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NATURAL SAPONIN PLANT EXTRACT WITHOUT OR WITH FRESH BAKER'S YEAST IN LACTATING BUFFALOE COWS RATIONS IMPACT ON NUTRIENTS DIGESTIBILITY, MILK PRODUCTION, COMPOSITION, AND SOME BLOOD SERUM PARAMETERS.

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ABSTRACT

In a trial lasted for 90 days to assess the impacts of ration supplementation with saponin containing plant extract (defaunator) (SCPE) without or with fresh baker's yeast culture *Saccharomyces cerevisia*e (Probiotic) (FSCYC) as feed additives to enhance rumen fermentation in lactating buffalo cow. Twenty lactating buffalo cows of an average weight of 591 Kg were allotted to four groups of five animals each according to age and assigned at random to receive one of four dietary treatments. The treatments were: T1, (Control) received the Basal ration BR that consists of concentrate feed mixture: Egyptian berseem: rice straw (50:25:25 %, on dry matter basis), T2, received the BR plus 800 mg. saponin from the SCPE, T3, received the BR plus 800 mg saponin plus 10 gm's FSCYC, and T4 received the BR plus 800 mg saponin plus 20 gm's of FSCYC respectively. Results of ration supplementation of saponin without or with 10 or 20 gm's FSCYC treatments T2, T3, and T4 increased ($P<0.05$) nutrients digestibility, milk yield, milk protein, fat, lactose, total solids and solids not fat contents. Additives supplementation also increased blood serum total proteins, albumin (A) and globulin (G); however it decreased ($P<0.05$) A/G ratio, cholesterol and GPT. Treatment (T4) exhibited the highest ($P<0.05$) nutrients digestibility coefficients, milk yield, milk constituents, protein and fat, and blood serum proteins, albumin and globulin, but the lowest ($P<0.01$) blood serum urea, cholesterol, GOT and GPT wre obtained the treatment T4. It could be concluded that ration supplementation with SCPE plus 10 or 20 gm's of FSCYC for lactating buffalo cows (especially T4) had beneficial effects on their productive performance with normal physiologic responses of the cows.

Key words: fresh baker's saccharomyces cerevicia yeast, natural saponin plant extract, lactating buffaloes, nutrients digestibility, milk yield, constituents, blood serum.

INTRODUCTION

It has been reported that the elimination of the rumen protozoa population (defaunation) lead to improved animal performance (Leng, 1990). Although, these microorganisms contribute to fiber digestion, they increase the availability of energetic substrates for the animal. Nevertheless, it has been shown that protozoa prey upon bacteria (200 cells/minute or 1% bacteria/minute) and that they are preferred retain in the rumen (Weller and Pilgrim 1974; Coleman, 1975).

As a result of protozoa activity, a significant reduction in the flow of microbial biomass to the small intestine has been documented (Bird and Leng, 1978; Bird *et al*., 1979; Hsu *et al*., 1991). Independent of the diet offered, a consistent effect of elimination of protozoa is a larger availability of

amino acids for absorption at the small intestine, amino acids of bacterial (Ushida *et al*.,1988) and sometimes dietary origin (Michalowsky, 1988).

There are however, no commercial alternatives to defaunate ruminants at the farm level. In this sense, tropical plants with high or medium content of secondary compound may be an alternative to eliminate protozoa from the rumen. Among these modifying compounds are the saponin and condensed tannins, which have been shown to exert a specific effect against rumen protozoa while the rest of the rumen biomass remains unaltered (Lu and Jorgensen, 1987; Getachew *et al*., 2000; Wang *et al*., 2000).

Wina *et al*. (2003) evaluated the effect of saponin containing plant materials such as Morinda citrifolia (fruit), Nothopanax scutellarium (leaves), Sesbania sesban (leaves) and Sapindus rarak (fruit) on in vitro fermentation and found that gas production, short chain fatty acids, acetate: propionate ratio and protozoa population were the lowest in treatment of Sapindus rarak and concluded that this saponin rich plant has a potential as a natural defaunating agent. Moreover, in vitro fermentation, supplementation with Sapindus saponaria can decrease protozoa count (by 54%) and daily methane release (by 20%) relative to the control, without saponin content, (Hess *et al*., 2003).

Plant saponin natural extract which has been classified as a natural feed flavoring material (Valdez *et al*., 1986) has also been evaluated for its anti-microbial effect and its potential to modulate rumen fermentation and improve nutrient utilization in ruminants, (Benchaar, 2006).

Wina *et al*., (2006) reported that protozoal counts were decreased only in the long-term trial with sheep, using saponins from different plant sources.

Probiotics are live microbial cultures fed to animals to alter the balance of intestinal organisms in a beneficial way. Yeast Culture is a live culture of yeast (a fungi) and the media on which it was grown and dried so as to preserve the yeast's fermenting capacity.

The main effect of yeast culture is to stabilize the rumen environment (Hutjens 2005). Yeasts are known 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 are able to maintain their metabolic activities under anaerobic conditions, and exposure to low pH (Dawson, 1992).

Inclusion of yeast culture (*Saccharomyces cerevisiae*) in the diets of ruminants has been shown to increase nutrient digestibilities (Dawson,1993, El-Waziry *et al*., 2000, El-Ashry *et al*., 2001, El-Talty, 2001, and Marghany *et al*., 2006), shift bacterial populations (Harris *et al*., 1988), increase the number of rumen bacteria (Williams, 1988, Dawson 1993, and Edwards *et al*., 1991), alter the flow of nitrogen fractions to the duodenum (Erasmus *et al*., 1992, and Harrison *et al* 1988), and increase milk yield (El-Ashry *et al*., 2001, and Marghany *et al*., 2006).

Moreover benefits of supplementing ruminant rations with SCYC are: neutralization of certain bacterial toxins (Castagliuolo *et al*., 1999), adherence of flagellate bacteria, due to the presence of mannose receptors, allow

pathogens to be eliminated by feces (Czerucka and Rampal 2002). Moreover, lactic bacteria, a beneficial flora, are increased, reinforcement of mucosal integrity and intestinal cells. Also, live yeasts have a documented efficacy on intestinal villi height and crypt depth, enhancing the assimilation of nutrients, and enhance modulation of the immune system by stimulation of Ig-A response to pathogens (Qamar *et al*., 2001, Cheeke and Otero (2005).

Therefore, the present experiment aimed to evaluate the effects of saponin and glyco components containing extract SCPE (as defaunator), (natural liquid saponin extract as 50: 50 (v/v) mixture from *Yucca Shidigera* and *Quillaja Saponaria*), alone, and its combined effects with two levels of the fresh *Saccharomyces cerevisiae* yeast culture FSCYC (as a probiotic) on feed intake, nutrients digestibility, milk production, constituents, and some blood serum parameters using lactating buffalo cows.

MATERIALS AND METHODS

This study was conducted at the Agricultural Experiment Farm Station in Shalakan , at Kaluobeia Provence which belongs to The Faculty of Agriculture, Ain Shams University. Cairo, Egypt.

Animals and feeding: Twenty lactating buffaloes, in their 4^{lh} or $5^{TH.}$ lactation seasons were used in 90 days trial started after two weeks of parturition. Buffalo cows were allotted to four groups of five animals each according to age and assigned at random to receive one of four dietary treatments supplemented with saponin (the steroid or triterpene glycoside as defaunator) with its companion glyco component (ammonia binder) from a saponin containin natural plant extract SCPE without or with the additive Fresh baker's *Saccharomyces cerevisiae* yeast culture FSCYC. The Fresh SCYC containing total cell count of $2.5\text{-}2.7\times10^{10}$ and viable cell count of $1.3\times10^{9}\text{-}2\times10^{10}$ per gram (Grand Cairo Bakeries Company, Yeast Factory , Alsalam City, Cairo, Egypt. The second additive the liquid saponin containing plant extract SCPE was a 50:50 (v/v) mixture of Yucca and Quillaja desert plants concentrated liquid extracts from Nor-Feed, Denmark.

The experimental treatments were: (TI) -The control group which received the basal ration BR, that consisted of concentrate feed mixture (CFM) : Egyptian berseem (EB) : rice straw (RS); (50: 25 : 25 %, dry matter basis). (T2) received the BR+ 800 mg saponin ; (T3) - received the BR +10gm's FSCYC+800 mg saponin and, (T4) which received the BR+ 20 gm's FSCYC+800 mg saponin. The CFM consisted of 25% undecorticated cotton seed cake, 35%. wheat bran, 30% com, 3% rice bran, 3% molasses, 2% limestone, 1 % urea and 1% salt (Na CI).

The natural extracts, from the desert plants Mohave Yucca or Quillaja Saponaria, which contain saponins (defaunator) and glyco components (ammonia binder), have been classified as food grade materials and natural feed flavoring materials which are of course non-toxic and highly biodegradable, Valdez *et al*., (1986). This extract has long been used by the health foods industry in the USA as a healthy nutrient supplement product. The extract is approved for use in food and beverages by the FDA under CFR 172.510, FEMA number 3121. In the beverage industry, it is used to

prepare root beer, slush products, frozen carbonated beverages, beer, and juice.

The animals were hand- milked twice daily at 6.00 am and 16.00 pm., while milk samples were collected once biweekly for 90 days. Milk yield was recorded individually and milk samples were analyzed for percentages of fat, total solids (TS), solids-not fat (SNF), total proteins (TP), pH, acidity, and ash (Ling, 1963); lactose (Barnett and Abd El-Tawab, 1957).

The chemical composition of the ration ingredients is shown in Table (1).

Table (1): The experimental feed ingredients (Concentrate feed mixture CFM, Egyptian Berseem forage, Rice straw, (RS), and the fresh *Saccharomyces cerevisia* yeast culture (FSCYC) and the basal diet nutrients content.

Item	Dry matter (DM)	Organic matter (OM)	Ash	Crude protein (CP)	Crude fiber (CF)	Ether Extract (EE)	Nitrogen free extract (NFE)
CFM[1]	92.6	90.1	9.9	14.1	13.4	2.7	59.9
Egyptian Berseem	12.3	88.2	11.8	13.8	27.3	2.6	46.9
Rice Straw	94.53	83.39	16.6	3.5	31.5	1.5	40.1
FSCYC	29.0	92.6	7.4	44.3	6.5	3.0	38.8
Basal ration[2]	92.95	88.719	11.281	18.031	20.044	2.226	48.418
T2	92.95	88.719	11.281	18.031	20.044	2.226	48.418
T3	95.85	90.41	11.50	19.23	20.25	2.31	49.54
T4	95.95	94.09	11.71	20.60	20.32	2.39	50.67

[1]CFM=Concentrate feed mixture. [2] Calculated chemical composition.

Management: Amounts of daily feeds were assessed to cover the maintenance and the production requirements (Shehata, 1970). 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, 15.00 and 21.00 hr. after the animals were allowed to drink fresh water at 7.00, 14.00 hr. and at 20.00 hr. The daily supplementary yeast was mixed with CFM twice daily just before feeding to ensure that each animal had consumed its own supplement. Saponin containing liquor doses were dissolved in drinking water for the specific groups (T2, T3 and T4) in the drinking pool at times of water drinking. The treatments were begun after 2 wk's after calving and extended till 90 days.

Feed and milk sampling and chemical analysis: Samples of CFM, Egyptian Berseem, Rice Straw and Fresh baker's yeast were analyzed for dry matter (OM), 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.

Sampling and analysis of blood serum: Blood samples were withdrawn from the jugular vein from each animal 4 hours (hrs.) post morning feeding (pmf.) in the same day of milk sample collection. Collected blood samples were centrifuged at 4000 r.p.m. for 20 min. and the blood serum was stored in clean glass vials at -20°C till analysis. Serum total proteins were

determined as described by Armstrong and Carr (1964), albumin (Doumas *et al*., 1971), urea (Patton and Crouch, 1977), and creatinine was determined according to Husdan (1968), transaminases (GOT and ,GPT) activities (Reitman and Frankel, 1957), cholesterol (Kostner et aI., 1979). Globulin and albumin/globulin ratio (A/G) were calculated.

Digestibility trials: Trial experimental periods were setup into three phases representing the first, second and third month's of lactation study. By the end of each of the three months of the experimental periods, three animals from each experimental group were used in the digestibility trial. Feces was hand collected at 10.00 a. m. employing and following the Grab sample method for three successive days from each animal. The acid insoluble ash as internal marker was measured for determining the digestibility (Van Keulen and Young, 1977). Proximate chemical analysis was carried out according to the A. O. A. C. (1995) procedures, which were employed for the digestibility coefficients of studied nutrients calculations according to Maynard and Loosli, (1957).

Statistical analysis: Statistica analysys was performed using the least square methods described by Snedecor and Cochran (1982). Significant differences among means were tested between treatments within each treatment using Duncan's new multiple range test was used to test the differences among means (Duncan, 1955). The General linear models (GLM) procedures of S A S (Statistical Analysis Systems, 1998) were used.

RESULTS AND DISCUSSION

Dry matter intake and digestibility coefficients:

Feed intake, and nutrients digestibility coefficients for tested rations with lactating buffaloes are presented in Table (2).

Table (2): Mean values of live body weight, dry matter intake (DMI), nutrients digestibility, (%) of the experimental rations fed to lactating buffalo cows.[1]

ITEM	Experimental rations				
	Control T1	T1+SCPE T2	T1 + SCPE+ 10 g FSCYC T3	T1 +SCPE+ 20 g FSCYC T4	± SE
LBWT (Kg)	**593**	**592**	**585**	**595**	
DM intake:					
Total DMI(Kg/head/day)	15.40	15.32	15.28	15.24	
Total DMI as % LBWT	2.59	2.59	2.60	2.56	
From CFM	7.70	7.66	7.64	7.62	
From berseem	3.85	3.83	3.82	3.81	
From rice straw	3.85	3.83	3.82	3.81	
NUTRIENTS DIGESTIBILITY, (%):					
Dry matter	66.60^{d}	68.38^{c}	73.25^{b}	75.65^{a}	0.109
Organic matter	69.33^{d}	73.10^{c}	77.35^{b}	79.38^{a}	0.134
Crude protein	71.19^{d}	73.65^{c}	75.24^{b}	77.09^{a}	0.132
Crude fiber	58.49^{d}	60.60^{c}	66.14^{b}	70.65^{a}	0.040
Ether Extract	77.01^{d}	79.18^{c}	80.85^{b}	82.90^{a}	0.240
Nitrogen free extract	64.08^{d}	66.00^{c}	67.70^{b}	69.95^{a}	0.099
TDN	59.67	61.35	65.59	69.79	
DCP	13.52	13.52	15.17	15.24	

[1]Each value is a mean of 27 samples from 3 animals;
SE= Standard error of means; CFM=Concentrate feed mixture;
[a, b, c, d] Values in the same raw with different superscripts differ (P<0.05) significantly.

Averages of feed DM intake values ranged between 15.40 and 15.24 kg/day. The dry matter intake tended to decrease significantly (P>0.05) by the addition of SCPE (T2) and yeast culture with saponin (T3 & T4). Digestibility coefficients of dry matter and organic matter increased significantly as SCPE liquor (at 800 mg) without or with FSCYC were added at 10 or 20 g/d/head as compared by the control group.

The Increase in DM & OM digestibility may be due to the stimulation of rumen cellulolytic bacteria by yeast addition (El-Ashry *et al*., 2001, El-Saadany *et al*., 2002, Abdel-Khalek *et al*., 2002, Hutjens 2005) and this might be attributed to the improvement of crude protein digestibility, due to suppression or elimination of protozoa and ammonia utilization as an effect of saponin with its accompanying glyco- components effects, (Benchaar, 2006; Lovett *et al*., 2006, Wina *et al*., 2006, Hutjens, 2005 and Wallace, 2007). Dann *et al*., (2000) and Robinson and Garrett,(1999) have reported significant increases in dry matter intake when yeast culture was fed to transition cows, resulting in higher milk yields and less weight loss postpartum. A reduction in rumen lactic acid concentrations has also been reported (Williams, 1989). Thalib, *et al*., (2001) reported that using probiotics improved the positive effects of defaunation on animal performance in which the performance of the treatment groups were significantly higher than the control treatment, when they used commercial probiotics (micro Bio, cellulolytic cocci, and rods) and a defaunator consisted of the extracted saponin from Sapindus rarak fruit with methanol.

Crude protein digestion results pointed out to an improvement (P<O.05) as the saponin and the saponin with FSCYC were added at 10 0r 20 g /h/d. Erasmus *et al*. (1992) and EL-Waziry et at. (2000) found that CP digestibility was significantly increased with yeast culture supplement. Wohlt *et al*,. (1998) and Wiedmeier *et al*. (1987) reported that significantly higher CP digestibility in dairy cattle was obtained by the addition of yeast culture to their rations.

The improvement of protein digestibility may be due to the increase of microbial protein production and the reduction in NH3-N production (Pen *et al*., 2006), stimulation of rumen proteolytic bacteria (Williams, 1989,. Newbold 1990 and Allam *et al*., 2001) and/or may be due to increased degradation of protein and the flow of microbial nitrogen to the intestines, (Wiedmeier *et al*.,1987).

Also as a result of saponin plant extract antimicrobial effects in elimination or reduction of protozoa numbers and count in the rumen (Benchaar, 2006; Lovett *et al*., 2006, Wina *et al*., 2006, Hutjens, 2005), that prey upon bacteria (200 cells/minute or 1% bacteria/minute), they are preferred retained in the rumen (Weller and Pilgrim 1974; Coleman, 1975). As a result of protozoa activity, a significant reduction in the flow of microbial biomass to the small intestine has been documented (Bird and Leng, 1978; Bird *et al*., 1979; Hsu *et al*., 1991).

Crude fiber digestibility increased significantly (P<0.05) as a result for the addition of saponin and fresh yeast culture (T2, T3, and T4) compared with T1. The improvement of crude fiber may be due to increasing the number of rumen cellulolytic bacteria by saponin and yeast addition (WIliams,

1989, Newbold, *et al*., 1990, and Allam *et al*., 2001, and it provides stimulatory factors to rumen bacteria (Piva *et al*., 1993, Putnam *et al*., 1997, and Wohlt *et al*., 1998). Ether extract and nitrogen free extract digestibility were increased significantly (P<0.05) by the addition of yeast. The increase in EE & NFE digestibility (P<O.05) in response to saponin and SCYC treatment (T2, T3, and T4) may be due to the increased energy utilization (instead of being lost as methane, CO2, or lactic acid , which might be saved as a cause of the additives effects on rumen medium and microflora) as indicated by the increase in the propionic acid in rumen (Wiedmeier *et al*., 1987, Harris and Lobo, 1988, Williams, 1989, Wohlt *et al*., 1998) or to the observed improvement of the digestibility of most nutrients (Robinson, 1997 and Al-Dabeeb and Ahmed. 2002).

Milk production and composition:

The effect of saponin wihtout or with FSCYC supplementation on of milk composition and acidity (%) are presented in Table (3).

Table (3): Effect of experimental rations on milk yield (Kg/d) and constituents of lactating buffalo cows.[1].

Item	Experimental rations			
	Control (Cont.) No Supplement. T1	Cont.+SCPE 0 FSCYC T2	Cont.+SCPE+ 10 g FSCYC T3	Cont.+SCPE+ 20 g FSCYC T4
Total solids, %,				
1st. month	16.06^{d}+0.15	16.81^{c}+0.17	17.18^{b}+0.17	17.59^{a}+0.16
2nd. Month	16.07+0.15	16.41+0.15	17.09+0.13	17.47+0.13
3rd. month	16.54+0.11	16.67+0.10	17.34+0.11	17.56+0.11
Overall mean TS, %	16.29^{d}±0.078	16.63^{c}±0.081	17.23^{b}±0.079	17.54^{a}±0.079
Solids not Fat, % ,				
1st. month	9.53^{c}+0.11	9.88^{b}+0.13	10.06^{b}+0.13	10.22^{a}+0.13
2nd. Month	9.37+0.11	9.93+0.11	10.04+0.10	10.62+0.10
3rd. month	9.79+0.09	9.92+0.08	10.06+0.08	10.40+0.08
Overall mean SNF, %	9.61^{c}±0.061	9.92^{b}±0.063	10.06^{b}±0.02	10.44^{a}±0.062
Fat, %,				
1st. month	6.82^{b}+0.03	7.39^{a}+0.03	7.46^{a}+0.03	7.43^{a}+0.03
2nd. Month	6.84+0.03	7.51+0.03	7.53+0.02	7.50+0.02
3rd. month	6.76+0.02	7.39+0.02	7.42+0.02	7.44+0.02
Overall mean Fat, %	6.80^{b}±0.016	7.42^{a}±0.017	7.46^{a}±0.017	7.46^{a}±0.017
Protein, %,				
1st. month	3.89^{c}+0.06	3.93^{c}+0.07	4.62^{b}+0.07	4.71^{a}+0.07
2nd. Month	3.86+0.06	3.95+0.06	4.52+0.05	4.75+0.05
3rd. month	3.91+0.05	3.93+0.04	4.39+0.05	4.85+0.05
Overall mean Protein, %	3.89^{c}±0.036	3.94^{c}±0.037	4.48^{b}±0.037	4.79^{a}±0.037
Lactose, % ,				
1st. month	4.65^{d}+0.05	4.78^{c}+0.06	4.95^{b}+0.06	5.23^{a}+0.06
2nd. Month	4.66+0.05	4.80+0.05	4.97+0.05	5.27+0.05
3rd. month	4.70+0.04	4.81+0.04	5.00+0.04	5.16+0.04
Overall mean Lactose, %	4.68^{d}±0.031	4.80^{c}±0.032	4.99^{b}±0.031	5.22^{a}±0.031
Ash, % ,				
1st. month	0.717^{c}+0.002	0.724^{b}+0.002	0.728^{b}+0.003	0.735^{a}+0.003
2nd. Month	0.708+0.002	0.722+0.002	0.726+0.002	0.738+0.002
3rd. month	0.710+0.002	0.719+0.002	0.719+0.002	0.731+0.002
Overall mean Ash, %	0.712^{c}±0.002	o.722^{b}±0.002	0.724^{b}±0.002	0.734^{a}±0.002
Acidity, % ,				
1st. month	0.173^{c}+0.001	0.175^{c}+0.001	0.176^{ab}+0.001	0.177^{a}+0.001
2nd. Month	0.171+0.001	0.174+0.001	0.174+0.001	0.175+0.001
3rd. month	0.171+0.001	0.172+0.001	0.174+0.001	0.175+0.001
Overall mean Acidity, %	0.172^{c}±0.0003	0.174^{b}±0.0004	0.175^{ab}±0.0004	0.176^{a}±0.0004

[1]Each value is the mean of 30 combined samples from 5 animals for each treatment.
[A,b,c,d]Means in the same raw with different superscripts differ (P<0.05) significantly.

Total solids (TS) % content was higher (P<0.05) for T4 than T3, T2, and the control which was the lowest (P<0.05) as the level of yeast increased, which agree with that results reported by Allam *et al*., (2001) and EL-Ashry *et al*., (2001).

Solids-not fat (SNF) %, and ash % for T4 followed a trend being higher (P<0.05) than both T3, T2, where all supplemented treatment were higher (P<0.05) than the control.

Fat content, %, did not differ significantly for supplemented treatments, however , all of T4, T3, and T2 were higher (P<0.05) than the control, that agrees with Jin *et al*., (2007) findings. Also, these responses, for the treatment groups, might be a result of increased utilization of saved energy and protein because of the saponin and yeast additives effects on ruminal protozoa (defaunation), methanogenes suppression, and the activation of hydrogen and lactic acid utilizing bacteria, and enhancement of other bacteria genera for multiplication and producing more microbial protein, (Benchaar, 2006).

Milk protein content, %, was the highest (P<0.05) for T4, followed by T3, where both were higher than T2 which didn't differ from the control group. Which might be a result of the combined addition for saponin +FSCYC which might helped utilizing the microbial protein escaped from being consumed by protozoa (Benchaar, 2006; Pen *et al*., 2006, Agrawal *et al*., 2006) that might be reduced or eliminated by saponin supplementation in T4 and T3 and utilizing ruminal ammonia saved from being converted to urea (Table 5), (Thalib *et al*., 2001; Hutjens, 2005; Pen *et al*., 2006). Improvement of milk protein and fat content may be due to the stimulation of the rumen microbes multiplication, which cause a change in microbial protein synthesis lead to an increased postruminal protein passage and lead to an increased milk protein yield, as explained by Dawson (1993) and that the Supplementation with FSCYC might supply some stimulatory factors to rumen cellulolytic bacteria (Putn. al., 1997; Wohlt *et al*.,1998 and Allam *et al*.,2001). Results reflected that milk acidity (%) insignificantly increasedvfor treatment rations than the control one , which agree with the results obtained by Dawson, (1993) and EL-Ashry *et al*. (2001).

Milk production and components yields are presented in Table (4).

Results of Milk yield and milk constituents (Table 3) reflected an increase for all parameters studied (P<0.05) as saponin without or with FSCYC (T2, T3, and T4) was added to T3 or T4 as compared to the control group during trial different periods. The 4% Fat corrected-milk daily yield, total solids and fat yields were significantly (P<0.05) increased for groups T4, T3 and T2 repectively, than those values for the control group during the 3 pahases of the trial. These results are in accordance with those reported on animals fed diets supplemented with, SCYC (Piva *et al*.,1993, Robinson and Garrett,(1999), Dann *et al*., (2000), Allam *et al*. (2001), EL-Ashry *et al*., (2001), and Jin *et al*., (2007). The T4 ration group produced more milk yield with higher (P<0.05) total protein, solids not fat and lactose yields than other treatments. Results which are in accordance with those reported by Wohlt *et al*. (1991), Kobayasli *et al*. (1995), Putnam *et al*. (1997) and EL-Ashry *et al*. (2001). Hutjens, (1991) reported that utilization of yeast by cows lead to

increased milk production averaged 25.1 kg of 4% FCM compared to control cows at 23.5 kg. The increase in milk total solids yield exhibits positive improvement which is very important to milk and cheese industry.

Table (4): Impact of SCPE without or with FSCYC supplementation on lactating buffalo's milk yield and constituents[1].

ITEM		Experimental rations				
		Control T1	T1+SCPE T2	T1+SCPE+ 10 g FSCYC T3	T1+SCPE+ 20 g SCYC T4	± SE
Total milk yield, Kg/d:						
	1 ST. month	6.96^{d}	7.49^{c}	7.79^{b}	8.35^{a}	0.056
	2 nd. month	7.00	7.59	7.86	8.45	0.056
	3 rd. month	7.1	7.63	8.77	8.48	0.056
Overall mean		7.01^{d}	7.57^{c}	8.14^{b}	8.43^{a}	0.032
Fat yield, g/d:						
	1 ST. month	472.18^{d}	553.2^{c}	581.6^{b}	619.6^{a}	4.312
	2 nd. month	480.8	570.2	593.6	635.3	4.312
	3 rd. month	476.5	563.3	648.0	632.9	4.312
Overall mean		476.48^{d}	562.21^{c}	607.74^{b}	629.24^{a}	2.489
4 % Fat corrected milk yield, Kg/d:						
	1 ST. month	9.9^{d}	11.3^{c}	11.8^{b}	12.6^{a}	0.086
	2 nd. month	10.0	11.6	12.0	12.9	0.086
	3 rd. month	10.0	11.5	13.2	12.9	0.086
Overall mean		9.95^{d}	11.46c	12.37^{b}	12.81^{a}	0.049
Total solids yield, g/d:						
	1 ST. month	1134.2^{d}	1247.3^{c}	1340.0^{b}	1465.9^{a}	11.74
	2 nd. month	1111.8	1247.9	1335.8	1464.8	11.74
	3 rd. month	1180.5	1283.8	1533.5	1503.7	11.74
Overall mean		1142.2^{d}	1259.7^{c}	1403.32^{b}	1478.13^{a}	
Solids not fat yield, g/d:						
	1 ST. month	645.4^{d}	740.7^{c}	784.8^{b}	853.1^{a}	7.57
	2 nd. month	642.5	752.3	789.2	895.9	7.57
	3 rd. month	702.9	761.3	882.5	891.1	7.57
Overall mean		673.6^{d}	7514^{c}	818.8^{b}	880.0^{a}	4.373
Total protein yield, g/d:						
	1 ST. month	269.5^{d}	293.2^{c}	346.8^{b}	397.3^{a}	6.01
	2 nd. month	270.1	298.9	353.3	405.7	6.01
	3 rd. month	279.8	302.7	395.1	408.5	6.01
Overall mean		273.1^{d}	298.3^{c}	365.1^{b}	403.8^{a}	3.470
Lactose yield, g/d:						
	1 ST. month	322.6^{d}	358.7^{c}	384.1^{b}	429.7^{a}	4.41
	2 nd. month	328.2	364.8	391.2	439.8	4.41
	3 rd. month	333.3	368.1	442.9	449.4	4.41
Overall mean		328.03^{d}	363.87^{c}	405.1^{b}	439.6^{a}	2.543
Ash yield, g/d:						
	1 ST. month	49.9^{d}	54.2^{c}	56.7^{b}	61.4^{a}	0.43
	2 nd. month	49.6	54.8	57.0	62.4	0.43
	3 rd. month	50.2	54.9	60.1	62.1	0.43
Overall mean		49.9^{d}	54.7^{c}	58.8^{b}	61.9^{a}	0.248

[1]Each value is the mean of 30 combined samples from 5 animals of each treatment.
[a, b, c, d] Means in the same raw with different superscripts differ (P<0.05) significantly.
4% FCM was calculated as⊗ 0.4×milk weight(Kg))+(15×fat weight(Kg)) , (Ensminger, 1978).

Blood serum parameters and physiological performance of buffalo cows:

Blood serum levels of total protein and albumin (g/dL) presented in table (5), showed that the total proteins values for the supplemented groups were higher (P<0.05) for T4 than T3 and T2 where also were which is higher (P<0.05) than the control which agree with El-Ashry *et al*., (1994), Soliman *et al*., (1997) and El-Ashry *et al*., (2001) findings, however our results contradict with those results reported by Piva *et al*., (1993) who found that blood plasma total proteins were adversely affected by adding yeast culture.

The control treatment group results values for blood serum parameters, A/g ratio, urea-N, creatinine, cholesteroland and GPT were higher (P<0.05) than the corresponding values in the treatments (T2, T3 and T4) throughout the periods of the experiment.

Results reflect that dietary treatments had no harmful effects but they were within the normal physiological levels. These results agree with the results of Soliman *et al*., (1997) and El-Ashry *et al*., (2001).

Blood serum level of urea nitrogen (mg/dL) and creatinine are presented in Table (5).

It was noticed that serum urea nitrogen values were decreased in the supplemented groups T2, T3, and T4, through the three experimental periods. Serum level of creatinine was lower in both T2 and T3 groups than other ones. These results indicate state of normal functioning of the kidneys.

Blood serum values of cholesterol (mg/dL) are presented in Table (5).

The present results revealed that cholesterol level was significantly (P<0.01) decreased in the supplemented treatments as an effect of saponin extract action which agree with a number of studies have shown that saponins from different sources lower serum cholesterol levels in a variety of animals including human subjects as reported by Southon *et al*. (1988); Harwood *et al*. (1993); Potter *et al*. 1993; Matsuura, (2001); Al-Habori and Raman, (1998).

On way for reduction of blood cholesterol is through the large mixed micelles formed by the interaction of saponins with bile acids account for their increased excretion when saponin-rich foods such as soyabean, lucerne and chickpea are consumed Oakenfull, (1986); Oakenfull and Sidhu, (1990). The resulting accelerated metabolism of cholesterol in the liver causes its serum levels to go down Francis *et al*., (2002) and Cheeke *et al*., (2006). Another way for decreasing cholesterol is through the decreased intestinal cholesterol absorption induced by some saponins, however, was seen to be without interference with the entero-hepatic bile acid recirculation (Harwood *et al*. 1993). Saponins also reduced the more harmful LDL- cholesterol selectively in the serum of rats, gerbils and human subjects (Potter *et al*. 1993; Harris *et al*. 1997; Matsuura, 2001).

Table (5): Effects of SCPE and FSCYC supplementation on some blood serum parameters[1].

Item	Experimental rations				
	Control , No Supplement. T1	Cont.+ SCPE 0 FSCYC, T2	Cont.+ SCPE+ 10 g FSCYC T3	Cont.+ SCPE+ 20 g FSCYC T4	± SE
T.Proteins, g/dL					
1st. month	7.18d	7.52c	7.66b	8.38a	0.072
2nd. Month	7.21	7.51	7.67	8.63	0.072
3rd. month	7.34	7.56	7.66	8.47	0.072
Overall mean	7.25c	7.53b	7.66b	8.5a	0.041
Albumin, g/dL					
1st. month	3.33c	3.51b	3.39c	3.82a	0.018
2nd. Month	3.28	3.46	3.43	3.83	0.018
3rd. month	3.39	3.41	3.45	3.85	0.018
Overall mean	3.34c	3.40b	3.42b	3.84a	0.010
Globulin, g/dL					
1st. month	3.85d	4.01c	4.27b	4.56a	0.068
2nd. Month	3.93	4.05	4.24	4.79	0.068
3rd. month	3.95	4.15	4.21	4.62	0.068
Overall mean	3.91d	4.07c	4.24b	4.66a	0.039
A/G Ratio,					
1st. month	0.87a	0.87a	0.79b	0.84ab	0.013
2nd. Month	0.83	0.85	0.80	0.79	0.013
3rd. month	0.85	0.82	0.81	0.84	0.013
Overall mean	0.85a	0.85a	0.81b	0.83ab	0.007
Urea-Nitrogen, mg/dL					
1st. month	36.97a	35.88b	34.69cd	34.83d	0.182
2nd. Month	36.68	35.77	34.50	34.88	0.203
3rd. month	35.96	35.59	34.46	34.83	0.181
Overall mean	36.53a	35.75b	34.35c	34.84d	0.107
Creatinine, mg/dL					
1st. month	1.19a	1.14b	1.11b	1.22a	0.115
2nd. Month	1.22	1.16	1.14	1.21	0.115
3rd. month	1.19	1.14	1.13	1.14	0.115
Overall mean	1.2a	1.15b	1.13b	1.19a	0.009
Cholesterol,mg/dL					
1st. month	153.6a	143.7b	144.6b	144.1b	1.488
2nd. Month	154.0	141.9	144.6	144.0	1.488
3rd. month	153.4	142.1	141.2	141.9	1.488
Overall mean	153.7a	142.6b	143.4b	143.3b	0.859
GOT, U/L					
1st. month	127.9bc	129.0b	132.8a	124.1d	1.559
2nd. Month	127.6	129.6	1.33.0	123.3	1.559
3rd. month	128.3	128.4	132.6	126.4	1.559
Overall mean	127.9bc	129.0b	132.8a	124.6d	0.908
GPT, U/L					
1st. month	53.95a	46.84b	37.10c	35.34c	1.196
2nd. Month	56.33	45.82	36.72	34.99	1.196
3rd. month	57.78	44.85	36.03	34.86	1.196
Overall mean	56.02a	45.8b	36.6c	35.1c	0.690

[1]Each value is the mean of 30 combined samples from 5 animals for each treatment.
[a,b,c,d]Means in the same raw with different superscripts differ (P<0.05) significantly.

Mean activity values of GOT in T4 was the lowest (P<0.05) while T3 was the highest (P<0.05). The GPT (U/L) results showed a decreasing trend with introducing additives to rations of the lactating buffaloes.

Results indicate no harmful effects for the saponin or the FSCYC additives on liver function of the supplementd animals (Comelius 1970) and that biosynthesis of albumin and globulin in the liver were normal. Physiological levels of blood serum parameters studied in this trial were within the normal range for blood constituents of buffaloes reported by El-Ashry *et al*., (1994) and El-Ashry, *et al*.,(2001).

The economic efficiency:

Table (6) shows the effect of supplementing lactating buffalo cows rations with saponin from SCPE and FSCYC on the economic efficiency expressed as price of milk per cost of feed consumed. The prices considered here were (CFM 1700 LE/ton, Egyptian berseem, 280 LE/ton; Rice straw, 350 LE/ton; FSCYC, 20 LE, and SCPE, $18.47/L). The results indicated that using the supplement of saponin, yeast and different combinations were better economically than control. The FSCYC supplemented groups were more beneficial than the control and the saponin only group. The T4 (saponin 800 mg+ 20g FSCYC) was the best and the superior (P<0.05) of all treatments.

The results revealed that the introduction of the additives to rations decreased the feed cost of 1 Kg milk produced and improved the economic efficiency by 54.6, 84.5, and 202.9 %. It is very important to notice that the increase of the milk total solids with the introduction of the additive in rations of lactating buffalo cows indicates to the efficiency of treatments in increasing the industrial value (cheese industry) as the net total solids yield increased with treatment with the study additive additives.

It could be concluded that the addition of saponin at 800 mg with 10 or 20 g FSCYC/h/d to the lactating buffalo cows, especially T4, is recommended for the improvement of nutrients digestibility, milk yield and the total solids components (which is very important to milk and chees industry) and the maximization of the economic return.

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تأثير مستخلص الصابونين النباتى الطبيعى بدون أو مع خميرة الخباز الطرية الطازجة فى علائق الجاموس الحلاب عل هضم العناصر الغذائية ، وإنتاج اللبن وتركيبه ، وعلى بعض عوامل سيرم الدم.

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فى تجربة إستمرت 90 يوما لتقدير أثار إستخدام مستخلص الصابونين النباتى الطبيعى بمفرده أو مع خميرة الخباز الطرية الطازجة فى علائق الجاموس الحلاب. إستخدم 20 جاموسة حلابة بمتوسط وزن حى 591 كجم. وزعت الحيوانات على 4 مجموعات من خمس حيوانات تبعا للعمر ثم وزعت عشوائيا على أربعة معاملات العلائق التجريبية. وكانت المعاملات التجريبية متمثلة فى: T1 مجموعة المقارنة وغذيت على العليقة الأساسية (تكونت من علف مركز مكعبات: برسيم مصرى:قش أرز بنسبة 25:25:50% على أساس المادة الجافة) ، T2 التى غذيت على العليقة الأساسية +800 ملليجرام (مجم) صابونين ، T3 التى غذيت على العليقة الأساسية + 800 مجم صابونين+10 جم خميرة خباز طرية طازجة ، T4 التى غذيت على الأساسية +800 مجم صابونين+20 جم خميرة خباز طرية طازجة.

أظهرت النتائج أن إمداد الحيوانات بمستخلص االصابونين بدون أو مع 10 أو 20 جم من خميرة الخباز الطرية أدى إلى تحسن ($P<0.05$) معاملات هضم العناصر الغذائية ، محصول اللبن ، بروتين ودهن اللبن ، اللاكتوز ، الجوامد الكلية ، والجوامد غير الدهنية للمعاملات T2, T3, T4 مقابل مجموعة المقارنة. أدت الإضافات إلى زيادة ($P<0.05$) تركيز قياسات الدم: البروتين الكلى ، الألبيومين ، الجلوبيولين. وأدت إلى نقص ($P<0.05$) الكوليستيرول وا ل GPT .

أظهرت المعاملة الرابعة T4 أعلى ($P <0.05$) القيم لمعاملات هضم العناصر الغذائية ومحصول اللبن ومكوناته ، والبروتين والدهن، كما أنها أظهرت أعلى تركيز ($P<0.05$) لقياسات سيرم الدم : البروتين الكلى ، والألبيومين والجلوبيولين ، وأقل تركيز ($P<0.05$) لليوريا والكوليستيرول وال GPT وال GOT مقابل المجموعات الأخرى.

أظهرت المعاملة T2 (العليقة القاعدية+800 مجم صابونين) إستجابات أعلى ($P<0.0\%$) من المجموعة T1 المقارنة:لمعاملات الهضم ، محصول اللبن ومكوناته ، واللا كتوز وبروتينات البن والجوامد الكلية والجوامد اللادهنية ، ولكنها لازالت أقل ($P<0.0\%$) من قيم أداء المجموعات T3 , T4 .

تظهر الدراسة أن العلائق التى أغنيت بإضافة الصابونين مع 10 أو 20 جم خميرة الخباز الطرية الطازجة وخصوصا المجموعة الرابعة T4 والتى أعطت أعلى قيم هضم العناصر الغذائية وإنتاج اللبن وتركيبه مع عدم وجود أى آثار غير طبيعية أو مرضية كما ظهر من نتائج دراسة قياسات سيرم الدم.