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EFFECT OF DIETARY INCLUSION OF MONENSIN SODIUM OR PROBIOTIC IN NEONATAL BUFFALO CALVES

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ABSTRACT

The aim of the present investigation was carried out to study the effect of inclusion dried yeast culture and monensin sodium as dietary natural additives to manipulate of nutrient utilization, some rumen fermentation, blood constituents' parameter and animal performance in twenty one neonatal male buffalo calves (Bubalus bubalis) with average body weight (LBW) of 42.4±3.15 kg and one week of age were randomly assigned to one of three treatments (7 calves/each) in designed treatments consisted of basal diet fed milk as 10 % of body weight (control); 2nd group (YG) fed basal diet plus 10gm of yeast culture (strain 1026) and 3rd group (MG) fed basal diet plus 1mg of monensin sodium/kg BW/day for 105 days of age as experimental period.Results showed neonatal calves fed YG group were higher (P<0.05) in digestibility of DM, CP, CF, TDN%, DCP% and total VFA concentration.

In contrast, ruminal pH value was lower at 3hr after feeding as compared with other treatments. Nevertheless, rumen ammonia nitrogen concentration, propionate% and acetate to propionate showed a significantly increased (P<0.05) in MG group while, acetate% remained unaffected among treatments.On the contrary, butyrate% was significantly decreased (P<0.05) with YG and MG treatments compared to the control group. Plasma total protein and globulin were highly significant in YG and MG. However, AST and ALT activity decreased.No statistical significance differences between treatments in plasma albumin, A/G ratio, creatinine concentration, urea-nitrogen and immunoglobulins (IgG). While, daily weights gain, dry matter intake and feed conversion tended to be better in YG than the other groups.

In conclusion, previous findings suggested a potential for yeast culture affect could be more widely safely accepted and effectively replace of monsion as growth promoters supplementation in pre-weaning buffalo calves rations.

Key words:

Neonatal buffalo calves, *Saccharomyces cerevisiae*, monensin, growth performance, nutrient digestibility, rumen fermentation and blood constituents.

INTRODUCTION

Pre-weaning period is one of the most critical resistance life phases in ruminant and suffers from a lot of stressful condition that can be lead to increased health problems (i.e. diarrhea, bloat). So that, some of farm programmers suckling calve have been used antibiotic as growth promote which has been potential appearance of effective animal's production and improve efficiency by 2-16% as well as having disease control effects **(Ozsoy *et al.,* 2013).**

However, there are becoming negative effects of developing cross-resistance and multiple antibiotic resistances in pathogenic bacteria in both human and livestock **(Wierup, 2000)**.

Probioticsespecially yeast culture *(Saccharomycescerevisiae)*one of thepromising alternatives antibiotics which used to assist intestinal bacterial population establishment and antagonistic to harmful microbes, maintain the microbial balance, health improve and performance lymphoma of young calves **(Puniya *et al.*,2015).** Also**,**effectively colonize the gastrointestinal tract, inhibit pathogen proliferation, neutralize the enterotoxins and enhance immune function **(Tripathi and Karim, 2011).** Beside it is a rich source of enzymes, vitamins, other nutrients and important co-factors, have been reported to produce a variety of beneficial production responses, these include growth rate, feed intake, feed efficiency, milk composition, productionandreproduction in ruminants **(Calsamiglia *et al.*,2006)**. Furthermore, fed yeast can act modulator of immune responses and gut health status by lower diarrhea frequency in weaning calves and stimulate cellulolytic activity of fibrolytic bacteria in the rumen **(Jurkovich *et al.,* 2014).** On the other hand**,** Monensin sodium polyether highly lipophilic substances ionophore produced by a strain of *Streptomyces cinnamonensis*, one of the most commonly fed antimicrobials and feed additive used in beef cattle fed to improve manipulation energy metabolism and protein utilization performance in ruminal fermentation by control of gram positive bacteria activity to inhibit lactate and ammonia-producing ruminal bacteria **(Duffield *et al.,* 2012).** A reduction of population size and activity occurs in gram-positive bacteria groups, protozoa and fungi tend to be inhibited and prevention of coccidiosis, bloat control and control of acidosis **(Vosooghi-Poostindoz *et al.,* 2014).**

The question whether the probiotics can effectively replace antibiotic as growth promoters in such critical conditions is still open.

Therefore, the objective of this study was conducted to investigate the effect of dietary inclusion yeast culture and monsein sodium as alternative feed additives on quantify changes of pre - weaning buffalo calves productive performance and blood metabolites parameters.

MATERIAL AND METHODS

1.Animals, Diets and Management:

This experimental was carried out at Mahallet Mousa Experimental Farm Station, Kafer El-Sheikh Governorate, Animal Production Research Institute (APRI) Agricultural Research Centre, Ministry of Agriculture. Giza, Egypt. Twenty one of suckling male buffalo calves one week of age were removed from their dams after 3 days of birth (fed colostrums), then fed milk for 4 days and beginning at 8^{th} day up to 105 days of age. Calves were randomly assigned to one of three treatments approximately similar weight (LBW) an average of 42.4±3.15 kg (7calves/group). The experimental diets consisted of (basal diet) fed milk on 10 % of body weight (control ration); YG group fed basal diet supplemented with 10 gm yeast culture Yea-Sacc® 1026 containing a minimum of 5×10^9 colony forming units (CFU)/g *Saccharomyces cerevisiae* (strain 1026) obtained from Alltech Inc. (Nicholasville, KY, USA), and MG group fed basal diet plus 1 mg of monensin sodium /kg BW/day according to Australian Pesticides and VeterinaryMedicines Authority **(APVMA**) recommendations. Calves were housed individually in pens bedded with rice straw for all duration of the experimental. Fasting live body weight recorded in the morning to adapted feed intake and then weekly intervals until weaning time of each group. Yeast culture and monensin sodium supplemented individual hand-mixed buckets before milk meal and calves fed milk using teat feeder twice daily at 07:00 and 18:00 hr according to **Salama and Mohy El-Deen (1996).** Concentrate feed mixture (consisted of yellow corn 50%, barley 15%, soybean meal 25%, molasses 8 %, minerals mixture 0.50 %, limestone1.50 % and vitamin A D, E 0.20%) and berseem hay were offered *ad lib* as calf starter in their pens. Fresh water and mineral-vitamin mixture blocks were freely available throughout the feeding trial. Fasting body weight, daily DM intake (DMI) was estimated and average daily gains (ADG), total gain, feed conversion ratio (FCR) and feed efficiency were calculated.

2. Digestion trial:

Three calves from each group at the end of experimental diets were taken randomly to determine the digestibility and nutritive value by using acid insoluble ash (AIA) method as described by **Van Keulen and Young (1977)** and kept individually in metabolic cages allowing separate collection of feces. Feeding consumptions and rectum grabbed feces collection were practiced for 5 days. 10 % of feces sample treated with 10 ml sulfuric acid to prevent losses of ammonia and kept frozen at -18 °C for further chemical analyses.

3. Rumen liquor parameter

At the last day of the digestibility trial, rumen fluid samples collected individually from each group in the morning using a rubber stomach tube at zero, 3 and 6 hr after feeding for two consecutive days and strained through double layers of cheese clothes and directly pH values was measured using a portable pH meter with glass electrode (Microcomputer pH-vision model 6007 (JENCO). Filtered samples cooled in a special bag containing ice and transported to the laboratory into a closed test tube to immediately estimated ammonia-N (NH_3-N mg/100ml) concentration using the distillation method as described by **Conway (1957)**. Total volatile fatty acids (TVFA's ml eq/100ml) concentrations estimated according to **Warner, (1964);** and molar proportion of VFA's according to **(Erwin *et al.,* 1961).**

4. Feed sample collection and chemical analyses:

Faces and diets samples were collected and composited to determined dry matter (DM), crude protein (CP), ether extract (EE), crud fiber (CF), nitrogen-free extract (NFE) and ash according to **AOAC, (1990)** procedures. Neutral detergent fiber (NDF), acid detergent fiber (ADF) and (ADL) acid detergent lignin were estimated according to **Van Soest *et al.,* (1991).** Nutrient digestibility and nutritive values evaluation were calculated according to feed consumed and their chemical composition; the composed diets for comparable nutrients are presented in (Table 1). Milk samples were collected at the same time of milking experimental and kept at -20 °C to determine total solids, ash, total protein according to **Ling, (1963)** and lactose by **Barnett and Abd El-Tawab, (1957)** while, solid-not-fat (SNF) was calculated (Table 2).

Table (1): Chemical composition of experimental animal diets, buffalo milk, and berseem hay and calf starter.

Ingredients	Control	YG*	MG	BH	Calf starter
Moisture	8.50	8.74	8.15	10.6	9.95
Chemical composition (as DM basis %):					
CP	20.33	20.39	20.59	12.3	17.26
CF	7.45	7.78	7.94	28.5	8.74
EE	3.46	3.52	3.28	2.7	3.23
NFE	59.7	59.51	59.04	43.57	64.38
OM	90.94	91.2	90.85	87.07	93.61
Ash	9.06	8.8	9.15	12.93	6.39
ADF	14.87	15.19	15.58	28.96	14.55
ADL	6.39	6.4	6.19	7.58	5.54
NDF*	33.82	34.03	34.14	47.65	34.67
DE kcal/kg*	2.7	2.69	2.68	2.02	2.66
NFC%	33.33	33.26	32.84	24.42	38.45

*** YG = treatment with 10 g/calf/day Yea-Sacc® 1026, MG = treatment with 1mg/kg BW/day monensin sodium; the yeast culture Yea-Sacc® 1026 contained *SaccharomYGes cerevisiae* (strain 1026). Digestible Energy (DE) = 4.36- (0.049 X NDF %); Non-fibrous carbohydrates (NFC %) = 100- (%NDF+%CP+%EE+ %ash) according to NRC, (2001).**

Table (2): Milk composition throughout the experimental period (%).

Week	Fat	Protein	Lactose	Ash	Total solids	Solid not fat
2	6.20	4.30	5.00	0.40	15.90	9.70
4	7.13	4.36	4.80	0.45	16.74	9.61
6	5.62	3.95	5.19	0.56	15.32	9.70
8	5.74	3.84	4.97	0.64	15.19	9.45
10	7.63	4.33	4.65	0.66	17.27	9.64
12	7.32	4.37	5.14	0.56	17.39	10.07
14	6.73	4.38	4.96	0.28	16.35	9.62
Mean	6.62	4.22	4.96	0.51	16.31	9.68

3.6. Blood samples

Blood samples were drawn biweekly in the morning from jugular vein in heparinized test tubes before feeding throughout the experimental period, and immediately centrifuged at 4000 rpm for 15 minutes for separate plasma and then frozen at -20 °C until assayed.

Total protein and albumin were determined while, globulin concentration and albumin: globulin ratio calculated. AST, ALT, urea and creatinine evaluated by automated methods using commercial colorimetric test kits of Diamond Diagnostics Co., Egypt, Total immunoglobulin IGg quantify in plasma used the single radial immune diffusion technique (Bind ARID tm Binding site limited, Birmingham, UK) according to **Fahey and McKelvey, (1965)** method's.

3.7. Statistical Analysis:

Statistical analysis was carried out using the General Linear model (GLM) procedures of **SAS, (1999).** Differences between groups were evaluated by analysis of variance ANOVA using one way design according to the following model: $Yij=\mu+Ti + eij$;

where: Yij= observed values, μ= overall mean, Ti= experimental group and eij= Random error. Differences among means were tested using Duncan's multiple range tests **(Duncan,1955)**. The data presented as mean ± standard error (SEM). Level of significance was set at probability level ($P<0.05$)

RESULTS AND DISCUSSION

1. Feed intake, Nutrients Digestibility and Nutritive Values:

Results in (Table 3), indicated that the most nutrient digestibility percent of pre-weaning buffalo calves in yeast culture supplemented group was significantly higher ($P<0.05$) than other treatments**,**that is probably due to enhance yeast additive microbial activity and microbial growth by moderate ruminal pH and enhance degradability of ammonia utilization **(Chaucheyras-Durand *et al.,* 2008)**. Also, ability to alter enzyme activities in the gastrointestinal tract and stimulation effect on rumen proteolytic and cellulolytic bacteria lead to gut improvement through rumen maturity by favoring microbial establishment and increasing microbial population **(Yang *et al.,* 2004)**.Furthermore,*S.cerevisiae* provides stimulatory rumen microorganisms' growth factors (i.e., organic acids, B vitamins and amino acids) which utilize lactate and enhancement digest cellulose **(Calsamiglia *et al.,* 2006)**.

Table (3): Effect of fed experimental diets on daily dry matter intake, nutrient digestibility and nutritive values during feces grabbing period of suckling buffalo calves. (Mean ± SEM).

Item	Experimental Diets		
	control	SC	MG
Animal weight, kg	68.35 ±1.900	76.4 ±2.050	73.68 ±2.240
Body weight, kg $W^{0.75}$	23.77 ±0.250	26.34 ±0.260	25.15 ±0.310
DMI intake, kg/head/day			
Milk	0.51 ±0.048	0.52 ±0.035	0.515 ±0.042
Calf starter	0.609^{b} ±0.039	0.644^{a} ±0.040	0.595^{b} ±0.031
Berseem hay	0.23 ±0.012	0.229 ±0.021	0.211 ±0.019
Total DMI kg/head/day	1.349 ±0.260	1.393 ±0.190	1.321 ±0.220
Nutrient digestibility, %			
DM	65.41^{b} ±0.300	69.35^{a} ±0.620	63.18^{b} ±0.750
OM	67.23 ±0.590	72.16 ±0.840	66.73 ±0.600
CP	66.97^{b} ±0.780	71.43^{a} ±0.210	67.09^{b} ±0.810
CF	52.42^{b} ±1.200	58.22^{a} ±1.750	51.46^{b} ±1.650
EE	68.86 ±1.290	76.30 ±1.100	67.91 ±1.310
NFE	72.15 ±2.160	78.45 ±2.500	70.56 ±2.290
NDF	54.26 ±1.220	65.08 ±1.250	55.21 ± 0.970
ADF	40.6 ±0.940	48.32 ±1.370	39.55 ±0.850
ADL	12.9 ±0.120	17.24 ±0.080	13.5 ±0.150
Nutritive value			
TDN	62.98 ±0.690	68.46 ±0.490	61.79 ±0.320
DCP	13.62 ±0.250	14.56 ±0.190	13.81 ±0.220
TDN intake			
TDN (Kg) DM /head/day	0.849 ±0.041	0.954 ±0.029	0.816 ±0.037
TDN (Kg) /100kg BW	1.243 ±0.311	1.248 ±0.034	1.108 ±0.042
TDN(g) /kg $W^{0.75}$	35.74 ±1.090	36.21 ±1.480	32.45 ±0.970
DCP intake			
DCP(Kg) DM /head/day	0.184 ±0.021	0.203 ±0.026	0.182 ±0.024
DCP (Kg) /100kg BW	0.269 ±0.38	0.265 ±0.42	0.247 ±0.510
DCP (g) /kg $W^{0.75}$	7.729 ±0.049	7.700 ±0.053	7.254 ±0.460
ME, Mcal/kg*	2.28 ±0.030	2.269 ±0.038	2.264 ±0.024
NE1, Mcal/kg*	1.423 ±0.011	1.557 ±0.014	1.394 ±0.020
RFQ*	122.3 ±2.550	104.6 ±3.170	75.6 ±2.850
QI*	1.626 ±0.018	1.405 ±0.024	1.042 ±0.016

^{a,b,c}Means within row bearing different superscripts differ significantly ($p < 0.05$);SC = treatment with 10 g/calf/day Yea-Sacc® 1026, MG = treatment with 1mg/kg BW/day monensin sodium; TDN = Total Digestible Nutrients; DCP = Digestible Crud Protein; NDF= Neutral Detergent Fiber; Digestible Energy (DE) ; Non-fibrous carbohydrates (NFC%); ME = Metabolic Energy = (1.01 X DE)-0.45; NE (Mcal/kg)=Net Energy=(0.0245 X TDN%)-0.12 (NRC, 2001).RFQ (relative feeding quality) = (DMI% of BW) X (TDN% of DM)/1.23.

QI (quality index) = 0.0125XRFQ (Moore, 1994).

The positive effect of nutrient digestibility with buffalo calves fed yeast has been previously observed by **(Shahin *et al*. 2005**; **Komonna, 2007; Khattab *et al.,* 2010 and Azzaz *et al.,* 2015).** Similar results of MG in the present study was reported by **Arelovich *et al.,* (2008)** who reported that DM digestibility was not affected by addition monensin as related to changes in fluid kinetics and microbial efficiency. In contrast, **Callaway *et al.,* (2003)** found that, monensin supplementation improved energy metabolism and protein utilization by increased propionate production and reduced protein degradation in rumen. **Abdel-Ghani *et al*. (2003)** reported that digestion coefficient as DM had no effect due to 10g yeast/h/d supplementation on buffalo male calves. However**, Mukhtar *et al*. (2010) and Bitencourt *et al*. (2011)** stated that nutrients digestibility showed insignificant effect on sheep with monensin or *Saccharomyces cerevisiae* supplementation.

Table (3) showed YG group improved ($P<0.05$) nutritive digestibility values as TDN (68.46%) and crud protein as DCP (14.56%), in YG group compared with MG (61.79 and 13.81%) and control (62.98 and 13.62%) respectively. This is in alignment with the recorded results by **Shahin *et al*., (2005) Komonna, (2007) and Helal and Abdel-Rahman, (2010).**

Also, DM intake kg/head/day appeared to higher with animals add YG than MG and control animal groups. Consequently, animals fed the same diet tented to be higher TDN intake in YG as kg/100kg BW & g/kg $W^{0.75}$ being 1.248 and 36.21 respectively. These results are in agreement with those mentioned by **Helal and Abdel-Rahman, (2010); Degirmencioglu *et al.,* (2013) and Yuan *et al.,* (2015).** In contrast, no effects of yeast supplementation on DMI when using the same yeast strain (**Khattab *et al.,* 2010**).

2. Rumen Fermentation parameters:

The present results (Table 4) indicated that ruminal pH value was higher for suckling calves' treatments before morning feeding and then deceased gradually at 3hrs post feeding and return to increased till 6hr. The reduction in ruminal pH of calves fed yeast at 3hr post-feeding has been associated with rumen VFA's accumulation production increased and acetic/ propionic ratio decreased **(Arelovich *et al.,* 2008)**. In contrast, total VFA had inverse relation with ruminal pH values. The lowest total VFA's values before feeding at 0 time, (7.56, 7.65 & 7.35 mmol/100ml) and increased ($P<0.05$) at 3hrs post-feeding (10.73, 10.94 & 9.67 mmol/100ml) for control, YG and MG, respectively and then decreased again at 6hr. Increasing total VFA concentration at 3hrs may be attributed to enhancing activity of cellulolytic and mesophilic bacteria in rumen and require branched chain volatile fatty acids for normal growth. Moreover, methane production decreased as consequent reduction of energy loss and providing thus additional energy for VFA's synthesis **(Ozsoy *et al.,* 2013)**. The results in accordance with those found of suckling calves fed YG by **Shahin *et al*., (2005); Abd El-Tawab, (2007); Hucko, (2009) and Khattab *et al.,* (2010).**

In addition, **Perna Juniora *et al.,* (2017)** found no significant effect on ruminal pH and total ruminal VFA values when fed six rumen-cannulated cows on 300 mg monensin per animal and day as feed additives. Disagreement of these results reported by **Komonna, (2007) and Ismaiel *et al.*, (2010)** who found that, the yeast culture and commercial probiotic had no effect on ruminal pH and TVFA concentrations

Table (4): Effect of fed experimental diets on rumen fluid parameter for suckling buffalo calves (Means ± SEM).

Item	Experimental diets			
	Time (hrs)	control	SC	MG
pH	0	6.10 ±0.019	5.82 ±0.013	6.24 ±0.033
	3	5.55[b] ±0.025	5.34[b] ±0.029	5.65[a] ±0.036
	6	5.71 ±0.015	5.59 ±0.08	5.92 ±0.016
NH3-N (mg/dl)	0	13.71 ±1.11	13.86 ±1.13	13.54 ±1.02
	3	17.50[b] ±0.19	18.22[b] ±0.21	18.95[a] ±0.31
	6	14.11 ±0.47	14.37 ±0.26	14.8 ±0.35
TVFA's (meq/dl)	0	7.56 ±0.43	7.65 ±0.56	7.35 ±0.41
	3	10.73[ab] ±0.68	10.94[a] ±0.45	9.67[b] ±0.52
	6	8.62[ab] ±0.18	8.96[a] ±0.23	8.43[b] ±0.14
individual VFA's (mol/100 mol)				
Acetate	0	48.15 ±0.53	49.20 ±0.32	49.00 ±0.49
	3	45.42 ±0.61	47.11 ±0.45	46.42 ±0.58
	6	45.50 ±0.36	46.47 ±0.43	47.10 ±0.26
Propionate	0	39.38 ±0.38	39.30 ±0.53	41.90 ±0.46
	3	40.32 [b] ±0.40	39.99 [b] ±0.31	40.83 [a] ±0.54
	6	41.30 ±0.39	39.76 ±0.48	39.50 ±0.59
Butyrate	0	12.47 ±0.02	11.50 ±0.03	9.10 ±0.04
	3	14.26[a] ±0.04	12.90[b] ±0.08	12.75[b] ±0.06
	6	13.40 ±0.04	13.77 ±0.02	13.40 ±0.05
Acetate: propionate ratio	0	1.223 ±0.023	1.252 ±0.016	1.169 ±0.018
	3	1.126 [b] ±0. 027	1.178 [a] ±0.020	1.137[ab] ±0.023
	6	1.102 ±0.015	1.168 ±0.011	1.192 ±0.013

[a,b,c]Means within row bearing different superscripts differ significantly (P< 0.05).
Control = control treatment, SC = treatment with 10 g/calf/day Yea-Sacc®1026,MG = treatment with1mg/kgBW/daymonensinsodiumtheyeastculture Yea-Sacc® 1026 contained *SaccharomYGes cerevisiae* (strain 1026); NH3-N =ammonia nitrogen VFA's=volatile fatty acids.

Data presented in (Table 4), revealed that MG group was significantly higher ($P<0.05$) in rumen ammonia nitrogen concentrations than the other at 3hrs post feeding (18.95mg/dl). This is in agreement with previously published results **(Komonna, 2007 and Arelovich *et al.,* 2008)**,they reported that monensin had better performance with high-concentrate diets and true protein with improved overall utilization efficiency of feed and N utilization. Moreover, some studies found higher values of ruminal ammonia-N with yeast culture supplementation of buffalo calves **(Abdel-Latif, 2005 and Shahin *et al*., 2005)**.While, **Perna Juniora *et al.,* (2017)** stated that no significant effect on ruminal NH_3-N concentrations when fed six rumen-cannulated cows on 300 mg monensin per animal and day as feed additives.

Regarding values of acetic acid (mol/100mol) revealed that YC& MG groups increased at 0 and 6hrs post feeding than control group. On the other hand, results recorded that the ratio of acetate to propionate was decreased at 0 to 6hr post feeding. Moreover, butyrate% increased gradually ($P<0.05$) with YG and MG treatments from 0 to 6hrs.

Callaway *et al*.,(2003) stated that monensin increased propionate production in rumen. Additionally, **Arelovich *et al.,*(2008)** reported that 9% monsion numerically decreased acetate and butyrate concentration while, propionate increased. In the meantime, **Perna Juniora *et al.,* (2017)** indicated that daily 300 mg monensin per animal unaffected molar proportions of acetic and butyric acids in rumen.

3. Blood metabolites:

Plasma total protein, albumin, globulin, A/G ratio, creatinine, urea, IgG and ALT&AST enzyme activities are presented in (Table 5). Values of the most plasma parameters estimated in the present study were within the reference intervals for healthy buffaloes calves published by several workers in the literatures **(EL-Ashry *et al.,* 2003 and Abd El-Tawab, 2007).** Plasma total protein and globulin were significantly higher ($P<0.05$) in MG (6.32 and 2.80 g/dL) or YG (6.22 and 2.75 g/dL) than control group (6.18 and 2.69 g/dL). Yeast culture treated animal's elevation plasma TP as results to stimulate of rumen microbial protein synthesis and increase rumen microorganism's population, consequently, increase microbial protein passage as well as protein yield and increase of net globulins from the rumen to duodenum **(Helal and Abdel-Rahman, 2010)**. Improved protein utilization with monensin supplementation led to high responded performance with high-concentrate diet and true protein with improved N utilization stated by. **(Arelovich *et al*., 2008)**. However, **Bagheri *et al.,* (2009); Baiomy, (2011) and Ozsoy *et al.,* (2013)** reported that yeast culture supplementation not affected blood metabolites such as total protein, globulin and urea, AST and ALT.

Plasma albumin values and A/G ratio were observed a slight reduction in YG and MG groups without statistical differences (P>0.05) as compared with control group, **Shahin *et al*., (2005)** found add yeast in buffalo calves diets decreased A/G ratio. Moreover **Helal and Abdel-Rahman (2010)** reported that blood plasma serum albumin increased significantly within normal range in ewes fed yeast supplement.

The liver functions (ALT & AST) activity decreased significantly (P<0.05) in YG and MG than control group. Meanwhile their insignificant differences among treatments in blood creatinine concentration (0.84, 0.83 and 0.82 mg/dl) and urea-nitrogen (52.30, 53.60 and 49.9 mg/dl), respectively (Table 5). The obtained results are in accordance with those reported of early stage in buffalo calves by **Komonna, (2007)**. **Hassan, (2009)** found that yeast supplementation had no significant effect on blood urea concentration. In addition, **Bruno *et al.,* (2009)** found reduced plasma urea N in yeast treated calves indicates improved protein utilization. However, **Bagheri *et al.,* (2009)** reported plasma urea concentrations increased with yeast additive due to increased protein requirements in growing cattle. Also, **Baiomy, (2011) and Ozsoy *et al.,* (2013)** found that blood metabolites such as urea, AST and ALT not affected with yeast culture supplementation. The difference in these results most likely due to ration composition, animal species, levels and duration of yeast additives.

Table (5): Effect of fed experimental diets on selected blood metabolites and immunoglobulin for suckling buffalo calves (Means ± SEM).

Items	Control	Yeast	MG
No. of animals	7	7	7
Total protein, g/dL	6.18^{c} ±0.0116	6.22^{b} ±0.0162	6.32^{a} ±0.086
Albumin, g/dL	3.49 ±0.0281	3.47 ±0.0283	3.48 ±0.0202
Globulin, g/dL	2.69^{c} ±0.0137	2.75b ±0.0142	2.80^{a} ±0.0197
A/G ratio	1.29 ±0.265	1.26 ±0.213	1.24 ±0.0305
ALT, U/L	45.34^{a} ±5.635	41.31^{b} ±4.475	42.22^{b} ±4.815
AST, U/L	45.91^{a} ±1.540	43.22^{c} ±2.035	44.87^{b} ±1.713
Creatinine, mg/ dL	0.82 ±0.0176	0.84 ±0.0151	0.83 ±0.0169
Urea, mg/dl	49.9 ±12.26	52.30 ±16.70	53.60 ±11.64
IgG (mg dL^{-1})	682.35 ±137.11	696 ±0.148	773.22 ±146.30

^{a,b,c}Means within row bearing different superscripts differ significantly (*P*< 0.05); SC = treatment with 10 g/calf/day Yea-Sacc® 1026; MG = treatment with 1mg/kg BW/day Monensin sodium; IgG= immunoglobulins; A/G ratio = albumin/globulin ratio; ALT = alanine aminotransferase; AST = aspartate aminotransferase.

In the total experimental period (105 days) of age Immunoglobulins (IgG) seems to be higher in MG (773.22 mg/dL^{-1}) and YG (696 mg/dL^{-1}) compared to the control group (682.35 mg/dL^{-1}) with no significance. Improved IgG in yeast and monsion treated calves this may be attributed to better health status and immune status enhances as a result to increasing IgA and immunoglobulin secretary components **(Sretenović *et al.,* 2008)** or as a result to increase gamma globulins caused by Kupffer cell proliferation and plasma cells number in bone marrow **(Benjamin, 1990). Ozsoy *et al.,* (2013)** found that improvement gut health status with lower frequency diarrhea in yeast culture calf group.

4. Calves Performance:

Results in (Table 6), revealed that average daily weight gain (ADG) improved significantly (P<0.05) in suckling calves fed YG and MG than the control group (632, 585 *vs.* 557 g/day), respectively. Also, total weight gains more by 13.46 and 5.03%, than control, respectively. These findings were in agreement with those reported by **Khattab *et al.* (2010) and Helal and Abdel-Rahman, (2010).** They detected a significant greater weight gain in the 1st and 4th week after birth and more gain by 37.6 % at 4th weeks after birth for buffaloes given 10g dry yeast in the diet, than control group. Also, **Ozsoy *et al.,* (2013)** reported that increased weight gain by 15.5%, in fattening male goat kids with added 4.5% yeast culture. Furthermore, **Puniya *et al.,* (2015)** stated improved utilization of nutrients and growth rate in growing buffalo fed 1mg/kg BW of monsion as feed additive. Moreover, some authors found that buffalo calves fed yeast culture didn't affected weight gain **(Szucs *et al.,* 2013 and Degirmencioglu *et al.,* 2013). Timmerman *et al.,* (2005)** noticed that YG can faster accommodate to the stress of the first weeks of life calves and higher daily weight gains in the first two-three weeks of age, thereafter, the advantages of using YG were not apparent.

Table (6), revealed that, the total dry matter intake was slightly increased (P<0.05) in calves fed yeast culture than other groups during the feeding trial. **Chaucheyras-Durand *et al.,* (2008)** reported that yeast culture has positive promoting effects of young ruminant's performance through enhanced DM intake, daily gain, and digestibility, as result to enhance rumen activity and provides vitamins as growth rumen fungi support. **Lesmeister *et al.,* (2004)** add YG could be correlated an early establishment in rumen development parameters such as papillae length and width, rumen thickness and stabilization of rumen microbial communities.

Table (6): Growth Performance of suckling buffalo calves fed experimental diets. (Means ± SEM).

		Experimental Diets	
Item	**control**	**SC**	**MG**
Duration period/days	**105**	**105**	**105**
Number of suckling calves	**7**	**7**	**7**
Average body weight (kg):			
Initial body weight, kg	**40.67 ± 0.318**	**39.46 ± 0.490**	**39.88 ± 0.365**
$W^{3/4}$	**16.1 ± 0.306**	**15.74 ± 0.284**	**15.87 ± 0.361**
Final body weight, kg	**99.15 ± 1.722**	**105.83 ± 1.846**	**101.36 ± 1.980**
Total weight gain, kg	**58.48 ± 1.224**	**66.37 ± 1.065**	**61.48 ± 1.163**
Av. Daily Gain (ADG), kg	**0.557^{c} ± 0.019**	**0.632^{a} ± 0.015**	**0.585^{b} ± 0.017**
DMI intake, /head/day:			
Buffalo Milk, kg*	**0.460 ± 0.180**	**0.448 ± 0.263**	**0.459 ± 0.291**
Calf starter, kg	**0.654^{b} ± 0.053**	**0.712^{a} ± 0.095**	**0.630^{b} ± 0.087**
Berseem hay, kg	**0.315 ± 0.028**	**0.308 ± 0.047**	**0.328 ± 0.033**
Total DM intake, kg	**1.429^{ab} ± 0.046**	**1.468^{a} ± 0.120**	**1.417^{b} ± 0.091**
DM intake/ $w^{3/4}$,g	**88.758 ± 9.150**	**93.266 ± 6.025**	**89.288 ± 8.702**
RGR%*	**1.369 ± 0.063**	**1.602 ± 0.055**	**1.468 ± 0.069**
Feed conversion: (Kg intake/kg gain)			
Kg DM	**2.566 ± 0.069**	**2.322 ± 0.091**	**2.420 ± 0.075**
Kg TDN	**1.616 ± 0.045**	**1.590 ± 0.051**	**1.495 ± 0.063**
Kg DCP	**0.349 ± 0.020**	**0.338 ± 0.026**	**0.334 ± 0.028**
FE (Gain: Feed)%*	**38.97 ± 2.870**	**43.05 ± 3.121**	**41.28 ± 2.185**

[a,b,c] means within the same row with different superscripts are significantly different ($P < 0.05$) FE= feed efficiency; RGR% = relative growth rate; control = control treatment, SC = treatment with 10 g/calf/day Yea-Sacc® 1026 contained *SaccharomYGes cerevisiae;* MG = treatment with 1mg/kg BW/day Monensin sodium; the yeast culture.

Add yeast culture to milk and starter mixture fed calves increased feed efficiency and daily weight gains (particularly at 3 - 4 weeks of a trial) due to the higher solid feed intake and nutrients absorption improvement from the intestines and/or faster rumen function development was reported by **(Timmerman *et al.,* 2005).**

Fourthmore, feed efficiency (FE%) and feed conversion as kg DM/kg gain, enhanced numerically insignificantly in YG and MG groups by 9.51 and 6 %, than control suckling calves, respectively. Our results are similar to those obtained by **Yuan *et al.,* (2015),** who showed numerical beneficial effects of yeast performance rearing calves Also, **Callaway *et al.,* (2003),** found that monensin increases ruminal propionate and decreases ammonia and lactate thus improving overall feed efficiency.

On the contrary **Berthiaume *et al.,* (2006) and Perna Juniora *et al.,* (2017)** found that fed cattle in short-term of 300 mg monensin per animal and day not affected on feed efficiency or other performance parameters. Similarly, **El-Ashry *et al.,* (2003)** confirmed that yeast culture supplementation was not apparent effect on feed conversion and feed utilization with calves.

CONCLUSION

Findings of the present study suggested a potential of yeast culture affect which could be more widelysafelyacceptedand effectively replace of monsion as growth promoters supplementation in pre-weaning buffalo calves rations.

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تاثير اضافة ميونسين الصوديوم اوالبروبيوتك على العجول الجاموسى قبل الفطام

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الملخص العربى

تم استخدام عدد 21عجل جاموسى لهذه الدراسة حديث الولادة بمتوسط وزن 42.4+3.15 وعمر واحد اسبوع تم تقسيمهم عشوائيا الى ثلاث مجاميع بكل مجموعة سبعة حيوانات وذلك لتقدير تاثير استخدام الخميرة الجافة وميونسين الصوديوم كاضافات غذائية طبيعية على كفاءة استخدام الغذاء وقياسات الكرش وبعض وظائف الدم واداء الحيوان . تغذت المجموعة الاولى (كونترول) على 10% من وزن الجسم لبن بدون اضافات والمجموعة الثانية كانت تتغذى علي مجموعة الكونترول بالاضافة ل10جم/حيوان/يوم خميرة جافة والمجموعة الثالثة تتغذى على الكونترول مع اضافة 1ملجم/كجم وزن جسم/يوم مونسين صوديوم فى معاملة تجربية لمدة 105 يوم.

وقد اظهرت النتائج ان المجموعة المغذاة على الخميرة قد حسنت من هضم معظم المركبات الغذائية كذلك المجموع الكلى للمركبات الغذائية المهضومة والبروتين الخام المهضوم ومجموع الاحماض الدهنية الطيارة الا ان حموضة الكرش قد انخفضت خاصة خلال الثلاث ساعات الاولى من التغذية بالمقارنة ببقية المعاملات. اما مجموعة المونيسين فقد اظهرت زيادة معنوية لتركيز امونيا الكرش وتركيز البيوتيرات والنسبة بين الاستيات والبيوتيرات بينما لم تؤثر المعاملات فى تركيز الاستيات.

كما اظهر التحليل الاحصائى زيادة معنوية لتركيزات البروتين الكلى للدم والجلوبيولين للمعاملة بالخميرة والميونسين مع انخفاض لبعض وظائف الكبد وتركيزات الالبيومين ونتروجين اليوريا و الاجسام المناعية بالدم بين المجاميع , كما اظهرت مجموعة الخميرة تحسنا معنويا للزيادة فى وزن الجسم والماكول ومعدلات التحويل الغذائى بالمقارنة ببقية المعاملات.