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IMPACT OF USING MICROBIAL FEED ADDITIVES (PROBIOTICS) IN RUMINANTS RATIONS ON DIGESTIBILITY, RUMEN FERMENTATION, MILK PRODUCTION AND PROPERTIES OF DOMIATI CHEESE

Ayyad, K. M. K.[1] ; I. A. A. Abou Ayana[2] ; M. A. Elkholany[3] and M. A. M. Abd El-Hafez[3]

[1] Dairy Technology Research Department, Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture, Egypt.

[2] Dairy Research Department, Food Technology Research Institute, Agriculture Research Center, Ministry of Agriculture, Egypt.

[3] Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture, Egypt

ABSTRACT

*T*his study started by nutritional evaluation (digestion coefficients and feeding value) to determine using commercial microbial additives BGY_{35} (yeast culture) or AVI-BAC® (lactic acid bacteria and enzymes) in the diet of Rahmani sheep feeding trails were carried out using 12 crossbred cows. Animals received the control diet (unsupplemented ration), plus probiotic AVI-BAC® or BGY 35 for the three groups G_1, G_2 and G_3, respectively. The obtained results concluded that feeding Rahmani sheep on microbial additives increased digestion coefficients of most nutrients compared with control group (G_1). In the same time, both CP and EE digestibility were significantly higher ($p<0.05$) with G_2 and G_3 compared with G1. The same positive effect was observed also with feeding values (TDN and DCP).

Treated rations (G_2 and G_3) for sheep didn't influence in ruminal pH values, but ruminal total VFA's and microbial protein content were significantly higher ($p<0.05$). Moreover, ruminal ammonia-N concentration was increased with the control group compared with the other groups.

The milk yield of lactating cows was higher with microbial additives (G_2 and G_3) compared with control (G_1) and the differences significant during the second period (from 61-120 days). Some positive effects were observed also as a result to using the treatments in milk content such as milk fat, protein and total solids. The treatments increased unsaturated fatty acids as well StearicC18:0 slightly increased unlike Linoleic C18:2n6 and Linolenic C18:3n3 slightly decreased. Moreover, the effect of the tested rations on somatic cell counts (SCC), pH value and acidity% as milk quality were not significant. BGY35 (G3) gained the highest points followed by AVI-BAC® (G2) then the control that was the lowest organoleptic properties.

INTRODUCTION

Recently, increasing attention is paid to the use of natural products instead of chemical compounds as manipulators of rumen fermentation. However, additives must be harmless to animals and no toxic residue present in their bodies or animals products.

For many years, ruminant nutritionists and microbiologists have been interested in manipulating the microbial ecosystem of the rumen to improve feed utilization and production efficiency by domestic ruminants (Samtra and

Karim, 2003). Addition of *Saccharomyces cerevisiae* live yeast cultures to ruminant diet has improved fiber digestibility and stimulated celluloytic bacteria (Dawson and Tricarico, 2002), increased the ruminal pH (Radev, 1999), total volatile fatty acid (Enjalbert et al., 1999) protozoa count (Jouany et al., 1998), and nutrients digestibility (özsoy et al., 2013 and Kassab and Mohamed, 2013) and decreased the NH_3-N (Koul et al., 1998). Also they effected percentages of different protozoa (Arakaki et al., 2000) and blood variables (Qnifade et al., 1999; and Galip et al., 2004). Generally, the manipulation of rumen microbial activity including dietary antibiotics and probiotics (bacterial and yeast culture) has been widely studied during the last 20 years. These probiotics are live microbial feed supplements which have been used as growth promoters to replace the widely used antibiotics and synthetic chemical feed supplement (Strzetelski, 1996 and Dawson, 2002).

Many researchers studied the effects of diet additives on certain physiological characteristics of dairy animals (cows, goats, sheep and buffaloes), include microbial additives for this purpose. However, they rarely studied the impact of these additives on the quality of dairy products such as Domiati cheese. Therefore, this study was conducted to investigate the effect of feeding microbial additives as yeast culture (BGY 35) and probiotic (AVI-BAC®) on nutrient digestibility, rumen fermentation parameters and milk yield as well the effect of these additives on the quality of Domiati cheese during storing for three months.

MATERIALS AND METHODS

This study was conducted at El-Serw Experimental Research Station belonging to the Animal Production Research Institute, Agriculture Research Center, Ministry of agriculture. Yeast culture (BGY35) is a brewer's dried yeast (*Saccharomyces cerevisiae*) composed of 35% crude protein, 1% crude fat and 8% crude fiber and contains vitamins, amino acids and minerals. Moreover, probiotic (AVI-BAC®) as growth promoter was produced by ProByn international Inc. (USA). Witch kg of AVI-BAC® contains lactobacillus (100g *L. acidophilus*, 1.0 x 10^8 CFU /g and *L. planterum*, 98g, 9.8 x 10^7/g), *Bifidobacterium bifidum* (2g, 2.0x10^6/g), *Bacillus subtilis* fermentation extract (50g), *Asperagillus oryzae* fermentation extract (50g), dextrose as diluents (70g) and enzymes including amylase (25u/g), cellulose (4.5 U/g), beta-glucanase (2.25u/g) and hemicellulase (2.75u/g). Each trial continued for 28 days the first 21 days as preliminary period, followed by 7 days for feces collection. The animals were fed according to NRC (1985) feed allowances.

Rumen fluid samples were taken from the three rams of each group at the end of experiment using stomach tube before feeding (0 times) and post-feeding (4 and 8 hrs). The samples were filtered through 3 layers of gauze and their pH values were immediately determined Ammonia nitrogen (NH_3-N) concentration was measured according to Conway (1957), total volatile fatty acids (VFA's) according to the technique described by Warner (1964) and microbial protein content was estimated by the method of Shultz and Shultz (1970).

In addition, nutrient digestibilities were determined using acid insoluble ash (AIA) technique of Van keulen and Young (1977).

The experimental work included two experiments:

The first experimental: Digestibility trails (on Rahmani rams).

Three groups of Rahmani rams, each of 3 animals with an average live body weight of 55.0 kg and average age 3 years, were used to determine digestion coefficients and some ruminal parameters. Animals were fed a diet composed of CFM and roughage (corn silage, berseem hay and rice straw) as a control diets (G_1) with commercial yeast culture (S. cerevisiae) namely BGY 35 (G_2) or a product of lactic acids bacteria and enzymes namely AVI-BAC® (G_3).

The second experimental: Effect on milk yield and quality (on crossbred cows): Three groups of dairy cows, each of 4 animals with an average live body weight of 44.0 kg were used to study the effect of the 3 tested rations as reported earlier on daily milk yield, milk composition and quality during the first 4 month after calving (120 days). The experimental cows were divided according to LBW, parity and milk production to three experimental groups. Animal were housed under semi-open shed.

Cows in all groups were fed based on milk yield according to NRC1988. Amount of feeds were adjusted biweekly based on milk yield and body weight.

Cows in the first group were fed the control diet (unsupplemented, G_1), while those in the 2^{nd} and 3^{rd} groups were fed the control diets daily supplemented with 3g AVI-BAC® ® per cow (AVI-BAC® ® ,G_2) and 20g BGY35 per cow (BGY35, G_3), respectively. Supplements of each treatment group were well mixed with the ingredients of daily amount of CFM immediately before feeding. Feeds were offered to animals in all groups twice daily during the experimental period. Cows in all groups were individually fed on different experimental diets.

Calf rennet powder (HALA) and mixed strains of *Lactococcus lactis* sp. *Lactis and Lactococcus lactis* sp. *cremoris* were obtained from Chr. Hansen's Lab Oritorum. A/S Copenhagen, Denmark). Salt was obtained from El-Naser Company of Alexandria.

Domiati cheese making: At the last 3 days of each period, the animals are hand milked (twice/day). The collected milk from each group was pooled and used for analysis and manufacturing of Domiati cheese according to Fahmi and Sharara (1950). All milk batches were heated to 75°C/15 sec. and then cooled to 38°C. The starter culture (1% w/w) and salt (5%w/w) were added to cheese milk and appropriate amount of rennet was added to achieve coagulation in 150 min. The resultant cheeses were separately pickled in their whey and stored at 6±2°C for 3 month. The samples were analyzed fresh and every month of storage. Fat, total nitrogen (TN), non-protein nitrogen (NPN), soluble nitrogen (SN), Dry matter, somatic cell count, titratable acidity (TA), Ash, total solids, solid non fat, lactose, protein, amino acids, and fatty acids of milk or cheese samples were determined according to AOAC (2007). Total volatile fatty acids (TVFAs) were estimated as ml 0.1 N NaOH/10 g cheese, according to Kosikowski (1987).

Domiati cheese was judged at fresh and every month of storage for organoleptic properties by 11 staff numbers of dairy department according to Pappas et al. (1996).

Rheological properties analysis: The curd tension (firmness) of milk curd was determined as described by Chandrasekhare et al. (1957). Syneresis (whey separation) was determined using the drainage whey (ml/100 ml yoghurt) as described by Hassan et al. (1999).

Data was statistically analyzed using SAS (2003). The significant differences among means were assigned according to Duncan (1955).

RESULTS AND DISCUSSION

Digestibility trails:

Digestion coefficients: The effect of the experimental rations on digestion coefficients of most nutrients and feeding values (TDN and DCP) were not significant (Table 1). The lowest values of digestion coefficients of all nutrient and feeding values were recorded with G_1 (control). In the same time, the digestion coefficients of CP and EE were higher ($p< 0.05$) with G_2 and G_3 compared with G_1 (control). The improvement in digestion coefficients of nutrients with feed additives may be due to the better condition of the rumen fermentation as reported by Wohlt et al. (1998) and Calsamiglia et al. (2006).

Table (1): Effect of dietary supplementation of microbial additives on digestion coefficients and feeding values.

Items	Groups		
	G1 (control)	**G2 (AVI-BAC®)**	**G3 (BGY35)**
digestion coefficients, %			
DM	72.60±3.22	74.03±2.65	73.71±3.61
OM	70.05±2.25	72.53±3.01	72.15±2.07
CP	73.89±1.65[b]	76.95±2.11[a]	76.57±1.60[a]
CF	65.71±1.68	68.23±2.19	67.51±2.68
EE	66.52±3.17[b]	71.15±2.63[a]	70.65±1.17[a]
NFE	71.10±4.18	72.93±3.69	72.70±2.69
Feeding values, %			
TDN	65.41±1.73	67.35±2.68	67.03±2.15
DCP	8.15±0.18	8.43±0.21	8.37±0.23

A and b: Means having different superscripts within the same row are significantly different at p<0.05.

Ruminal parameters: Rumen parameters are presented in Table, 2. The maximum pH values were noticed pre-feeding (0 time) while the maximum values were observed at 4 hrs post-feeding then it tended to increase again at 8 hrs post-feeding for all dietary treatments. In the same time, the effect of the tested rations on pH values was not significant. The highest values before and after feeding (0, 4 and 8 hrs) of ruminal ammonia-N were recorded with G_1 (17.35, 21.85 and 20.05) followed by G_3 (17.15, 21.37 and 19.15) and the lowest values were detected with G_2 (16.50, 20.03 and 18.39, respectively) and the differences were significant at 4 hours post-feeding only. Moreover, both ruminal total VFA's concentration and microbial protein content post-feeding (4 and 8 hrs) were noticeably higher with both treatments (G_2 and G_3) compared with unsupplemented ration (G_1). These positive effects of both treatments (AVI-BAC®) and BGY35) on most ruminal parameters was observed also by Ahmed (2001), El-Ashry et al, 2001 and Aiad et al., 2014) with farm animals (Friesian cows, buffaloes and goats, respectively).

Table (2): Ruminal parameters for Rahmani rams fed the experimental rations.

Items	Hours	Groups		
		G1 (control)	**G2 (AVI-BAC®)**	**G3 (BGY35)**
PH values	0	7.13±0.10	7.10±0.12	6.95±0.15
	4	6.27±0.03	6.37±0.07	6.33±0.16
	8	6.70±0.09	6.63±0.05	6.67±0.10
Ammonia-N (mg/100ml)	0	17.35±0.65	16.50±0.35	17.15±0.51
	4	$21.85±0.20^{a}$	$20.03±0.31^{b}$	$21.37±0.18^{ab}$
	8	20.05±0.15	18.39±0.35	19.15±0.25
Total VFA's (MEq/100ml)	0	8.50±0.30	8.80±0.25	8.75±0.33
	4	$11.35±0.11^{b}$	$12.40±0.20^{a}$	$12.50±0.14^{a}$
	8	$10.35±0.13^{b}$	$11.30±0.15^{a}$	$11.25±0.11^{a}$
Microbial protein (g/100ml)	0	0.333±0.010	0.337±0.010	0.400±0.007
	4	$0.553±0.009^{b}$	$0.567±0.09^{a}$	$0.570±0.10^{a}$
	8	$0.470±0.008^{b}$	$0.503±0.08^{a}$	$0.500±0.10^{a}$

A and b: Means having different superscripts within the same row are significantly different at p<0.05.

Generally, the highest value of total VFA's, microbial protein and ammonia-N concentrations were at 4 hrs post-feeding which was reflected on lowering pH values at that time as reported by Ibrahim et al., 2007, Ahmed et al., 2011 El-Emam et al., 2014 with lactating Zaraibi goats.

Daily milk yield: Milk yield as kg/h/d of lactating cows during the two experimental periods (120 days) are presented in Table (3). The daily milk yield was higher with G_2 and G_3 compared with the control group (G_1) and the differences were significant during the second period (from 61-120 day). The daily milk yield during the 1st period was 10.19, 11.73 and 11.55 kg for G_1, G2 and G_3, respectively. The corresponding value during 2nd period were 5.95, 7.10 and 6.96 kg, respectively. Similar results were observed also by Yousef et al. 1996, Putnam et al. (1997) and Ahmed et al. (2008) with using microbial additives in rations of buffaloes, cows and goats, respectively. In this respect, El-Ashry et al., (2001), Aboul-Fotouh et al. (2011) and Abd-Elaziz (2013) reported that the daily milk yield was noticeable improved as a result of using microbial additives and this might be attributed to its positive effect on digestibility of nutrients and ruminal enveromintals reported by the present study.

Milk composition:

Concerning milk composition (Table, 3) the data indicated that the differences among the three groups were not significant (p <0.05) during the two experimental periods. Some positive effects were observed with the treatments groups (G_2 and G_3) in both milk fat and total solids during the two experimental periods but without significant differences. Generally, the obtained values of milk constituents were within the normal range given by Putnam et al., (1997) and Aboul-Fotouh et al., (2011) for dairy cows.

Table (3): Milk production and its chemical composition of dairy cows fed the experimental rations during the two experimental periods.

Items	Groups		
	G_1 (control)	**G_2 (AVI-BAC®**	**G_3 (BGY35)**
First period (from 1: 60 days) :			
Daily milk yield (kg/h)	10.19±0.93	11.73±1.05	11.55±0.77
Fat	3.45±0.07	3.61±0.05	3.55±0.03
Protein	2.91±0.03	2.95±0.02	3.01±0.05
Lactose	4.55±0.08	4.61±0.05	4.63±0.07
Solids non fat	8.15±0.07	8.27±0.09	8.36±0.06
Total solids	11.60±0.11	11.88±0.12	11.91±0.09
Ash	0.69±0.01	0.71±0.01	0.72±0.01
Somatic cell count x 10^3	151±15	139±11	145±17
pH value	6.59±0.01	6.65±0.01	6.63±0.00
Acidity, %	0.160±0.002	0.167±0.001	0.169±0.001
Second period (from 61:120 days) :			
Daily milk yield (kg/h)	5.95±0.45^b	7.10±0.57^a	6.97±0.31^a
Fat	3.71±0.09	3.77±0.07	3.75±0.03
Protein	2.93±0.05	2.99±0.03	3.03±0.05
Lactose	4.60±0.08	4.63±0.05	4.67±0.07
Solids non fat	8.23±0.05	8.34±0.08	8.43±0.09
Total solids	11.94±0.08	12.11±0.09	12.18±0.11
Ash	0.70±0.01	0.72±0.00	0.73±0.01
Somatic cell count x 10^3	135±13	119±17	131±12
pH value	6.67±0.01	6.65±0.00	6.69±0.01
Acidity, %	0.162±0.001	0.165±0.002	0.164±0.001

A and b: Means having different superscripts within the same row are significantly different at p<0.05.

Somatic cell counts and milk quality: The effect of the experimental rations on somatic cell counts (SCC) and milk quality such as pH and acidity % were not significant as shown in Table (3). Moreover, the flavor and colour of the different group were not affected by treatments. The highest value of acidity% (0.169) was recorded with G_3 while the lowest value was detected with G_l (0.160) and the differences were not significant.

Table 5: Some fatty acids of milk fat contents of dairy cows fed the experimental rations during the two experimental periods.

Treatments	Fatty acids				
	Palmitic C16:0	**Stearic C18:0**	**Oleic C18:1n9**	**Linoleic C18:2n6**	**Linolenic C18:3n3**
Control	28.56±0.794	10.57±1.962	21.35±1.238	3.63±0.149	0.48±0.005
AVI-BAC®	25.0±0.695	11.0±2.04	24.7±1.432	2.1±0.086	0.21±0.003
BGY35	27.2±0.757	12.62±2.34	22.3±1.177	2.54±0.104	0.24±0.002

Similar results were observed also by Ahmed et al. (2008). They found that milk quality (pH and acidity %) and somatic cell counts were not significantly effect as a result to using of microbial additives in lactating goats rations.

Data in Table (5) indicated supplementing cow's diets with AVI-BAC® or BGY35 significant ($P<0.05$) affected fatty acids milk contents, Palmitic C16:0, Stearic C18:0, Oleic C18:1n9, Linoleic C18:2n6 and Linolenic C18:3n3. Oleic C18:1n9 and Stearic C18:0 increased by adding AVI-BAC® or BGY35 compared with the control whilst Palmitic C16:0, Linoleic C18:2n6 and LinolenicC18:3n3 decreased against the control. According to the World Health Organization, evidence is "convincing" that consumption of palmitic acid increases risk of developing cardiovascular diseases (WHO, 2003). Also, Oleic acid is a common monounsaturated fat in human diet. Monounsaturated fat consumption has been associated with decreased low-density lipoprotein (LDL) cholesterol, and possibly increased high-density lipoprotein (HDL) cholesterol. Despite the slight increase in Stearic acid C18:0, it is undesirable. Likewise the decline in Linoleic C18:2n6 and Linolenic C18:3n3 is undesirable as well

Table (6): Milk fatty acid profile of dairy cows fed the experimental rations during the two experimental periods.

Fatty acids	Name	Relative distribution %		
		Control	AVI-BAC®	BGY35
C6:0	Caproic acid	1.11	1.2	0.90
C8:0	Caprlyic acid	4.72	4.63	4.87
C10:0	Capric acid	2.46	2.50	2.0
C11:0		-	0.50	-
C12:0	Lauric acid	2.22	2.45	2.44
C14:0	Myristic acid	8.6	9.71	10.4
C14:1ù7	Myristioleic acid	0.26	0.2	0.27
C14:1 ù5		0.76	0.80	0.72
C15:0	Pentadecanoic acid	2.39	2.74	3.1
C16:1 ù9	Palmitoleic acid	0.24	0.40	3.3
C16:1 ù7		1.34	1.10	0.66
C16:1 ù5		0.78	0.43	0.70
C16:3 ù4	Hexagonic acid	0.32	0.46	0.34
C17:0	Heptadecanoic acid	2.0	2.52	2.55
C18:1ù7	Vaccinic acid	2.36	2.32	3.24
C18:1 ù5		0.85	0.78	1.01
C18:2 ù7		0.67	0.60	0.64
C18:2 ù4		-	-	0.23
C18:3 ù6	Gamma Linolenic acid	0.48	0.20	0.23
C18: 3 ù4		-	0.20	
C18: 4 ù3	Linolenic acid	0.63	0.70	0.72
C20:0	Arachidic acid	0.23	0.20	0.25
Non identified fatty acids		2.99	2.86	1.10

Data presented in Table (6) indicated that cow's diets supplemented with AVI-BAC® or BGY35 significant ($P<0.05$) increased both of C11:0, Lauric acid C12:0, Myristic acid C14:0, Pentadecanoic acidC15:0, C16:1 ω9 Palmitoleic acid, C17:0 Heptadecanoic acid, C18: 3 ω4, and C18: 4 ω3 Linolenic acid. Nerveless, C10:0 Capric acid, C16:1 ω7, C16:1 ω5, C18:1ω7 Vaccinic acid, C18:2 ω7 and C18:3 ω6 Gamma Linolenic acid decreased by previous treatments. On the other hand, adding of AVI-BAC® to cows' diets increased C6:0 Caproic acid and C14:1 ω5. At the same time addition of BGY35 to cows' diets increased C8:0 Caprlyic acid, C18:1ω7 Vaccinic acid, C18:1 ω5 and Arachidic acid C20:0. From these data, the good effect of these bio- additives (AVI-BAC® or BGY35) appeared by increasing the level of health fatty acids (unsaturated FA). BGY35 improved the level these acids more than AVI-BAC®. These additives had almost equal effect on saturated fatty acids

Table 7: Some chemical properties of milk used manufacturing Domiati cheese.

Treatments	Acidity	pH	TS%	Fat%	TN%	Lactose%	Ash%
Control	0.17	6.63	11.51	3.7	2.66	4.62	0.7
AVI-BAC®	0.17	6.62	11.84	4.0	2.75	4.83	0.7
BGY35	0.17	6.62	11.96	3.8	2.76	4.87	0.7

Milk obtained from cows was analyzed; data presented in Table (7) shows the chemical properties. Acidity, pH and Ash were similar in AVI-BAC®, BGY35 treatments and control samples. Milk samples of treatments AVI-BAC® and BGY35 were higher fat, TN, lactose and TS% than control. It is expected; this reflected in the yield of Domiati cheese manufactured as well its chemical composition.

Table (8): effect of different rations feeding cows on rheological properties of milk curd

Treatments	Rennet coagulation time (sec)	Curd tension	Curd syneresis time (min)			
			10	30	60	90
Control	176	23.51	2.26	5.96	6.90	7.27
AVI-BAC®	172	24.62	4.29	5.83	6.87	7.10
BGY35	171	24.41	4.23	5.95	6.89	7.20

Rheological characteristics of curd depend on the milk components, protein, fat, solids and solids not fat and ash. In this study all these compounds increased which reflected on the rheological properties. Rennet coagulation time (sec) decreased in AVI-BAC®; BGY35 treatments compared with control (176 sce.) unlike Curd tension took an opposite direction. Rennet coagulation time (sec) and curd tension were close together largely in treatments. Concerning curd syneresis time (min), AVI-BAC® ; BGY35 treatments achieved a decline in curd syneresis time at the all intervals except after 10 min. Curd syneresis was nearly double (4.29 and 4.23) in AVI-BAC® ; BGY35 treatments, respectively compared with control (2.26). These results could be attributed to the rearrangements, within the network produced by attractive forces between individual casein particles or clusters micelles leading to additional intermolecular bonds and, therefore, to a contraction of the gel and the expulsion of whey, which was favoured by change in pH values (Walstra et al., 1985).

Chemical Composition of Domaiti Cheese

In general, TS%, Acidity%, Fat/DM%, TN/DM%, SN/TN%, Amino acid%, TVFAs gradually increased along storage period (Table 9). The two treatments were slightly higher TS% than control, but there in not a clear difference between AVI-BAC® and BGY35 treatments was detected. The acidity increased along storage period to reach 2.33, 2.37 and 2.39 for control, AVI-BAC® and BGY35, respectively, the pH- values took an opposite direction. With regard Fat/DM%, the two treatments (AVI-BAC® and BGY35) were slightly higher than the control; these treatments didn't record obvious differences in Fat/DM%. It was natural that this ratio increases with the length of storage. Microbial additives influenced protein proteolysis of cheese during cold storage, TN/DM%, SN/TN% and Amino acid% increased in both AVI-BAC® and BGY35 compared with the control. Regarding TVFAs, the control was lower than the two treatments (AVI-BAC® and BGY35) this decline was negligible as well the difference between the treatments was limited.

Table (9): Some chemical properties of Domiati cheese during cold storage period as affected by microbial additives (AVI-BAC® and BGY35).

Group	Storage period	Chemical analysis							
		TS %	**Acidity %**	**pH**	**Fat/DM %**	**TN/DM %**	**SN/TN %**	**Amino acid%**	**TVFAs**
control	Zero	34.2	0.18	6.57	36.2	4.6	9.7	0.024	7.1
	Month	38.1	1.58	5.12	42.4	5.9	12.6	0.027	11.1
	2 month	40.6	2.13	4.55	44.2	6.3	14.5	0.030	12.8
	3 month	42.8	2.33	4.19	44.2	6.8	17.3	0.040	14.1
AVI-BAC®	Zero	33.9	0.18	6.58	36.8	4.8	9.8	0.024	7.3
	Month	37.2	1.58	5.10	43.1	6.3	12.9	0.029	11.5
	2 month	41.8	2.14	4.52	45.0	6.6	14.8	0.031	13.1
	3 month	43.2	2.37	4.13	44.9	7.1	17.7	0.043	14.5
BGY35	Zero	34.4	0.18	6.55	36.9	4.7	9.8	0.025	7.5
	Month	39.6	1.59	5.09	43.4	6.5	13.0	0.031	12.0
	2 month	41.7	2.14	4.50	45.3	6.9	15.1	0.035	13.5
	3 month	43.2	2.39	4.11	45.1	7.4	18.1	0.048	14.9

Organoleptic Properties: It seems from the data given in Table (10) that the all fresh Domiati cheese had nearly the same scoring point for flavour, body & texture, the general appearance and the total points. The resultant cheese had a good body and texture (soft, smooth and lubricity texture) and pleasant creamy flavour. However, a little change was observed in cheese quality during storage period (2 month), except the body was firm comparable with fresh cheese. In general, quality of samples increased with increasing the storage period, the total points recorded the highest scores (91.7, 94.1 and 95.6) after 3 months for the control, AVI-BAC® and BGY35, respectively.

As ripening advanced (3 month), the flavour, body & texture and appearance of cheese were improved. This may be contributed to the high content of soluble nitrogen serve as a precursor of certain flavour compounds. AVI-BAC® and BGY35 treatments had greater points than control and at the same time BGY35 treatment was better than AVI-BAC®

Table (10): Effect of supplementing diets with microbial additives on sensory properties of Domiati cheese produced from cows' milk during cold storage period

Group	Store period	Aberrance (10)	Body &texture (40)	Flavor (50)	Total (100)
control	Zero	8.5	34.8	44.0	87.3
	Month	8.6	35.5	45.2	89.9
	2 month	8.4	36.4	44.8	89.9
	3 month	8.7	37.1	45.8	91.7
AVI-BAC®	Zero	8.7	34.5	44.1	87.3
	Month	8.5	36.2	44.8	89.5
	2 month	8.6	37.6	45.2	91.4
	3 month	9.0	38.8	46.3	94.1
BGY35	zero	8.5	35.1	44.2	87.8
	Month	8.7	36.9	45.8	91.4
	2 month	8.9	37.2	46.3	92.4
	3 month	9.2	39.8	46.6	95.6

REFERENCES

Aboul-Fotouh G.E.; S.M. Allam; A.M. El-Gaafarawy, O.A. El-Zelaky and A.M Abdel–Hafeez (2011). productive and reproductive performance of dairy cows fed corn silage without or with some microbial additives Egypation J. Nutrition and Feeds 14 (3): 393-408,

Abd El-Aziz, M, Kholif SM, Morsy TA. Buffalo’s milk composition and its fat properties as affected by feeding diet supplemented with flaxseed or fibrolytic enzymes in early lactation. J Life Sci 2012; 4: 19-25.

Ahmed, M. E., A. M. Abd El-Gwad, E. l. Shehata and S. A. Tawfik (2011). Influence of using feed forage in different forage as fresh , silage and hay on blood profile and carcass quality of growing Rahmani sheep. Egyptian J. of sheep and goat Sci., 6 (2) : 25.

Ahmed, M. E., E. I. Shehata, F. A. Ibrahim, K. M. Aiad and O. A. El-Zalaky (2008). Milk production and quality of dairy Zaraibi goats fed Trifolium alexandarinum (1^{st} cut) silage with some crop residues. Egyptian J. of sheep and goat Sci., Vol. 3(2):27-40.

Ahmed, M.E.; Fathia A. Ibrahim; Fatten F. Abou Ammo and Ahlam A. El-Shewy (2001). Influence of using folic acid on lactating Zaraibi goats' performance., J. Agric. Sci. Mansoura Univ., 26:6745.

AOAC, (2007): International Official Methods of Analysis. 20 Ed. Gaithersburg, MD. USA.

Arakaki, L.C.; R.C. Stahringer ; J. E. Garrett and B. A. Dehority(2002). The effects of feeding monensin and yeast culture, alone or combination , on the concentration and generic composition of rumen protozoa in stears fed on low-quality pasture supplemented with increasing levels of concentrate. Animal Feed Science and Technology, 84: 121:127.

Calsamiglia, S., Castillejos, L. and Busquet, M. 2006. Alternatives to antimicrobial growth promoters in cattle. In Garnworthy, P C, Wiseman, J: Recent Advances in Animal Nutrition, Nottingham p. 129–167

Chandrasekhare, M. R.; Swaminathan, D. S. B. and Subramanyam, V. (1957): Effect of different treatments on curd tension. J. Food Sci. 6:226-231.

Conway, E.F.(1957). Micro diffusion Analysis and Volumetric Error. Rev. Ed. Lock Wood, London.

Dawson, K. A. and J. Tricarico (2002). The evaluation of yeast culture 20 years of research. Oroceedings of Alltech's 16th Annual Symposium, Alltech Technical Publications, European, Middle eastern and African Lecture Tour.

Duncan, D. B. (1955). Multiple Range and Multiple F-test Biometrics, 11:1-42.

El-Ashry, M.A.; Kholif, A.M.; El-Alamy, H.A. and El-Hamamsy, T.A. 2001a. Effect of different yeast cultures supplementation to diet on the productive performance of lactating buffaloes. Egypt. J. Nutr. and Feeds, 4: 21.

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

El-Emam G. I., Y.H. Hafez, H. Bahery, E.I. Khalifa, E. I. Shehata and M. E. Ahmed (2014). Growth performance and some rumen and blood parameters of growing Rahmani lambs fed diets containing Triticale and berseem silages and their mixture. Egyptian J. Sheep and Goat Sci., 9(1).

Enjalbert, F.; J. E. Garrett; R. Moncoulon; C. Bayourthe and P. Chicoteau (1999). Effects of yeast culture (*Saccharomyces cerevisiae*) on ruminal digestion in non-lactating dairy cows. Animal Feed and Science Technology, 76: 195-206.

Fahmi, A.H. and H.A. Sharara, 1950. Studies on Egyptian domiati cheese. J. Dairy Res., 17: 312-312.

Galib, N.; C. Aydin; I. I. Turkmen; M. Y. Yalcand and H. Biricik (2004). Effects of supplemental yeast culture on blood parameters. Indian Veternary Journal, 81: 1235- 1238.

Hassan, A. M.; Helmy, A. and Enab, A. K. (1999): Utilization of some local polysaccharide in manufacturing of yoghurt. Egyptian J. Dairy Sci. 27:281-289.

Jouany, J. P.; F. Mathieu; J. Senaud; J. Bohatier; G. Bertin; and M. Mercier (1998). The effect of *Saccharomyces cerevisiae* and Aspergillus oryzae on the digestion of the cell wall fraction of a mixed diet in defaunated and refaunated sheep rumen. Reproduction Nutrition Development, 38: 401-416.

Kassab, A. Y. and A. A. Mohamed (2013). Effects of dietary live dried yeast on some physiological responses and productive performances in Sohage ewes. Egyptian H. Nutrition and Feeds, 16(2) : 213-223.

Koskowiski, F. V. (1987): Cheese and Fermented Milk Food. 2nd Ed Edward Brothers. Inc. Ann, Arbor, Michigan USA.

Koul, V.; U. Kumar; V. K. Sareen; S. Singh (1998). Mode of action of yeast culture (Yea-Sacc 1026) for stimulation of rumen fermentation in buffalo calves. Journal of the Science of Food and Agriculture, 77: 407-413.

NRC (1985). Nutritional requirements of domestic animals. Nutrient requirements of sheep National Research Council, Washington.

NRC, 1988. Nutrient Requirements of Dairy Cattle. 6th rev. ed. National Research Council (U.S.A.). Subcommittee on Dairy Cattle Nutrition. Washington: National Academy of Sciences.

Onifade, A.A.; R. I. Obiyan; E. Onipede; D.O. Asejumo; O.M. Babatunde (1999).Assessment of the effects of supplementing rabbit diets with a culture of *Saccharomyces cerevisiae* using growth performance, blood composition and clinical enzyme activates. Animal Feed and Science Technology,. 77: 25-32.

Özsoy, B.; S. Yalcin; Z. Erdogan; Z. Cantekin and T. Aksu(2013). Effects of dietary live yeast culture on fattening performance on some blood and rumen fluid parameters in goats. Revus Med.Vet., 164, 5, 263-271.

Pappas, G.P., E. Kondlyi, L.P. Voutsinas and H. Mallatou, 1996. Effect of starter level, draining time and aging on the physico-chemical organoleptic and reheological properties of feta cheese. J. Soc. Dairy Technol., 49: 73-73.

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

Radev, V.. (1999). Influence og the yeast culture (Yea-Sacc 1026) on the rumen metabolism in sheep Bulgarian Journal of Agriculture Science, 5: 663-668.

Santra A. and S. A. Karim (2003): Rumen Manipulation to Improve Animal Productivity, A. Santra. Central Sheep and Wool Research Institute, Avikanagar - 304 501

SAS Institute (2003). SAS/STATR User's Guide: statistics. Ver. 9.1, SAS Institute Inc., Cary, NC, USA.

Shultz, T.A. and E. Shultz (1970). Estimation of rumen microbial nitrogen by three analytical methods. J. Dairy Sci , 53:781.

Strzetelski, J. (1996). Modern principles and methods of fattened cattle nutrition. Instyut Zootechniki biuletyn digestibility studies. J. Anim. Sci.., 47:2.

Van keulen, and P. A. Young. 1977 . Evaluation of acid insoluble ash as a natural marker in ruminant digestibility studies. J. Animal Sci. 44: 282-287.

Walstra, P., H.J.M. Van Dijk and T.J. Geurts, 1985. The syneresis of curd. 1-General consideration and literature review. Neth. Milk Dairy J., 39: 209-246.

Warner, A.C.I. (1964). Production of volatile fatty acids in the rumen, methods of measurements. Nutr. Abst. & Rev., 34: 339.

WHO Technical Report Series 916, "Diet, Nutrition and the Prevention of Chronic Diseases",Report of a Joint WHO/FAO Expert Consultation, World Health Organization, Geneva, 2003, p. 88

Wohlt, J.E.; Corcione, T.T. and Zajac, P.K. 1998. Effects of yeast on feed intake and performance of cows fed diets based on corn silage during early lactation. J. Dairy Sci. 81:1345–1352.

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.

تأثير استخدام الاضافات الميكروبية (بروبايوتك) في علائق المجترات علي الهضم وتخمر الكرش وإنتاج اللبن وخصائص الجبن الدمياطي

كامل محمد كامل عياد[١]، إبراهيم عبد الباقى أبو عيانة[٢] ، محمد التابعى الخولانى[٣] و محمد عبد الحفيظ [٣]

[١] **قسم بحوث تكنولوجا الالبان ،معهد الانتاج الحيوانى ، مركز البحوث الزراعية ، الدقى ، مصر**

[٢] **قسم بحوث تكنولوجا الألبان ، معهد بحوث تكنولوجيا الأغذية ، مركز البحوث الزراعية ، الجيزة ، مصر**

[٣] **معهد بحوث الانتاج الحيوانى ، مركز البحوث الزراعية ، وزارة الزراعة ، مصر**

الهدف من هذا العمل البحثي هو تقدير الهضم والقيمة الغذائية نتيجة لاستخدام بعض الاضافات الغذائية مثل الخميرة التجارية (BGY 35) وبكتيريا حمض اللاكتيك (AVI-BAC®) في علائق ذكور الأغنام الرحماني ، ثم تجربة تغذية أبقار الفريزيان الخليطة لدراسة تأثير العلائق المختبرة علي اللبن وجودته، حيث غذيت الحيوانات التجريبية علي عليقة المقارنة (بدون أي إضافات) مضافا إليها الخميرة (BGY 35) أو بكتيريا حمض اللاكتيك (AVI-BAC®) في ثلاث مجموعات هي : مج١ ، مج٢، مج٣.

وقد أظهرت النتائج زيادة في معظم معاملات الهضم مع استخدام الإضافات الميكروبية (مج٢، مج٣) مقارنة بالكنترول ، وقد أظهر كلا من معامل هضم البروتين الخام والدهن الخام تحسنا معنويا مع مج٢، مج٣ مقارنة بالكنترول . نفس التأثير الايجابي لوحظ أيضا مع القيمة الغذائية (المركبات المهضومة الكلية ، البروتين المهضوم) نتيجة لاستخدام الإضافات الميكروبية في علائق الأغنام .

فيما يتعلق بقياسات سائل الكرش ، فقد أظهرت النتائج ان حموضة سائل الكرش لم تتأثر بالعلائق المختبرة ، في حين ارتفع معنويا كلا من الأحماض الذهنية الطيارة الكلية والبروتين الميكروبي بعد الأكل نتيجة لاستخدام المعاملة ، أيضا حدث ارتفاع في آمونيا الكرش في مجموعة الكنترول مقارنة بالأخرى.

أما فيما يتعلق بتجربة التغذية فقد أظهرت النتائج تحسنا في انتاج اللبن اليومي مع استخدام كلا المعاملتين (مج٢ ، مج٣) مقارنة بالكنترول ، وكان التحسين معنويا في الفترة الثانية من إنتاج اللبن (من ٦١- ١٢٠ يوم) ، ؟أيضا ظهرت بعض التأثيرات الايجابية في مكونات اللبن (مثل الدهن ، البروتين ، والجوامد الكلية) لاستخدام الإضافات الميكروبية في علائق الأبقار .

تأثير العلائق المختبرة علي الخلايا الجسدية في اللبن وقياسات جودة اللبن الاخري غير ملحوظ. كما أشارت النتائج الى زيادة ملحوظة فى الاحماض الدهنية غير المشبعة مع زيادة طفيفة فى حمض الاستياريك وانخفاض طفيف ايضا فى حمض اللينولك واللينولينك وزيادة كل من نسبة الدهن والبروتين واللاكتوز والمواد الصلبة الكلية والمواد الصلبة اللادهنية .

كذلك لم تظهر فروق واضحة معتبره فى التحلل البروتينى مع تلك الاضافات الميكروبية رغم زيادتها الطفيفة عن تجربة الكونترول. ونالت عينات الجبن الدمياطة درجات حسية فى المعاملات الميكروبية درجات اعلى من الكنترول ، حيث حقق BGY35 اعلى الدرجات الحسية تلاه AVI-BAC® واخيرا عينة الكنترول.