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EFFECT OF YEAST OR SELENIZED YEAST SUPPLEMENTATION TO RATIONS ON THE PRODUCTIVE PERFORMANCE OF LACTATING BUFFALOES.

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SUMMARY

Two experiments were carried out in this study. In the first experiment, three Baladi castrated male goats were ranked in 3x3 latin square design experiment with 30 days interval periods to study the effect of adding yeast or selenized yeast to goat's diet on their rumen activity. The control group was given a basic diet consisting of (50% concentrate feed mixture (CFM) + 50 % berseem clover). The yeast or selenized yeast supplemented groups (2 and 3) were given the control diet with 2.5 g/h/d yeast or selenized yeast, respectively. Animals fed selenized yeast had a higher rumen total nitrogen ($P<0.01$), non protein nitrogen ($P>0.05$) and true protein nitrogen ($P<0.05$), while, ammonia nitrogen and total volatile fatty acids were not affected by any of the yeast supplementations.

In the second experiment, fifteen lactating buffaloes were divided randomly into three groups (of 5 animals each) using complete random block design experiment with 90 days period. The control group was given a diet consisting of (60% CFM: 20% berseem clover: 20% rice straw), the yeast group was fed the control ration plus 10 g/h/d yeast and the selenized yeast group was fed the control ration plus 10 g/h/d selenized yeast. Individual milk samples were collected every two weeks of the experimental period for chemical analysis. After 4 hrs of the morning meal, grab samples and blood serum samples were collected in the last day every month for chemical analysis. Yeasts supplementation were improved the nutrients digestibility coefficient compared with control. Supplementation of yeast or selenized yeast to buffaloes rations increased ($P<0.05$) milk yield, milk protein and lactose contents compared with control. 4% FCM yield, milk constituents yield and fat content were slightly higher with animals fed yeasts than those of the control group. Feed efficiency (Milk yield/DMI and FCM/DMI) was higher ($P<0.05$) for animals fed yeast or selenized yeast than animals fed control. Nutrients digestibility coefficient of organic matter, crude protein, crude fiber and nitrogen free extract were significantly higher with animals fed on yeasts than control. Blood serum glucose and albumin were higher ($P<0.05$) in animals fed on yeast or selenized yeast supplemented rations. It could be concluded that organic selenium supplementation to diets improved rumen activity and milk constituents, while the yeast supplementations were improved milk production and nutrients digestibility coefficients.

***Keywords**: yeast, selenized yeast, rumen activity, digestibility, buffaloes, milk production, blood serum parameters.*

INTRODUCTION

Yeast and yeast cultures have been fed to dairy cattle for more than 60 yr with varied responses. In some studies, yeast cultures improved DMI (Williams et al., 1991; Wohlt et al., 1991; Dann et al., 2000) and milk production (Williams et al., 1991; Wohlt et al., 1991; Piva et al., 1993; Kung et al., 1997; Wang et al., 2001; Kholif et al., 2005), whereas other studies (Erdman and Sharma, 1989; Arambel and Kent, 1990; Soder and Holden, 1999) found no response to yeast cultures. Some of the benefits associated with *Saccharomyces cerevisiae* include increased DM and NDF digestion (Williams et al., 1991 and Carro et al., 1992; Kholif et al., 2005). Yeast cultures also have been shown to stimulate utilization of hydrogen by ruminal acetogenic bacteria (Chaucheyras et al., 1995). Wallace and Newbold (1992) reported that the responses of yeast culture are highly variable and apparently influenced by the composition of the diet. *Saccharomyces cerevisiae* (Yea-Sacc 1026) increased the number of ruminal total bacteria and cellulolytic bacteria (Newbold et al., 1995), increased the proportion of propionate (Mutsvangwa et al., 1992; Newbold et al., 1995), and decreased lactate concentration (Newbold et al., 1990). The Egyption soil had a shortage in selenium which effect on plants, animals and human health. Selenium is an essential microelement for animal and human diets. It was identified as a part of cellular glutathione peroxidase, which provided evidence for selenium involvement in other metabolic processes (Heider and Bock, 1993). Its deficiency in nutrition may causes decreases the productivity of domesticated animals (Foster and Sumer, 1997). Recently, researchers found evidence for selenium as a cancer-protective agent (Ip and Lisk, 1994). Therefore, selenium must be provided to human and animals as a part of nutritional intake. El-Batal and Fadel (2002) produced an edible food yeast (*S. cerevisiae*) having high levels of organically bound intracellular selenium in an assimilable non-toxic form, which is useful as a dietary supplement. Kholif (2005) used selenized yeast in lactating buffaloes diets to increase milk yield and its protein content.

This study was conducted to evaluate the effects of organic selenium supplemented rations on the productive performance of lactating buffaloes.

MATERIALS AND METHODS

This study was conducted at the Experimental Farm in Shalakan, Faculty of Agriculture, Ain Shams University and Dairy Science Department, National Research Center, Dokki, Giza, Egypt, during 2004-2005.

Microorganisms:

Yeast (*Saccharomyces cerevisiae F-25*) and selenized yeast (*Saccharomyces cerevisiae F-25* with organic selenium) were obtained from Microbial Chemistry Lab. National Research Center, Dokki, Cairo, Egypt. The cultures were maintained on Malt agar medium.

Preparation of high selenium yeast in shaking flasks:

Cane molasses medium composed of (g/L): molasses, 100 (42% sucrose 2.0; orthophosphoric acid, 2.0 and

sodium selenite, 0.05 (pH 5.5). The medium (50 ml in 250 ml Erlenmeyer flask) was autoclaved at 121°C for 15 min. The yeast culture was harvested by centrifugation at 3000 rpm for 15 minutes. The yeast yield was washed 5 times with distilled water. The yeast cells obtained was dried at air flow 18 ^{0}C till standard weight. Total count of yeast live cells was determined using agar plat count and selenium contents was determined according to (El-Batal and Fadel 2002). Fermentation was performed in 220 (rpm) shaking at 32°C for 72 h inoculation. The employed yeast cells have $4.2x10^{10}$ live cells/gas well as containing 1000 µg selenium/g dry cells.

Animals and diets:

Three Baladi castrated male goats (being 4 years old andweighting on average of 29 kg) were divided into three groups to study the effect of yeast or selenized yeast supplementation to goats ration on rumen activity using 3x3 Latin square design experiment for 30 days interval periods. The control diet used consisted of berseem clover (B) and concentrate feed mixture (CFM) (50 : 50 on dry matter basis). The experimental diets used were : control diet plus 2.5 gm/head/day yeast (*Saccharomyces cerevisiae*) (Yeast) and control diet plus 2.5 gm/head/day selenized yeast - contained 2.5 mg/h/d organic selenium - (Selenized yeast).

Fifteen lactating buffaloes after 7 days of parturition were divided to three groups - according to milk production and lactation season - to study the effect of yeast or selenized yeast supplemented buffalo's rations on blood serum parameters, nutrient digestibility coefficients and milk yield and composition using complete random block design experiment with 90 days period. Experimental rations were control (60% CFM: 20% berseem : 20% rice straw), treatment I (control ration plus 10 gm/h/d yeast), treatment II (control ration plus 10 g/head/day selenized yeast - contained 10 mg/head/day organic selenium). The CFM was consisted of 35% yellow corn, 25 % wheat bran, 22% decorticated cotton seed meal, 15% rice bran, 1.5% ground limestone and 1.5% common salt. The chemical composition of ingredients is showed in Table (1). The offered feeds were assessed to cover the requirements for each animal (A.R.C. 1965). The CFM for each animal was offered individually once daily at 8.00 am, while berseem clover and rice straw were offered at 10.00 am and 4 pm. Dry matter intake was measured during the last refusals of the previous day. Clean water was available to animals at all times.

Analysis of feed samples:

Samples of ingredients and rations were analyzed for DM, ash, CF, organic matter (OM) and ether extract (EE) according to methods of A.O.A.C. (1995). While, nitrogen-free extract (NFE) was calculated.

Rumen liquor analysis:

At the last of each period, rumen liquor samples were collected from each goats at 4 hrs. post morning feeding by a stomach tube. The samples were strained through two layers of cheese cloth and then stored in glass bottles (10 ml) with 3 drops of toluene and a thin layer of paraffin oil just to cover the surface to stop microbial activity and to prevent volatilization and stored at – 18°C till they were analyzed. Ruminal pH was determined using a digital pH-meter, total nitrogen (TN), non-protein-nitrogen (NPN) and NH_3-N were determined according to A.O.A.C.

(1995). True protein nitrogen (True-PN) was calculated by difference (TN-NPN). Total volatile fatty acids (TVFA's) were determined by steam distillation as described by Warner (1964).

Digestibility trial:

Simultaneously three digestibility traits were carried out on all animals (buffaloes) of each treatment of feeding trail and repeated each 30 days of the experimental period. Grab sample method was used and silica as internal marker was applied for determining the digestibility. Feces grab samples were collected handily at 8.00 for three successive days from each animal. Solution of 10% H_2So_4 were added to the representative samples then dried in oven at 70°C for 24 hours. The dried feces samples from each animal were mixed and stored at -18°C for chemical analysis. The digestibility coefficient was calculated according to the following formula according to (Gallup *et al.*, 1945 and Forbes and Garrigus 1948).

Sampling and analysis of milk:

Individually milk samples were collected every two weeks of the experimental period (90 days). The buffaloes were handily milked (twice/day), milk yield was recorded and pH of milk was determined (Ling, 1963). Milk samples were also, analyzed for fat, total solids (TS), total protein (TP) and ash (Ling, 1963) lactose (Barnett and Abd El-Tawab, 1957). solids-not-fat (SNF) was calculated by difference.

Blood serum analysis:

Blood samples were collected from the jugular vein of each animals (buffaloes) at the last day of each period (4 hr. post morning feeding). The collected blood samples were centrifuged at 4000 r.p.m./20 min. to separate the serum. The obtained serum was stored at –18°C till it was analyzed. Serum total protein was determined as described by Armstrong and Carr (1964), albumin (Doumas et al. 1971), urea (Patton and Crouch,1977), glucose (Siest et al.,1981), serum GOT and GPT (Reitman and Frankel, 1957) and cholesterol (Raltiff and Hall 1973). Globulin and albumin/globulin ratio were calculated.

Statistical analysis:

Data obtained from this study were statistically analyzed according to procedures outlined by Snedecor and Cochran (1982). The procedure was;

1- Latin square design for rumen liquor data using the general linear model procedure:

$$Y_{ijk} = \mu + R_i + C_j + T_k + e_{ijk}$$

Where Y_{ijkl} is the parameter under analysis of the ijkl goat, μ is the overall mean, R_i is the effect due to the period on the parameter under analysis, C_j is the effect due to the animals on the parameter under analysis, T_k is the effect due to treatment on the parameter under analysis, e_{ijk} is the experimental error for ijk on the observation.

2- Complete random block design for milk, blood and digestibility data using the general linear model procedure:

$$Y_{ijk} = \mu + R_i + T_k + e_{ijk}$$

Where Y_{ijkl} is the parameter under analysis of the ijkl goat, μ is the overall mean, R_i is the effect due to the lactation period on the parameter under analysis, T_k is the effect due to treatment on the parameter under

analysis, e_{ijk} is the experimental error for ijk on the observation.

The Duncan's multiple range test was used to test the significance between means (Duncan, 1955).

RESULTS AND DISCUSSION

Dry matter intake:

Dry matter intake did not differed among treatments, being 15.56, 15.35 and 15.65 kg/h/d in control, yeast and selenized yeast, respectively. The animals of selenized yeast treated group consumed higher ($P>0.05$) amount of DM following by control and then yeast treated group. Values of grams consumed/kg metabolic body size (MBS) were similar among treatments being 136.40, 136.10 and 136.86 g/MBS. These results are in agreement with El-Ashry et al., (2001)

Rumen liquor parameters:

Effects of treatments on characteristics of ruminal fermentation are shown in Table (2). Ruminal pH values were significantly higher ($P<0.05$) in yeasts treated groups than control group. All values were above pH 6.0 which indicated a better digestion of cellulolytic materials (Mertens, 1978). Also, TVFA's value was slightly increased with animals fed yeast supplemented groups compared with control group. The major effect of yeast on Ruminal fermentation included increased concentrations of VFA and propionate (Lila et al., 2004).

Rumen total nitrogen ($P<0.01$) and true protein nitrogen ($P<0.05$) were significantly increased with animals fed on selenized yeast compared with other treatments. Its interested to note that, the highest improvement of nutrients digestibility (Table, 3), and highest values of rumen total nitrogen and true protein nitrogen and TVFA's which observed with animals fed on selenized yeast followed by yeast led to concluded the highest improvements of rumen environment and microflora activity which produced more microbial protein. Hieder and Bock (1993) suggested that selenium was identified as a part of cellular glutathione peroxidase, which provided evidence for selenium involvement in other metabolic process. It has been suggested that increased bacterial flora in animals fed *S. cerevisiae* is central to the action of yeast in the rumen and increased bacterial population leads to an increase in both the degradation of fiber in the rumen and the flow of microbial protein from the rumen (Wallace and Newbold, 1992).

Ammonia-N concentration was not modified by the addition of yeasts which was similar to the results of Mutsvangwa et al., (1992) in lactating dairy cows fed yeast (10 g/d). Although no significancy different ($P>0.05$) were detected among different treatments in ammonia-N and non protein nitrogen concentrations, values of ammonia-N seemed to be sufficient to cover the microbial demands for microbial protein synthesis as obtained from the reports of previous investigators (Mehrez et al., 1977, Wallace, 1979 and Erdmann et al., 1986).

Nutrients digestibility coefficient:

Table (3) showed nutrients digestibility coefficient as affected by experimental treatments. Organic matter and crude fiber digestibilities were significantly increased ($P<0.01$) with animals fed ration supplemented with yeasts compared with control. This improvements of crude fiber digestibility may be due to the increase

Table (1): Chemical composition of concentrate feed mixture (CFM), rice straw (RS) and berseem clover (B) (DM basis).

Item	*CFM*	*RS*	*B*
Dry matter	91.29	93.39	18.0
Ash	10.11	13.23	12.1
Organic matter	89.89	86.77	87.9
Crude protein	14.15	3.96	12.8
Ether extract	4.05	4.55	2.5
Crude fiber	15.33	35.5	28.2
Nitrogen free extract	56.36	42.76	44.4

Table (2): Rumen liquor contents as affected by supplementing goat's ration with yeast or selenized yeast (the first experiment).

Item	*Control*	*Yeast*	*Selenized yeast*	*±SE*
Total nitrogen (mg/100ml)	148.7^{B}	150.45^{B}	195.10^{A}	0.278
Non protein nitrogen (mg/100ml)	65.34	63.62	74.10	0.685
True protein nitrogen (mg/100ml)	83.36^{b}	86.83^{b}	120.07^{a}	0.472
Ammonia nitrogen (mg/100ml)	30.77	27.37	30.58	1.191
TVFA's (m.eq/100ml)	6.28	6.77	6.60	0.157
pH	6.25^{B}	6.28^{A}	6.30^{A}	0.020

Table (3): Nutrients digestibility coefficient as affected by supplementing lactating buffalo's rations with yeast or selenized yeast (the second experiment).

Item	*Control*	*Yeast*	*Selenized yeast*	*±SE*
DM	58.96	61.59	60.29	1.721
OM	59.88^{B}	63.25^{A}	62.91^{A}	2.130
CP	59.69^{b}	65.93^{a}	63.11^{a}	1.115
EE	58.31	64.31	64.11	0.932
CF	57.44^{B}	68.55^{A}	67.31^{A}	1.583
NFE	56.99^{b}	65.39^{a}	63.21^{a}	2.343

A,B,C means with different superscripts are significant (P<0.01) difference.
a,b,c, means with different superscripts are significant (P<0.05) difference.

of the numbers of rumen total viable bacteria and cellulolytic bacteria with animals fed yeast (Lila et al., 2004 and Newbold et al., 1995). The digestion coefficients of crude protein and NFE were also significant improved ($P<0.05$) by the yeasts supplementation compared with control. Digestibility of dry matter and ether extract were followed the same trend, however, the effect of yeasts failed to be significant. There was no differences effect between two yeasts on nutrients digestibility coefficient. In total, there is no evidence for an improvement on nutrients digestibility coefficient through additional selenium to yeast. Similar results obtained by El-Waziry et al., (2000) and El-Ashry et al., (2001). Williams and Newbold (1990) suggested that yeast culture alter the site of digestion and that total tract digestibility.

Milk yield and composition:

Data of milk and milk constituent yields of the experimental buffaloes are summarized in Table (4). Milk yield was significantly ($P<0.05$) higher in yeasts supplemented groups representing an increase of about 9.35 % than buffaloes receiving control. Also, 4% FCM was insignificantly ($P>0.05$) higher in yeasts supplemented groups representing an increase of about 11.95 and 12.23% for yeast and selenized yeast, respectively, than buffaloes receiving control. As an impact of the increased milk yield, daily fat, TS, SNF, TP, lactose and ash yields were insignificantly higher ($P>0.05$) in groups received yeast or selenized yeast than that received control ration.

Data of milk composition of the experimental buffaloes are also summarized in Table (4). Milk protein and lactose contents were higher ($P<0.05$) in T_3 (selenized yeast) followed by T_2 and then control. From these data we can concluded the positive effect of selenium on the metabolic process in the mammary gland which led to the increase of milk protein and lactose synthesis. The higher milk yield with the animals fed yeasts supplemented ration might be attributed to the positive effect of yeasts on the digestibility of organic matter and its nutrients as shown in Table (3). These results also probably attributed to the higher of blood serum glucose and albumin concentration of animals fed yeasts supplemented ration as shown in Table (5). It led to an increase in milk lactose synthesis and consequently milk production being increase.

Milk fat content was insignificantly increased with yeasts treated groups compared with control. However, milk total solids, solids not fat and ash contents. Milk pH values were not significantly differ among treatments. Generally, feed efficiency calculated as milk yield / DMI and 4% FCM / DMI were significantly improved ($P<0.05$) with animals fed yeast supplemented ration followed by selenized yeast supplemented ration and then control.

Concentrations of selenium in colostrum and milk were about 1.8 times greater when cows were fed selenized yeast (Weiss and Hogan, 2005). From this finding we can produce selenium supported milk for humans. Selenium deficiency in nutrition may causes cardiological and oncological human diseases (Foster and Sumer, 1997). Researchers found evidence for selenium as a cancer-protective agents (Ip and Lisk, 1994). Therefore, selenium must be provided to human and animals as a part of nutritional intake.

Blood serum metabolites:

Table (4): Milk yield and composition as affected by supplementing lactating buffaloes rations with yeast or selenized yeast (the second experiment).

Item	Control	Yeast	Selenized yeast	±SE
No. of animals	5	5	5	
Live body weight	553	545	555	2.124
Metabolic body size ($W^{0.75}$)	114.4	112.80	114.35	0.524
Dry matter intake (kg/head/day):	15.56	15.35	15.65	1.023
kg DM/kg $W^{0.75}$	136.4	136.1	136.86	0.221
Milk yield (kg/d)	8.98[b]	9.82[a]	9.82[a]	0.216
4% FCM (kg/d)	12.13	13.58	13.62	0.558
Yields (g/d)				
Fat	569	643.1	645.9	4.16
Protein	380.3	437.8	424.2	2.985
Lactose	369.6	408.5	433.6	2.411
TS	1486.1	1645.1	1618.1	5.909
SNF	903.8	1002	972.1	4.37
Ash	70.36	79.88	79.12	1.212
Milk composition %				
Fat	6.28	6.36	6.40	0.134
Protein	4.14[b]	4.25[ab]	4.36[a]	0.045
Lactose	4.15[b]	4.30[ab]	4.46[a]	0.073
TS	16.42	16.48	16.48	0.109
SNF	10.25	10.13	10.07	0.053
Ash	0.777	0.812	0.795	0.030
PH	7.01	7.06	7.05	0.013
Feed efficiency:				
Milk yield/DMI	0.577[b]	0.640[a]	0.627[a]	0.896
FCM yield/DMI	0.780[b]	0.885[a]	0.870[a]	0.685

,b,c means with different superscripts are significant (P<0.05) difference.

'able (5): Blood serum contents as affected by supplementing lactating buffalo's rations with yeast or selenized yeast (the second experiment).

tem	Control	Yeast	Selenized yeast	±SE
'otal protein (mg/100ml)	7.40	7.01	7.49	0.122
\lbumin (mg/100ml)	4.11[b]	4.50[ab]	4.83[a]	0.081
;lobulin (mg/100ml)	3.29	2.52	2.65	0.225
./G ratio	1.52	1.95	2.03	0.193
;OT (U/100ml)	29.66	30.11	28.30	0.536
;PT (U/100ml)	13.2	12.90	12.98	0.235
;lucose (mg/100ml)	55.37[b]	61.57[a]	63.06[a]	0.559
:rea (mg/100ml)	38.34	40.08	37.84	0.273
:holesterol (mg/100ml)	109.39	100.54	105.23	0.823

,b,c, means with different superscripts are significant (P<0.05) difference.

Data in Table (5) showed no significant differences ($P<0.05$) among different treatments on some blood serum parameters, except glucose and albumin values ($P<0.05$), which were increased with animals fed selenized yeast followed by yeast and then control. These results maybe due to the improvements occurred in metabolic process as a selenium and yeast response.

Diets containing yeast selenium tend to increase total protein and A/G ratio however, globulin was slightly decreased with animals fed yeasts. Serum glucose had the same trend of milk yield (Table, 4) which was in accordance with the results of Clark et al., (1977) who claimed a positive correlation between blood glucose and milk yield. Yeasts supplementation to animals ration were not affected serum cholesterol. Blood serum glutamic-oxaloacetate-transaminase (GOT) and glutamic-pyruvate-transaminase (GPT) values were not significantly affected by treatments. These results indicated that supplementing yeast or selenized yeast to lactating buffaloes' rations were not affecting on liver activity or animals health.

The concentration of Se in serum at calving and until 28 day in milk was about 1.4 times greater for cows fed selenized yeast (0.3 mg Se/kg DM) than for those fed sodium selenate (0.3 mg Se/kg DM) (Weiss and Hogan, 2005).

CONCLUSION

It could be concluded that supplementing buffaloes' ration with the proposed of yeast or selenized yeast improved rumen fermentation and nutrients digestibility coefficients. Also, yeasts supplementation improved feed efficiency, milk production and composition with no deleterious effect on general health of the treated animals as compared to animals fed the control ration. Milk supported with selenium can protect humans against cancer. Although inorganic selenium in the diets was enough, lactating buffaloes have a positive response to organic selenium supplementation.

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تأثير إضافة الخميره أو الخميره المدعمة بالسيلينيوم إلى العلائق على الأداء الإنتاجي للجاموس الحلاب

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أجريت تجربتين فى هذه الدراسة: فى التجربة الأولى تم استخدام ثلاثة ذكور ماعز بلدى مخصية لدراسة تأثير إضافة الخميرة أو خميرة السيلينيوم على نشاط الكرش باستخدام نظام المربع اللاتينى ٣x٣ حيث تغذت الحيوانات على العلائق التالية:

١- المجموعة الأولى (المقارنة): علف مركز ٥٠% + برسيم أخضر ٥٠%.

٢- المجموعة الثانية: عليقه المقارنة + ٥ جم خميرة/ رأس/يوم.

٣- المجموعة الثالثة: عليقه المقارنة + ٥ جم خميرة مدعمة بالسيلينيوم/ رأس/يوم.

وكانت أهم النتائج المتحصل عليها ارتفاع تركيز كل من النيتروجين الكلى والبروتين الحقيقى معنويا والنيتروجين الغير بروتينى بإضافة الخمائر بينما لم يتأثر تركيز الأمونيا و الأحماض العضوية الطيارة فى الكرش بالمعاملات.

وفى التجربة الثانية تم استخدام ١٥ جاموسة حلابة لدراسة تأثير إضافة الخميرة أو خميرة السيلينيوم على الأداء الإنتاجي للجاموس الحلاب. حيث قسمت الحيوانات آلي ثلاثة مجموعات باستخدام نظام القطاعات العشوائية الكاملة حيث تغذت الحيوانات على العلائق التالية:

٤- المجموعة الأولى (المقارنة): علف مركز ٦٠% + برسيم أخضر ٢٠% + قش أرز ٢٠%.

٥- المجموعة الثانية: عليقه المقارنة +١٠ جم خميرة/ رأس/يوم.

٦- المجموعة الثالثة: عليقه المقارنة +١٠ جم خميرة مدعمة بالسيلينيوم/ رأس/يوم.

وكانت أهم النتائج المتحصل عليها كما يلى:

١- ارتفع معامل الهضم معنويا (٥%) لكل من المادة العضوية والبروتين الخام والألياف الخام والمستخلص الخالى من النيتروجين كما ارتفع كل من المادة الجافة الدهن الخام للمجاميع التى تغذت على كلا نوعى الخمائر مقارنة بالمجموعة المقارنة.

٢- ارتفع إنتاج اللبن معنويا (٥%) بإضافة نوعى الخمائر ونتيجة لذلك ارتفع محصول كل مكونات اللبن بإضافة نوعى الخمائر مقارنة بالمجموعة المقارنة. كما ارتفعت نسبة بروتين ولاكتوز اللبن معنويا (٥%) بإضافة خميرة السيلينيوم تبعتها إضافة الخميرة مقارنة بالمجموعة المقارنة. كما ارتفع دهن اللبن بإضافة الخمائر بينما ل(٥%) بإضافة مكونات اللبن معنويا بإضافة الخمائر. كما ارتفع معدل الاستفادة من الغذاء معنويا (٥%) بإضافة نوعى الخمائر مقارنة بالمجموعة المقارنة.

٣- ارتفع جلوكوز الدم والبيومين الدم معنويا (٥%) بإضافة الخمائر لعلائق الجاموس الحلاب بينما لم يتأثر تركيز باقى مكنات اللبن معنويا بالمعاملات.

ومن هذه النتائج يتضح أن إضافة الخميرة عامة قد حسن من إنتاج اللبن وتركيبة إلا أن إضافة السيلينيوم العضوى إلى علائق الجاموس الحلاب قد اثر ايجابيا على محتوى اللبن الناتج من السيلينيوم مما يؤدى إلى حماية المستهلك من بعض الأمراض السرطانية. ولذلك يوصى بإضافة خميرة السيلينيوم لتدعيم نقص الاستفادة من السيلينيوم فى أغذية الحيوانات الحلابة دون التأثير على صحة الحيوان.