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EFFECT OF DIFFERENT YEAST CULTURES SUPPLEMENTATION TO DIET ON THE PRODUCTIVE PERFORMANCE OF LACTATING BUFFALOES

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SUMMARY

Twenty lactating buffaloes were grouped into 4 feeding treatments for 25 weeks. The treatments were (1) control, (2) control + 10g Yea-sacc^{1026}, (3) control + 10g Lacto-sacc (4) control + 10g Baker's yeast. The control ration was consisted of concentrate feed mixture: berseem clover: rice straw (50 : 30 : 20, on dry matter basis).

Yea-sacc^{1026} supplementation increased ($P<0.05$) nutrients digestibility, milk yield, milk protein content, C_{16} content in milk fat, histidine, phenylalanine, serine, glycine, proline and tyrosine in milk, total protein, albumin, urea nitrogen, glucose and cholesterol in blood serum than control. Lacto-sacc supplementation increased ($P<0.05$) nutrients digestibility, C_{18} in milk fat, histidine, glycine and proline in milk, albumin and glucose in blood serum, however it decreased ($P<0.05$) alkaline phosphatase than control. Baker's yeast supplementation increased ($P<0.05$) nutrients digestibility, C_{14} and C_{16} in milk fat and glucose in blood serum, however it decreased ($P<0.01$) C_{18} content in milk fat. The highest nutrients digestibility, milk yield, milk protein and blood serum protein, urea, glucose and cholesterol contents were obtained with Yea-sacc^{1026} followed by baker's yeast then Lacto-Sacc supplementations. It could be concluded that Yea-sacc^{1026} supplementation to rations of lactating buffaloes had beneficial effects on their productive performance and a feasible economical efficiency under the farm feeding condition in Egypt.

Key words: *yeast cultures, lactating buffaloes, nutrient digestibility, blood serum, milk fatty acids, amino acids.*

INTRODUCTION

Yeast and yeast cultivates had been used as supplements in animal feeds for more than six decades. For the most part, early uses of these supplements were based on empirical observations, which suggested that improvements in animal performance could be obtained by including small amounts of yeast or yeast culture in animal diets. Until recently few attempts has been done to identify mechanisms which explain the beneficial activities associated with these preparations. Dawson, (1992) mentioned that yeast stimulates rumen bacteria to enhance lactate and ammonia utilization resulting in moderate pH and increases in microbial population which lead to increases in fiber digestion and protein synthesis in the rumen. In the last six years, a number of studies were carried out to explore the beneficial effects of yeast culture supplementation on cattle, sheep and goats productivity (Williams and Newbold, 1990, Dawson, 1990,

Offer, 1990, Edwards, 1991; Higginbotham *et al.*, 1994; Besong *et al.*, 1996, Putnam *et al.*, 1997 and El-Badawi *et al.*, 1998).

Yeasts are know as rich sources of vitamins, enzymes, nutrients and other important cofactors which make them attractive as a basic nutrient source by number of features: rich sources of vitamins, enzymes, nutrients and other important cofactors (Dawson, 1992). Yeast cells maintain their metabolic activities under anaerobic conditions, and exposure to low pH (Dawson, 1992). However, production responses to yeast culture supplementation vary with species, diet and the type of yeast supplement. So the objective of this study was to evaluate the effect of different types of yeast supplements in the ration on the productive performance of lactating buffaloes.

MATERIALS AND METHODS

This study was conducted at the Experimental Farm of Milk Replacers Research Center, Faculty of Agriculture, Ain Shams University and Food Tech. and Dairy Sci. Dept., National Research Centre, Dokki, Cairo, Egypt.

1. Animals and rations

Twenty lactating buffaloes, in their 4th or 5th lactation seasons were used in 25 weeks feeding trial started after two weeks of parturition. Buffaloes were grouped in equal numbers in four groups according to age and assigned at random to receive one of four dietary treatments. Dietary treatments were (1) control, (2) control + 10g Yea-sacc^{1026} (YS) containing 10^8 cells of *Saccharomyces cerevisiae* per gram (Alltech's product, USA), (3) control + 10g lacto-sacc (LS) containing dried fermentation products of *Lactobacillus acidophilus*, *Streptococcus faecium*, *Aspergillus oryzae* and *Aspergillus niger* , *and* 10^8 cells of *Saccharomyces cerevisiae* per gram (Alltech's product, USA) (4) control + 10g Baker's yeast (BY) containing 10^9 cells of *Saccharomyces cerevisiae* per gram supported by vitamin B_1, B_2 and Nichotnic acid (Egyptian Company for Starch, Yeast and Detergents) . Control ration consisted of concentrate feed mixture (CFM) : berseem clover (BC) : rice straw (RS); (50 : 30 : 20, dry matter basis).

The CFM consisted of 25% undecorticated cotton seed cake, 35% wheat bran, 30% corn, 3% rice bran, 3% molasses, 2% limestone, 1% urea and 1% salt (NaCl). Chemical composition of the ingredients is shown in Table (1).

2. Management

Amounts of daily feeds were assessed to cover the maintenance and the production requirements (Shehata, 1971). The CFM was individually weighed for each animal and offered twice daily during milking times at 6.00 and 16.00 hr, while roughages were offered at 8.00 and 14.00 h. after accessing the animals to fresh water. The daily supplemental yeast were mixed with CFM twice daily just before feeding to ensure that each animal had consumed its own supplement. The treatments were begun after 2 wk of calving and extended for 25 weeks after parturition.

3. Analysis of feed samples

Samples of CFM, BC, RS and yeasts were analyzed for dry matter (DM), ash, crude protein (CP), crude fiber (CF) and ether extract (EE) according to A. O. A. C. (1995). Nitrogen-free-extract (NFE) was calculated by differences.

4. Sampling and analysis of milk

The animals were machine-milked twice daily, while milk samples were collected once every two weeks for 13 weeks, then once every four weeks till the 25th week of

recorded individually and milk samples were analyzed for fat, total solids (TS), solids-not-fat (SNF), total protein (TP), pH, acidity and ash (Ling, 1963) lactose (Barnett and Abd El-Tawab, 1957), individual amino acids (AA) (Millipore Cooperative, 1987) and individual fatty acids (FA) were determined after the extraction of milk fat using chloroform-methanol (2 : 1 v/v) and the solvent was evaporated in a rotary evaporator. The methyl esters of the fatty acids were analyzed using Konik HRGC 3000 (Konik Instruments Inc, Miami - Florida 33015, USA) equipped with a flame ionization detector and fitted with stainless-steel column (1 x 2 m x 1/8 inch diameter) packed with 10 % Carbowax 20 M and supported on cromosorb WHP 80 - 100 mesh. The sample (1.0 - 1.5 ul) was injected into the column using microsyringe. The gas chromatographic conditions used for the analysis was temperature programmed from 130 - 220°C at the rate of 4°C/min., with a nitrogen flow rate of 30 ml /min., hydrogen 30 ml/min. and air 300 ml/min. Also, the injection temperature and detector temperature were 220 and 240°C, orderly. The peak areas were measured using an integrator. Identification and percent composition of the fatty acids were determined by the reference to a standard of known composition.

5.Sampling and analysis of blood serum

Blood samples (four hrs post-morning feeding) were collected from the jugular vein of each animal on the milk sampling day. Collected blood samples were centrifuged at 4000 r.p.m. for 20 min. and the blood serum was stored in clean glass vials at -18°C till analysis. Serum total protein were determined as described by Armstrong and Carr (1964), albumin (Doumas *et al.* 1971), urea (Patton and Crouch, 1977), transaminases (GOT and GPT) activities (Reitman and Frankel, 1957), glucose (Siest *et al.* 1981), alkaline phosphatase activity (Bessey *et al.* 1946), cholesterol (Kostner, *et al.*, 1979), and total lipids (Postma and Stroes, 1968). Globulin and albumin/globulin ratio was calculated.

6. Digestibility trials

During the last three months of the experimental period, three animals from each experimental group were used in digestibility trial. Grab sample method was used and acid insoluble ash as internal marker was applied for determining the digestibility (Van Keulen and Young, 1977). Faeces grab samples were collected handily at 12.00 a. m. for three successive days from each animal for chemical analysis according to A. O. A. C. (1995) and the digestibility coefficients of a certain nutrient was calculated.

7. Statistical analysis

The ANOVA for a two-way classification design using the general linear model procedure $Y_{ijk} = U + T_i + e_{ik} + A_j + (TA)_{ij} + E_{ijk}$, where Y_{ijk} : is the parameter under analysis of the ijk buffalo, U : is the overall mean, T_i : is the effect due to treatment, e_{jk} : is the effect due to the animals within treatment, (treatment error), A_j : is the effect due to the week of lactation, $(TA)_{ij}$: is the interaction (treatment * week of lactation), E_{ijk} : is the effect due experimental error associated with the Y_{ijk} observation , according to Snedecor and Cochran, (1982). The Duncan's new multiple range test was used to test the significance between means.

RESULTS AND DISCUSSION

1. Dry matter intake (DMI)

The highest DMI value was obtained by YS supplemented group followed by BY and then LS (Table, 2). The lowest

Table 1. Chemical composition of concentrate feed mixture (CFM), berseem (BC), rice straw (RS) and different yeast supplements (% Dry matter basis)

Items	Diet ingredients					
	CFM	BC	RS	Yea- sacc[1026]	Lacto- sacc	Baker
Dry matter	92.7	12.3	91.0	93.0	93.0	91.0
Organic matter	90.9	88.2	85.8	92.4	91.6	92.7
Ash	9.1	11.8	14.2	7.9	8.4	7.3
Crude protein	14.1	13.2	3.4	29.7	25.8	41.4
Ether extract	4.2	2.6	1.2	8.2	10.6	9.0
Crude fiber	15.1	27.3	35.1	12.3	12.5	3.20
Nitrogen-free-extract	57.5	45.1	46.1	42.2	42.7	39.1

Table 2. Mean values of live body weight (LBW), DM intake and nutrients digestibility by lactating buffaloes fed diets supplemented with different yeast cultures, during the last 3 months of the trial.

Parameter	Treatments				
	Control	Yea-sacc[1026] (T_1)	Lacto-sacc (T_2)	Baker yeast (T_3)	S.E.
LBW (kg)	590	573	575	586	--
DM intake :					
Total (kg / head / day)	12.13	13.43	12.43	13.33	--
Total % of LBW	2.06	2.34	2.16	2.27	--
From CFM	5.71	7.01	6.01	6.91	0.62
From berseem clover	3.69	3.69	3.69	3.69	--
From rice straw	2.73	2.73	2.73	2.73	--
Nutrients digestibility (%):					
Dry matter	67.04^{d}	73.26^{a}	70.30^{c}	71.63^{b}	0.38
Organic matter	70.55^{d}	76.90^{a}	73.56^{c}	75.26^{b}	0.41
Crude protein	71.62^{c}	77.56^{a}	75.01^{b}	76.43^{a}	0.40
Crude fiber	56.55^{c}	61.82^{a}	59.05^{b}	60.63^{a}	0.37
Ether extract	65.76^{c}	73.02^{a}	69.14^{b}	71.32^{a}	0.60
Nitrogen-free extract	74.53^{c}	81.47^{a}	77.93^{b}	79.30^{b}	0.47

- Each value is a mean of 9 samples from 3 animals, S.E. = Standard error, CFM = Concentrate feed mixture. Different superscripts in the same raw are significantly differ ($P < 0.05$)

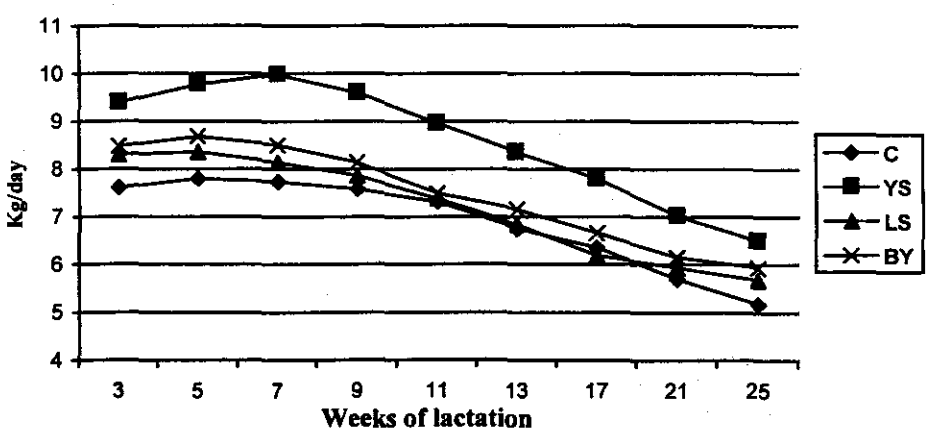

Figure 1. Effect of the different dietary treatments on buffaloes daily milk yield

BY and then LS (Table, 2). 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), Mutsvangwa (1992), Swartz *et al.* (1994) and Soder and Holden (1999). However, Wohlt *et al.* (1991), Williams *et al.* (1991), Erasmus *et al.* (1992), Olson *et al.* (1994), Yousef *et al.* (1996) and Putnam *et al.* (1997), who reported that there was a significant improvement in DMI when yeast culture was given to lactating animals.

2. Nutrients digestibility

The present data (Table, 2) clearly showed that animals fed rations supplemented with yeast had higher ($P<0.05$) DM, OM, CP, CF, EE and NFE digestibility values than those of control group. The highest digestibility values were obtained with YS supplemented group, followed by BY and then LS treated groups. These results are in line with those obtained by Wohlt *et al.* (1991) who attributed the increase in digestibility to the effect of yeast cultures which may provide stimulatory factors to rumen cellulolytic and proteolytic bacteria, especially when high concentrate (>50%) diets are fed. It was stated that feeding yeast cultures has increased numbers of cellulolytic rumen bacteria and resulted in improved fiber digestibility (Wiedmeier *et al.* 1987). Wohlt *et al.* (1991) reported that digestibility of crude protein and acid detergent fiber were significantly improved when yeast culture was added to diets for lactating cow.

3. Milk production and composition

Yields of milk (Fig. 1) and 4% fat-corrected-milk (FCM) and milk protein content (Table 3) were significantly ($P< 0.05$) improved by including yeast in the ration. In other words, YS, LS and BY treatments produced 24.8, 4.2 and 8.3% more milk respectively as compared to control. These results are in accordance with those reported by Huber *et al.* (1989), Günther (1990a), Günther (1990b), Wohlt *et al.* (1991), Kobeisy and Ibrahim (1991), Williams *et al.* (1991), Erasmus *et al.* (1992), Kumar *et al.* (1992), Piva *et al.* (1993), Sudarshan Singh (1993), Abd El-Ghani *et al.* (1995), Kobayashi *et al.* (1995), Strzetelski *et al.* (1996), Yousef *et al.* (1996), Putnam *et al.* (1997) and Abo El-Nor and Kholif (1998). The higher milk yield of animals fed on diets with yeast supplements may be attributed to higher DM, OM, CP, CF, EE and NFE digestibility values than control group. However, El-Badawi *et al.* (1998) recorded that during lactation period, in Baladi goats, milk yields (4% FCM, fat and protein) over the whole lactation were insignificantly higher ($P>0.05$) in YC-fed groups. There was no interaction between treatments and weeks of lactation during the first 25 weeks of lactation.

Milk protein content was significantly ($P<0.05$) higher with YS than control treatment. This result is in accordance with those reported on lactating animals fed diets supplemented with yeast culture {Erdman and Sharma (1989), Günther (1990a), Günther (1990b), Kobeisy and Ibrahim (1991), Kumar *et al.* (1992), Sudarshan Singh (1993), Abd El-Ghani *et al.* (1995), Kobayashi *et al.* (1995), Yousef *et al.* (1996) and Putnam *et al.* (1997)}. Skorko-Sajko *et al.* (1993) reported that the increased flow of lysine and methionine observed by Erasmus (1991) might probably help to explain the increase in milk and milk protein yield. In addition, the increase in milk protein yield by yeast culture supplementation may be due to stimulation of rumen microbes, that cause altering in microbial protein synthesis and increased protein passage and protein yield, explain by (Dawson, 1993). However, Abo El-Nor and Kholif (1998) and Soder and Holden (1999)

Table (3): Mean values of yield and composition of milk produced by lactating buffaloes fed diets supplemented with different yeast cultures.

Items	Treatments				S.E.
	Control	Yea-sacc^{1026} (T_1)	Lacto-sacc (T_2)	Baker yeast (T_3)	
Milk yield (kg/d)	6.89^{b}	8.60^{a}	7.18^{b}	7.46^{b}	0.40
4% FCM (kg/d)	9.35^{b}	12.81^{a}	10.55^{b}	10.78^{b}	0.45
Fat %	6.96	7.26	7.13	6.97	0.17
Protein %	3.84^{b}	4.05^{a}	3.93^{ab}	3.92^{ab}	0.05
Lactose %	4.80	4.90	4.74	4.77	0.08
Ash %	0.70	0.73	0.70	0.72	0.01
SNF %	9.38	9.58	9.40	9.43	0.09
TS %	16.34	16.82	16.55	16.42	0.15
PH value	6.70	6.67	6.67	6.68	0.02
Acidity %	0.174	0.177	0.177	0.177	0.002

FCM = 4% fat corrected milk, SNF = Solids-not-fat, TS = Total solids, S.E. = Standard error. Means of 45 samples from 5 animals for each treatment. Means with different superscripts are different at ($P<0.05$).

Table (4) : Fatty acids composition of milk produced by lactating buffaloes fed diets supplemented with different yeast cultures.

Fatty acid (%)	Treatments				S.E.
	Control	Yea-sacc^{1026} (T_1)	Lacto-sacc (T_2)	Baker yeast (T_3)	
C_6	1.06	1.89	1.14	0.79	0.27
C_8	0.75	0.97	0.90	0.90	0.16
C_{10}	1.88	1.97	2.31	1.82	0.31
C_{12}	2.41	2.53	2.34	2.51	0.18
$IsoC_{14}$	0.31	0.10	0.27	0.23	0.13
C_{14}	10.88^{bc}	11.56^{ab}	10.11^{c}	12.03^{a}	0.37*
$C_{14:1}$	1.84	0.31	1.64	2.72	0.64
C_{15}	2.25	1.45	2.01	2.03	0.40
$C_{15:1}$	0.80	1.01	1.09	1.05	0.32
$IsoC_{16}$	2.88	0.72	0.49	0.00	0.69
C_{16}	28.28^{BCc}	30.08^{ABab}	27.43^{Cc}	30.40^{Aa}	0.47*
$C_{16:1}$	1.15	1.16	4.05	3.92	0.80
C_{17}	6.17	3.47	1.42	1.09	1.54
C_{18}	14.64^{Bb}	15.13^{Bb}	15.90^{Aa}	12.64^{Cc}	0.65**
$C_{18:1}$	24.53	26.92	27.61	26.36	3.10
$C_{18:2}$	0.17	0.71	0.68	1.49	0.48
Saturated	71.52	79.87	64.32	64.44	6.32
Unsaturated	28.48	30.13	35.68	35.56	3.16
Short ($<C_{14}$)	6.10	7.36	6.69	6.02	0.62
Medium	54.56	49.88	49.11	53.47	3.20
Long ($>C_{17}$)	39.35	42.76	44.20	40.50	3.53

- Each value is a mean of 3 combined samples from 5 animals. S. E. = Standard error. * = significant at 5 % level, ** = significant at 1 % level, Dissimilar superscripts at the same row are significantly different ($P<0.05$, small letters, $P<0.01$, capital letters).

Table (5): Mean values of amino acids[1] content (mg/100 g sample) in milk of buffaloes fed diets supplemented with different yeast cultures.

Amino acids (AA)	Control	Yea-sacc[1026] (T)	Lacto- (T)	Baker (T)	S.E.
EAA					
Histidine	87^{b}	117^{a}	115^{a}	105^{ab}	9*
Arginine	90	98	108	116	14
Threonine	181	225	205	193	18
Valine	231	301	266	257	25
Isoleucine	205	241	234	225	20
Leucine	387	445	401	392	34
Phenylalanine	170^{Bb}	212^{Aa}	176^{ABb}	163^{Bb}	13*
Lysine	298	369	335	328	29
Total EAA	1649	2010	1840	1779	159
NEAA					
Aspartic	281	348	324	314	28
Glutamic	958	1063	958	952	80
Serine	178^{Bb}	232^{Aa}	212^{ABab}	207^{ABb}	17*
Glycine	63^{b}	90^{a}	91^{a}	83^{ab}	8*
Alanine	89	153	151	141	25
Proline	361^{Bc}	584^{Aa}	466^{Bb}	423^{Bbc}	34**
Tyrosine	121^{Bb}	161^{Aa}	132^{ABb}	109^{Bb}	12*
Total NE AA	2051^{Bb}	2631^{Aa}	2334^{ABb}	2229^{ABb}	300*
Total AA	3700	4641	4174	4008	340

[1]Each value represents an average value of 3 combined samples from 5 animals. S.E. = standard error, EAA = essential amino acids, NEAA = non-essential amino acids, * = significant at 5 % level ** = significant at 1 % level , Dissimilar superscripts at the same row are significantly different ($P<0.05$, small letters, $P<0.01$, capital letters).

found that milk protein were not significantly affected by yeast culture. Moreover, Huber *et al.* (1989), recorded that supplementation of yeast cultures had decreased milk protein.

Milk fat content for YS and LS treated groups were higher by 4.3 and 2.4% than those of BY or control groups, howevere the differenence was insignificant between groups (P>0.05). Results of milk fat content are in accordance with those reported by Huber *et al.* (1989), Strzetelski *et al.* (1996), Abo El-Nor and Kholif (1998) and Soder and Holden (1999). However, Abd-El-Ghani *et al.* (1995) and Yousef *et al.* (1996). found that animals fed yeast culture had a significant increase in milk fat content.

The total solids, SNF, lactose, ash, pH and acidity showed similar trends to fat content with no significant differences (P> 0.05) among groups. These results were in accordance with those obtained by Erdman and Sharma (1989), Arambel and Kent (1990), Erasmus *et al.* (1992), Piva *et al.* (1993), Abo El-Nor and Kholif (1998) and Soder and Holden (1999).

The overall means of fatty acids show that YS and BY had higher content (P<0.05) of C_{14} and C_{16} than those of control and LS. Also, LS had significantly higher (P<0.05) content of C_{18} than other groups (Table, 4). Giger-Reverdin *et al.* (1996) reported that milk fatty acid production was increased in dairy goats fed yeast culture. However, Abo El-Nor and Kholif (1998), found that as the level of yeast culture increased in the diet, saturated fatty acids gradually increased, while $C_{18:1}$, $C_{18:2}$, $C_{18:3}$ and $C_{20:4}$ were insignificantly decreased.

The overall means of amino acids pattern (Table 5) indicate that YS and LS had higher contents (P<0.05) of histidine and glycine than those of control group. Moreover, YS group had significantly higher (P<0.05) contents of phenylalanine and tyrosine than control, LS and BY groups. Serine was higher (P<0.05) for YS and LS than control. Proline was higher (P<0.05) for YS than other treatment groups (Table 5). Values of non-essential amino acids were higher (P<0.05) with YS group than other treatment groups. Values of total non-essential amino acid may explain the increases in milk protein content with yeast supplemented groups than control group.

4. Blood serum parameters

The data in Table (6) indicate that YS supplemented group had higher serum total protein, albumin, urea nitrogen, glucose and cholesterol contents (P<0.05) than control. Also, LS supplemented group had higher serum albumin and glucose contents but lower in alkaline phosphatase activity (P<0.05) than control. The BY group had higher serum glucose content (P<0.05) than control. These results are in accordance with Yousef *et al.* (1996) and Abo El-Nor and Kholif (1998), however, Piva *et al.* (1993) found that blood plasma total protein were affected adversely by adding dietary yeast culture. Harris *et al.* (1991) found that Holstein cows fed diets supplemented with yeast culture had lower blood urea nitrogen. However, Kobayashi *et al.* (1995) reported that the concentration of urea-N in blood plasma was unchanged by adding dietary yeast culture.

5. Economical efficiency

Table (7) represents the effect of supplementing lactating buffaloes' diets with different types of yeast cultures on the economical efficiency expressed as price of milk yield per cost of feed consumed. The data indicated that using Yea sacc[1026] was better economically than control or other supplemented diets. Based on the assumption that the price of

Table (6): Mean values of some blood serum parameters of lactating buffaloes fed diets supplemented with different types of yeast cultures.

Items	Treatments				S.E.
	Control	Yea-sacc[1026] (T_1)	Lacto-sacc (T_2)	Baker yeast (T_3)	
Total protein (g/dl)	6.64^{b}	7.32^{a}	6.98^{ab}	7.09^{ab}	0.20
Albumin (g/dl)	3.30^{b}	3.65^{a}	3.61^{a}	3.50^{ab}	0.09
Globulin (g/dl)	3.34	3.67	3.37	3.37	0.18
A/G ratio	0.99	0.98	1.06	0.94	0.06
Urea nitrogen (mg/dl)	39.48^{b}	43.72^{a}	39.13^{b}	41.04^{ab}	1.22
GOT (U/l)	33.64	33.62	33.00	35.02	1.51
GPT (U/l)	21.40	22.62	23.20	22.75	0.82
Alka-p-ase (U/l)	37.72^{a}	35.97^{ab}	33.73^{b}	35.82^{ab}	1.20
Glucose (mg/dl)	55.48^{c}	65.98^{a}	60.19^{b}	64.74^{a}	0.86
Total lipids (mg/dl)	300.6	325.6	301.0	319.5	7.95
Cholesterol (mg/dl)	153.3^{b}	157.8^{a}	153.2^{b}	156.5^{ab}	1.13

S.E. = Standard error, A/G = Albumin/Globulin, GOT and GPT = Glutamic-oxaloacetic and Glutamic-pyruvic transaminases, Alka-p-ase = Alkaline phosphatase activity . Means of 45 samples from 5 animals each treatment. Means with different superscripts are different at ($P<0.05$).

Table (7): Effect of yeast supplementation in diets of lactating buffaloes on their economical efficiency.

Items	Control	Yea-sacc[1026] (T_1)	Lacto-sacc (T_2)	Baker yeast (T_3)
Intake as fed (kg/d)				
Concentrate	6.16	7.56	6.48	7.45
Rice straw	3.0	3.0	3.0	3.0
Berseem clover	30	30	30	30
Yeast cultures (g/d)	--	10	10	10
4% FCM yield (kg/d)	9.35	12.81	10.55	10.78
Cost of feed consumed (L.E./d)[1]	5.64	6.41	5.81	6.34
Price of 4% FCM yield (L.E./d)	14.07	19.29	15.89	16.24
Cost of kg 4% FCM (L.E./d)[2]	0.60	0.49	0.56	0.60
Economical efficiency[3]	2.49	3.01	2.73	2.56

[1]Cost of feed consumed (L.E./d) = Price of each ration ingredient x its amount consumed/d. [2]Cost of kg 4% FCM (L.E./day) = Cost of feed consumed/ average daily 4% FCM yield. [3] Economical efficiency = Price of 4% FCM yield / cost of feed consumed.

one ton of CFM, RS and BC were 550, 35 and 70 Egyptian pounds (L.E.) respectively. The price of one kg of Yea sacc[1026], lacto sacc and Baker's yeast were 45, 38 and 6 L.E., respectively.

REFERENCES

Abd El-Ghani, A.A.; M.A.A. El-Barody and O.A.O. Saad (1995). Milk yield and composition, blood metabolites and rumen activity as affected by different levels of *Saccharomyces cerevisiae* plus growth medium supplementation in Egyptian buffaloes. In Proc. 5th Sci. Conf. Animal Nutrition, *1: 115-128.* Ismailia, Dec., 1995.

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.

A.O.A.C. (1995). Association of Analytical Chemists. Official Methods Of Analysis. International, 16th Edition, Vol. 1, " Agricultural, Chemicals, Contaminants, Drugs". Washington, D. C., 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.

Armstrong, W.D. and C.W. Carr (1964). Physiological chemistry: Laboratory Directions, 3rd ed. PP. 75, Bburges Publishing Co. Minneapolis, Minnesota, USA.

Barnett, A.J.G. and G. Abd El-Tawab (1957). Determination of lactose and cheese. J. Sci. Food Agric., 8: 437-441.

Besong, S.; J.A. Jackson; C.L. Hicks and R.W. Hemken (1996). Effects of a supplemental liquid yeast product on feed intake, ruminal profiles, and yield composition, and organoleptic characteristics of milk from lactating Holstein cows. J. Dairy Sci. 79 : 1654-1658.

Bessey, O.A., O.H. Lowry and M.J. Brock (1946). Method for the determination of alkaline phosphatase with five cubic millimeters of serum. J. Biol. Chem., 164:231.

Dawson, K.A. (1990). Designing the yeast culture of tomorrow: Mode of action of yeast cultures for ruminants and non-ruminants. In: Biotechnology in the Feed Industry. Vol. V. Alltech Technical Publications, Nicholasville. KY, USA.

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's 8th Annual Symposium. 1: 23.

Dawson, K.A. (1993). Biotechnology in the Feed Industry , Proceedings of Alltech's 9th Annual Symposium , T.P. Lyons. Ed. Alltech's Technical Publications P. 269.

Doumas, B.; W. Wabson and H. Biggs (1971). Albumin standards and measurement of serum with bromocresol green. Clin. Chem. Acta, 31 : 87.

Edwards, I.E. (1991). Practical uses of yeast culture in beef production : Insight into its mode of action. In : Biotechnology in the Feed Industry. Vol. VI. Alltech'sTechnical Publications , Nicholasvilie KY, USA.

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 – 121.

Erasmus, L.J. (1991). The importance of duodenal amino acid profiles for dairy cows and the impact of changes in these profiles following the use of

yea-sacc[1026]. Feed compounder. 11, 24-29.

Erasmus, L.J.; P.M. Botha and A. Kistner (1992). Effect of yeast culture supplement on production, rumen fermentation and duodenal nitrogen flow in dairy-cows. J. Dairy Sci. 75 : 3056-3065.

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.

Giger-Reverdin, S.; N. Bezault; D. Sauvant and G. Bertin (1996). Effects of a probiotic yeast in lactating ruminants: Interaction with dietary nitrogen level. Animal Feed Science and Technology. 63 : 149-162. (C.F. DSA (1997) 59 : 1627).

Günther, K.D. (1990a). Live yeast cultures as additives in dairy cattle feeds . Kraftfutter. 4 : 168-172.

Günther, K.D. (1990b). Yeast culture – yea sacc[1026] success under German dairy conditions. Feed compounder 10 : (1) 24-27.

Harris, B., Jr.; D.E. Dorminey and H.H. Horn, Van (1991). The effect of different levels of feather meal and yeast culture in diets fed to Holstein cows in early to mid-lactation. (Abstract) J. Dairy Sci. 74: (Supplement 1) 299.

Higgibotham, G.E.; C.A. Collar; M.S. Aseltine and D.L. Bath (1994). Effect of yeast culture and Aspergillus oryzae extract on milk yield in a commercial dairy herd. J. Dairy Sci. 77 : 343-348.

Huber, J.T.; J. Sullivan; 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 Publications, 35 – 38.

Kobayashi, T.; S. Oda; A. Takenaka and H. Itabashi (1995). Effects of yeast culture supplement on milk protein yield, ruminal fermentation , and blood components in early to mid-lactation dairy cows. Bulletin of National Institute of Animal Industry. 55 : 13-20.

Kobeisy, M.A. and E.M. Ibrahim (1991). Effect of live yeast culture in lactating buffaloe's ration on milk yield, composition and some technological properties. Assiut Journal of Agricultural Sciences, 22 : 151-163.

Kostner, G.M., P. Avogaro, G. Bittolo Bon, G. Cazzolato and G.B. Quinci (1979). Determination of high-density lipoproteins: Screening methods compared. Clin. Chem. 25/6: 939.

Kumar, U.; V.K. Sareen and S. Singh (1992). A note on the effect of supplementation of yeast culture (*Saccharomyces cerevisiae* plus growth medium) in the diet of buffaloes on milk yield and composition. J. Anim. Prod. 55 : 440-442.

Ling, E.R. (1963). "Text Book of Dairy Chemistry" . Vol. 11. Practical Champan and Hall, L.T.D. London, 4th ed. pp. 140.

Millipore Cooperative (1987). Liquid chromatographic analysis of amino acids in food using a modification of the P1 Co-TAG method.

Mutsvangwa, 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 patterns of ruminal fermentation in steers. Zimbabwe Journal of Agricultural Research. 30 : 21-31. (C.F. DSA (1995) 57 : 6773).

Offer, N.W. (1990). Maximizing fibre digestion in the rumen : The role of

yeast culture. In : Biotechnology in the Feed Industry , Vol. V. Alltech's Technical Publications. Nicholasville, KY, USA.

Olson, K.C.; J.S. Caton; D.R. Kirby and P.L. Norton (1994). Influence of yeast culture supplementation and advancing season on steers grazing mixed- grass prairie in the northern great Plai: I. Dietary composition, intake and in situ nutrient disappearance. J. Anim. Sci. 72 : 2149-2157.

Patton, C.J. and S.R. Crouch (1977). Spectrophotomitric and kinetics investigation of the berthelot reaction for the determination of ammonia. Anal. Chem., 49 : 464 - 469.

Piva, G.; S. Belladonna; G. Fusconi and F. Sicbaldi (1993). Effects of yeast on dairy cow performance, ruminal fermentation, blood components, and milk manufacturing properties. J. Dairy Sci. 76 : 2717-2722.

Postma, T. and J.A. Stroes (1968). Lipids screening in clinical chemistry. Clinica Chimica Acta, 22 : 569.

Putnam, D.E.; C.G. Schwab; M.T. Socha; N.L. Whiteouse; N.A. Kierstead and B.D. Garthwaite (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.

Reitman, S. and S. Frankel (1957). Colorimetric method for the determination of serum glutamic - oxaloacetic - and glutamic - pyrovate transaminase. An. J. Clin. Path., 28 : 56.

Shehata, O. Kh. (1971). Lectures in Animal Production (In Arabic) Animal Production Department, Fac. Agric., Ain Shams Univ., Shoubra El-Kheima, Cairo, Egypt.

Siest, G.; J. Henny and F. Schiele (1981). Interpretation des examens de laboratoire Karger ed. 206.

Skorko-Sajko, H.; J. Sajko and W. Zalewski (1993). The effect of yea-sacc^{1026} in the ration for dairy cows on production and composition of milk. J. Animal and Feed Sci. 2 : 15-167.

Snedecor, G.W. and W.G. Cochran (1982). Statistical Methods. 7th ed. Iowa State Univ. Press, Ames, Iowa, USA.

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.

Strzetelski, J.A.; B.K. Kowalczyk; T. Stasiniewicz; M. Soroka and B. Niwinska (1996). Yeast cells as a feed supplement for cattle. 3. New yeast preparations for cows in the first period of lactation. J. Anim. And Feed Sci. 5 : 1-9.

Sudarshan Singh (1993). Buffalo Nutrition. International Milling, Flour and Feed. 187: 16-19.

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.

Van Keulen, J. and P. A. Young (1977). Evaluation of acid insoluble ash as a natural marker in ruminant digestibility studies. J. Anim. Sci., 44: 282 – 287.

Wiedmeier, R.D.; M.J. Arambel and J.L. Walters (1987). Effects of yeast culture and Aspergillus oryzae fermentation extract on ruminal characteristics and nutrient digestibility. J. Dairy Sci. 70 : 2063.

Williams, P.E.V. and C.J. Newbold (1990). The effects of noval microorganisms on rumen fermentation and ruminal productivity. In : Recent Advances in Animal Nutrition 1990 (Ed. By Cole,

D.J.A and W. Haresign). Butterworths, London.

Williams, P.E.V., C.A.G. Tait, G.M. Lunnes and C.J. Newbold (1991). Effects of the inclusion of yeast culture (*Saccharomyces cerevisiae* plus growth medium) in the diet of dairy cows on milk yield and forage degradation and fermentation patterns in the rumen of 'steers. J. Anim. Sci. 69 : 3016- 3026.

Wohlt, J.E.; A.D. Finkelstein and C.H. Chung (1991). Yeast culture to improve intake, nutrient digestibility and performance by dairy cattle during early lactation. J. Dairy Sci. 74 : 1395-1400.

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.

تأثير إضافة بيئات مختلفة من الخميرة على الأداء الإنتاجي للجاموس الحلاب

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تم توزيع ٢٠ جاموسة في بداية موسم الحليب عشوائيا حسب وزنها و إنتاجها السابق من اللبن إلي ٤ مجموعات غذيت لمدة ٢٥ أسبوعا على العلائق التالية: (١) عليقة المقارنة ؛ و تتكون من علف مركز و برسيم أخضر و قش أرز بنسبة ٥٠ : ٣٠ : ٢٠ على أساس المادة الجافة، (٢) عليقة المقارنة مضافا إليها ١٠ جرام من بيئة اليي ساك[١٠٢٦] ، (٣) عليقة المقارنة مضافا إليها ١٠ جرام من بيئة اللاكتو ساك، (٤) عليقة المقارنة مضافا إليها ١٠ جرام من خميرة الخباز الجافة، و قد أوضحت النتائج ما يلي:

– أدت إضافة بيئة اليي ساك[١٠٢٦] إلي زيادة معنوية (على مستوى ٥%) في النسب الهضمية لمكونات الغذاء ، و إنتاج اللبن و كذلك محتواه من البروتين و الحمض الدهني بالمتيك (ك١٦) و الأحماض الأمينية هستيدين و فنيل ألانين و سيرين و برولين و تيروزين، كما أدت إلي زيادة معنوية (على مستوى ٥%) في محتوى سيرم الدم من البروتين الكلى و الألبيومين و نيتروجين اليوريا و الجلوكوز و الكولستيرول، مع زيادة بوجه عام في الكفاءة الاقتصادية للحيوان عنها في حيوانات مجموعة المقارنة.

- أدت إضافة بيئة اللاكتو ساك إلي زيادة معنوية (على مستوى ٥%) في النسب الهضمية لمكونات الغذاء ، و حمض الاستياريك (ك١٨) في دهن اللبن ، و الأحماض الأمينية هستيدين و جليسين و برولين في بروتين اللبن، و الألبيومين و الجلوكوز في سيرم الدم عنها في حيوانات مجموعة المقارنة. بينما أدت إضافة اللاكتو ساك إلي انخفاض معنوي (على مستوى ٥%) في نشاط إنزيم الفوسفاتيز القاعدي في سيرم دم الحيوانات المعاملة عنها في حيوانات مجموعة المقارنة.

– أدت إضافة خميرة الخباز إلي زيادة معنوية (على مستوى ٥%) في النسب الهضمية لمكونات الغذاء ، و أحماض الميرستيك (ك١٤) و البالمتيك (ك١٦) في دهن اللبن ، و الجلوكوز في سيرم الدم عنها في حيوانات مجموعة المقارنة. بينما أدت إضافة بيئة خميرة الخباز إلي انخفاض معنوي (على مستوى ١%) في حمض الاستياريك (ك١٨) في دهن اللبن.

- تم الحصول على أعلى قيم للنسب الهضمية لمكونات الغذاء و انتاج اللبن و نسبة البروتين فى اللبن و محتوى سيرم الدم من البروتين و اليوريا و الجلوكوز و الكوليسترول فى المجموعة المضاف الى عليقتها بيئة اليي ساك[١٠٢٦] تليها خميرة الخباز ثم بيئة اللاكتو ساك و أخيرا عليقة المقارنة.

– ينصح بإضافة بيئة اليي ساك[١٠٢٦] بنسبة ١٠ جرام / يوم للحيوان حيث أنها ترفع من الأداء الإنتاجي للجاموس الحلاب و تزيد من كفاءته الاقتصادية تحت الظروف المصرية.