poland, PP. 457.

Soder, K. J. and L. A. Holden (1999). Dry matter intake and milk yield and composition of cows fed yeast prepartum and postpartum. J. Dairy Sci., 82: 605-610.

Steel, R. G. D. and J. H. Torrie (1980). Principals and Procedures of Statistics. Mc. Graw. Hill Book Company Inc; New York.

Steger. H., J. Voigt and B. Piatkpwaski (1970). Effect of the ration and Sampling time on rumen fluied on its composition in studies on cow. Arch. Tierernahrung, 20: 439.

Swartz, D. L.; L. D. Muller; G. W. Rogers and G. A. Varga (1994). Effect of yeast cultures on performance of lactating dairy cows: a field study. J. Dairy Sci. 77: 3073-3080.

Tarakanov, B. V. (1993). Biopreparations for raising the efficiency of feed utilization Zootekhniya, 8: 16-18.

Tawila, M. A. (1991). Studies on the possible methods for improving utilization of low quality roughages for ruminants ₚh. D. Thesis, Ain Shamas Univ.

Tomar, K. S; V. P. Singh and R. S. Yadav (1996). Effect of feeding maithy (*Trigonilla foenum graccum*) and chandrasoor (*Lepidum sativum*) seeds on milk and blood constitunts of Murrah buffaloes. Indian. J. Anim. Sci. 66: 11 1192-1193.

Udayasekhara, R. P and R. D. Sharma (1987). An evaluation of protein quality of fenugreek seeds 9 (trigonilla foenum graccum) and their supplementary effects. Foiod Chem., 24:1-9.

Warner, A. C. J. (1964). Production of volatile fatty acids in the rumen. Methods of measurements. Nut. Abst. and Rev. 34: 339.

Wiedmeier, R. D., M. J. Armabel and J. L. Walters (1987). Effect of yeast culture and *Aspergillus oryzae* fermentation extract on ruminal characteristics and digestibility. J. Dairy Sci. 70, 2063.

Williams, P. E. V. and C. J. Newbold (1990). Rumen probiosis: The effects of novel microorganisms on rumen fermentation and ruminant productivity. In: W. Hresign and D. J. A. Cole (Ed.). Recent Advances in Animal Nutrition PP 211-227. Butterworths. London.

Wilson, R. C., T. R. Overton and J. H. Clark (1998). Influence of shidigera Extract and Soluble protein on performance of cows and Concentration of Urea nitrogen in plasma and milk. J. Dairy Sci., 81: 1022.

Wohlt. J. E., T. T. Corcione and P. K. Zajak (1998). Effects of yeast on feed intake and performance of cows fed diets based on corn sillage during early lactation. J. Dairy Sci., 81: 1345.

Yoon, I. K., and M. D. Stern (1996). Effect of Saccharomyces cerevisiae and Aspergillus dyzae cultures on ruminal fermentation in dairy cows. J.Dairy Sci., 79: 411.

Yousef, H. M.; K. A. El-Masry and A. I. Aboulnaga (1996). Effect of dried live yeast supplement on haemobiochemical levels and milk production responses of lactating buffaloes under hot summer conditions in Egypt. Egyptian. J. Anim. Prod., 33: 11-21.

Yung. Chih, L. (1990). Effects of Biogen on layers. J. Poultry Sci., 2: 110-115.

J. Agric. Sci. Mansoura Univ., 29 (10), October, 2004

تأثير استخدام منشطات النمو الطبيعية والحيوية علـى الأداء الإنتـاجي للنعـاج الحلابة

رشدي إبراهيم محمد القاضي[١] أحمد محمد قنديل[٢] ـ محمد عبد المجيد برعي[٢].

١- قسم الإنتاج الحيواني ـ المركز القومي للبحوث ـ الدقي ـ جيزة ـ مصر.
٢- قسم الإنتاج الحيواني ـ كلية الزراعة ـ جامعة الأزهر ـ القاهرة ـ مصر.

أجريت هذه الدراسة لبحث تأثير إضافة بعض منشطات النمو الطبيعية مثل *البسبرو والخميرة الجافة النشطة وبذور الحلبة المطحونة* على إنتاج وتركيب لبن النعاج. استخدمت ستة عشر نعجة برقي حلابة في الموسم الثالث أو الرابع بمتوسط وزن ٤٤,٨ ± ٤٩.كجم من مزرعة محطة التجارب والبحوث الزراعية التابعة لكلية الزراعة جامعة الأزهر وقد وزعوا عشوائياً لأربعة مجاميع متساوية، (أربعة بكل مجموعة) ـ المجموعة الأولى بدون أي من الإضافات على العلف المركز ـ المجموعة الثانية بإضافة البسبرو ١٥جم/ رأس/يوم ـ المجموعة الثالثة بإضافة ١٥جم/رأس/يوم من بذور الحلبة المطحونة ـ المجموعة الرابعة بإضافة ١٠جم/ رأس/يوم من الخميرة الجافة النشطة وأضيفت المادة الخشنة المكونة من تبن الفول لجميع المجموعات لحد الشبع. وقد بدأت التجربة قبل ميعاد الولادة المتوقع بمدة أربعة أسابيع واستمرت حتى نهاية موسم الحليب.

وقد أوضحت النتائج الآتي:ـ

- سجلت النعاج المغذاة على أنواع الإضافات الغذائية المختلفة أعلى معدلات استهلاك يومي للمادة الخشنة الجافة معبراً عنها جم/ رأس/ يوم بنسب ٢٥,٠٠- ٤١,٤- ٤٦,٤% عليقة البسبرو (٢)، عليقة الحلبة (٣) ثم عليقة الخميرة الجافة (٤) على التوالي بمقارنتها بالعليقة المقارنة (١).
- فيما يختص بإنتاج اللبن اليومي فقد تفوقت مجموعة النعاج المغذاة على الإضافات الغذائية في كمية الحليب اليومي حيث زاد إنتاج اللبن اليومي بنسبة ١٠,٥-١٦,٣-١٢,٧% بالنسبة للعليقة الثانية والثالثة والرابعة على التوالي بالمقارنة بالعليقة المقارنة.
- فيما يختص بالنسب المئوية لمكونات اللبن المختلفة (كل من الجوامد الكلية، *والدهن ،والبروتين، واللاكتوز*) وكذلك محتوى اللبن من *الطاقة الكلية* اتجهت إلي الزيادة في لبن النعاج المغذاة على معظم الإضافات الغذائية المختلفة بمقارنتها بالعيقة المقارنة.
- أوضحت النتائج *أنه بالتغذية على الإضافات الغذائية المختلفة* أمكن تحسين معظم *معاملات الهضم المختلفة* وكانت الزيادة معنوية خاصة في معاملات هضم كل من *المادة الجافة والألياف الخام* بمقارنتها بالعليقة المقارنة. وقد نتج عن ذلك أن سجلت قيم المركبات الكلية المهضوم نتائج أفضل لجميع علائق الإضافات الغذائية المختلفة وكانت الزيادة معنوية لتلك الإضافات المختلفة مقارنة بالعليقة المقارنة.
- أظهرت تحليلات مكونات سائل الكرش انخفاضا في درجة تركيز أيون الأيدروجين لجميع المعاملات الغذائية المختلفة بعد التغذية بأربعة ساعات. بينما زاد تركيز الأحماض الدهنية الطيارة بعد التغذية بأربعة ساعات لجميع الإضافات الغذائية المختلفة من عليقة المقارنة ـ أما تركيز أمونيا ـ نتيروجين سائل الكرش فقد زاد زيادة ملحوظة بالتغذية على جميع الإضافات الغذائية بمقارنتها بالعليقة المقارنة. بينما لم تسجل فروق معنوية لجميع المعاملات الغذائية المختلفة قبل أو بعد التغذية بأربعة ساعات. وكانت جميع القيم داخل النطاق الفسيولوجي الطبيعي.

وتشير هذه الدراسة إلي إمكانية استخدام كل من البسبرو وبذور الحلبة المطحونة وكذلك الخميرة الجافة النشطة في علائق النعاج الحلابة حيث ينعكس ذلك على تحسن إدرار وتركيب اللبن وكذلك معاملات الهضم وفي نفس الوقت أن استخدام بذور الحلبة المطحونة يؤدي إلي انخفاض تكلفة العليقة للنعاج الحلابة.