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EFFECT OF SUPPLEMENTING DRY YEAST OR BENTONITE AND THEIR COMBINATION AS FEED ADDITIVES ON GROWTH PERFORMANCE OF BUFFALO CALVES.

A. H. Ghoniem, A.A. Abdou, E.A. El-Bltagy, R. I. Moawd and A. A. H. El-Tahan

Animal Production Research Institute, Agricultural Research Centre, Dokki, Giza, Egypt.

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SUMMARY

This study was conducted to investigate the effect of addition active dry yeast and bentonite or their mixture to buffalo calve rations on digestibility, rumen parameters, blood metabolites and growth performance. Total of twelve healthy growing buffalo calves with an average body weight of 290.83±11.90 Kg and aged thirteen months old were used in a feeding trial lasted for 4 months as an experimental period using randomized complete block animals design and were fed individually according to Kearl requirements (1982), where 60% of their energy requirement as total digestible nutrients (TDN) was offered from concentrate feed mixture (CFM), while the other 40% of energy requirement was covered from Egyptian berseem (Br). An extra rice straw (RS) was offered as 0.5% of animal's body weight (control ration). Animals were divided randomly into four groups (three animals per group) as follows: T1 (control ration), (T2) control ration plus yeast (10 g /animal /day), (T3) control ration plus bentonite (20 g/kg DM intake),(T4) control ration plus bentonite (20 g/kg DM intake plus yeast (10g/animal/day. The digestibility of CF, EE and NFE as well as the feeding values as TDN and DCP were almost had the same trend of DM digestibility among dietary treatments. Results of rumen parameters showed no clear trend among the dietary treatments respecting NH3-N concentration, however, almost its values of the tested rations were higher by difference degrees than that of control one. While the concentrations of TVFAs were significant higher with bentonite or yeast/bentonite rations than that of control or yeast – rations. No statistically significant differences were observed among the experimental rations for all measured blood metabolites, except that of urea-N was significantly ($p<0.05$) lower in group T3 and insignificant lower in groups T2 & T3 than control. Performance of calves in terms of daily gain, total dry matter intake did not affected by supplemented yeast and bentonite or both of them to rations. While, there were significant($p<0.05$) differences between experimental rations in feed conversion as DM and TDN intake per kg gain where the best feed conversion was associated with rations supplemented by bentonite and their mixture with yeast (T3 and T4). Similarly the beast economical efficiency was occurred with the rations (T3 and T4). Generally, from the obtained results could be concluded that the supplementation of dry yeast and bentonite or both of them to rations of buffalo calves had positive effects on digestibility, feeding value, and some rumen parameters growth performance and economic efficiency

Keywords: *buffalo calves, yeast, bentonite, growth performance, digestibility, rumen parameters.*

INTRODUCTION

In the Egypt, gap between the local beef production and the demand is widening calling for more efforts to increase and develop beef production. Recently feed additives are widely used in order to increase body weight gain of farm animals particularly species which well known with their slow growth rate. Bentonite mostly consists of silicon dioxide (SiO_2), magnesium oxide (MgO), aluminum oxide (Al_2O_3) and sodium oxide (Na_2O) (European food safety authority (EFSA, 2014). Bentonite recognized as safe for feeding to livestock (EFSA, 2016), and it's as feed additives for all animal species has been proposed. EFSA (2011) recommended a maximum level of 0.5% bentonite to be safe for all animal species in despite of the inconsistency in the currently available data. The inclusion of 0.1% and 0.3%

bentonite in a diet has an influence on final body weight, total body weight gain, and daily gain compared with the un-supplemented diets (Kim Young *et al*., 2017). It can absorb toxic products of digestion and decreases the accumulation of toxic substances in tissues, thus decreasing the incidence of internal disorders.(Mckenzie, 1991). Bentonite is a natural clay that comes from volcanic ash and consists mainly of montmorillonite with minor amount of illite, kaolinite, cristobalite and other minerals (Adamis *et al*. 2005). Bentonite, like other clay materials is a crystalline aluminosilicates characterized by its ability to exchange cations without major changes in structure; it is used in ruminant animal diets to improve digestibility of nutrients Salem *et al*. (2001), Mohsen and Tawfic (2002), Gabr *et al*. (2003) and Hassan (2009) and increased daily body gain as reported by Kang *et al*. (2002), Berthiaume *et al*. (2007). Using yeast culture in ruminant diets can improve the animal performance. Dawson *et al.* (1990) reported that yeast culture increased ruminal cellulose digestion and consequently improved feed efficiency and growth performance of ruminant animals. Also, increased microbial growth in the rumen and enhanced microbial protein synthesis. Several reasons for improvements in ruminal fermentation by feeding YC have been suggested. The results of numerous studies indicate that Saccharomyces cerevisiae dried brewer's yeast enhances animal productivity and their health conditions (Dobicki *et al*, 2007, Milewski, 2009, Gopalakannan and Arul 2010). In effective and nutritionally well-balanced animal diets, essential nutrients are often combined with feed additives and supplements that contain microorganisms and their products (Grela and Semeniuk, 2006). The addition of bentonite and probiotics to the diet of Hanwoo steers increased concentrations of trace minerals (Zn, Cu, and Fe) in the *longissimus* muscle of steers and in conclusion, the combined use of mineral clay and probiotics in the animal diet could be improved mineral retentions in muscle without any deleterious effects on carcass traits of steers (Wan-Sup *et al*., 2012). However, little information and results are available on the effect of feeding bentonite and probiotics together (associative effect) on the growth performance of beef cattle.

It is, therefore, postulated that the addition of probiotics with bentonite might show a desirable effect on meat quantity and quality. Based on the previous reports of the effects of bentonite and probiotic incorporated into diets of ruminants, a study was conducted to evaluate the effects of these dietary additives on productive performance by buffalo calves in Egypt.

MATERIALS AND METHODS

The experimental procedures:

This study was carried out at El-Gemmaiza Research Station which is belonging to Animal Production Research Institute, Agricultural Research Centre, Egypt. Twelve healthy growing buffalo calves with an average body weight of 290.83±11.9 Kg and age thirteen months were used in feeding trial that lasted for four months. Animals were divided randomly into four similar groups (three animals per group) as follows:

Control ration (T1): 60% CFM plus 40% Egyptian berseem (Br) based on total digestible nutrients (TDN) requirements in additions of 0.5% of animal's body weight from RS. While, Ration T2 received control ration plus bentonite (20 g/kg DM), Ration T3 received control ration plus yeast (10 g /animal /day), and Ration T4 received control ration plus bentonite (20 g/kg DM) and yeast (10 g /animal /day). Animals were fed individually according to Kearl requirements (1982) and bentonite and yeast (Dox-al,DXThepax100R(strain GSH351) containing $5x10^9$ cells / g (European patent n.0111202 - European patent n.98116181.3) were offered mixed with concentrate feed mixture. At the beginning, all animals were drenched drugs against internal parasites. Roughage portion was offered once daily, while CFM was offered twice daily, and animals were watered twice a day. Amount of feeds was adjusted biweekly according to growth rate changes and feed efficiency was also calculated.

Nutrients Digestibility and Rumen Parameters:

At the end of feeding trial, all animals were used for digestibility trail to determine the digestibility coefficients and feeding values of experimental rations using Acid Insoluble Ash (AIA) procedure as a natural marker according to Van Keulen and Young (1977). Fecal grab samples of about 500g were taken from the rectum three times for five days as collection period. At the end of collection period of the digestibility trial, rumen liquor was withdrawn using stomach tube before morning feeding (zero time), 3 and 6hr after feeding. The pH value was measured immediately using portable pH meter. The rumen liquor samples were filtered through three layers of cheese cloth. Then rumen liquor samples were put in plastic bottles and preserved by using few drops of toluene and paraffin oil and kept at -20 °C for determination of total volatile fatty acids and ammonia- nitrogen. at the same time, blood samples were taken from the jugular vein of the animals of the digestibility trial before morning feeding. Blood serum was preserved to measure some blood parameters.

Chemical Analysis:

Proximate analysis for dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE) and ash of feeds, feed refusals and feces were determined according to the official methods A.O.A.C. (2000). Rumen Ammonia-N was determined according to the modified semi-micro Kijeldehl digestion method A.O.A.C. (1995). Total volatile fatty acids were determined according to Eadie, *et al*., (1967). Blood serum was separated from the whole blood to determine the total protein, albumin and urea–N. using commercial kits of Bio-Merieus, lab, France. Globulin was determined by difference.

***Statistical analyses*:**

A statistical analysis was carried out by General Linear Model procedures (GLM) described in SAS User's Guide (SAS 2003). Differences among treatment means were separated by Duncan's new multiple-range test (Duncan, 1955).

RESULTS AND DISCUSSION

Chemical composition of experimental feeds:

The chemical composition of ingredients of experimental rations are presented in Table (1). The proximate analysis of Br and RS used in this study were extremely comparable to those recorded in the literature. The values of CP (14.25%), CF (14.22%) and EE (3.46%) of CFM were also within the normal range of the currently manufactured concentrates in Egypt, which usually used for meat production.

Table (1): Chemical composition of ingredients and calculated composition of experimental rations (on DM basis).

Item	Chemical composition						
	DM	OM	CP	CF	EE	NFE	Ash
Proximate analysis							
Concentrate feed mixture (CFM)*	92.15	86.24	14.25	14.22	3.46	54.31	13.76
Rice straw (R.S)	91.45	77.62	4.45	36.29	0.63	36.25	22.38
Berseem (Br)	15.35	82.25	10.53	28.36	0.83	42.53	17.75
Calculated composition of experimental rations							
T1 (control)	63.64	83.09	10.97	23.73	1.94	46.45	16.91
(T2)	65.61	83.77	11.72	21.90	2.19	47.96	16.23
(T3)	65.03	82.62	11.47	22.04	2.12	46.99	17.38
(T4)	65.64	82.58	11.37	22.24	2.10	46.87	17.42

**CFM; contained 37% yellow corn , 30% undecorticated cotton seed , 20% wheat bran, 6.5% rice bran, 3% molasses, 2.5% limestone, 1% common salt.*

Nutrient digestibility and feeding values:

Results indicated that the daily dry matter intake (DMI) as kg/100kg B.W was insignificantly lower with the three tested rations (T2, T3 and T4) than that of control one (T1). Also, similar trend regarding DMI as g/kg $w^{0.75}$ was occured among dietary treatments (Table 2). These results are in agreement with those obtained by El-Tahan *et al*. (2005) who observed lack of significant effect on dry matter intake due to supplemented the rations of growing calves with 2 or 4% tafla. Also, similar results were obtained by Saleh *et al*. (1999) who indicated that DM intake by lactating buffaloes slightly decreased in bentonite groups**.** Otherwise, Abou 'l Ella (2007), found that DMI of lactating ewes had a significant increased with rations supplemented with dried yeast and/or bentonite compared to the control ration that free from both supplements.

Table (2): Feed intake, digestibility and feeding nutritive values of the experimental rations by buffalo calves.

Item	T1	T2	T3	T4
DM intake :				
Kg/100 kg B.W	3.55±0.09	3.27±0.14	3.28±0.10	3.36±0.28
g /Kg $W^{0.75}$	154.92±3.85	140.81±3.54	141.64±2.38	145.17±2.51
Digestion coefficients % :				
DM	73.72^{b}±0.09	74.27^{b}±0.34	74.30^{b}±0.19	78.00^{a}±0.47
OM	77.08^{b}±0.54	76.14^{b}±0.37	76.88^{b}±0.60	79.44^{a}±0.30
CP	75.10^{c}±0.29	74.60^{c}±0.26	77.87^{b}±0.55	79.87^{a}±0.55
CF	60.38^{b} ±0.74	61.88^{b}±0.45	64.87^{a}±0.43	65.08^{a}±0.49
EE	65.75^{b}±0.68	72.83^{a}±0.53	77.76^{a}±0.28	78.37^{a}±0.40
NFE	84.10^{ab}±0.53	83.06^{b}±0.29	84.30^{ab}±0.80	86.11^{a}±0.96
Feeding values (%, DM basis) :				
TDN	65.61^{b}±0.11	65.75^{b}±0.63	65.58^{b}±0.56	67.65^{a}±0.43
DCP	8.25^{b}±0.12	8.72^{a}±0.12	8.93^{a}±0.20	9.06^{a}±0.12

a ,b and c means the same row with different superscripts differ (P<0.05).
(Control)T1= 60% CFM+40% BR+ R.S., T2=60% CFM+40% BR+ R.S. + yeast, T3=60% CFM+40% BR+ R.S. +Bentonite and T4= 60% CFM+40% BR+ R.S.+ yeast + Bentonite.

The enhanced intake is most likely due to on improvement of the rate of breakdown of feeds in the rumen. The digestibility of DM, OM and CP were significantly (p<0.05) increased when buffalo calves fed T4 ration compared to those which fed T1,T2 or T3 (Table 2). However, the digestibility of EE was significantly (p<0.05) higher with all tested ration than that of control one. compared with other groups. Also, CF digestibility was significantly (p<0.05) higher with T3 and T4 than that of T1 and T2. The digestibility of NFE did not significantly affected by supplemented rations with yeast and/or bentonite in comparison with the un-supplemented one (control). The feeding values as TDN showed significantly (p<0.05) increase by buffalo calves fed T4 ration compared with other groups, but there were no significant among other groups. While the values of DCP were significantly (p<0.05) higher when animals fed the tested rations (T2, T3 and T4) than those fed control ration. These results are in agreement with those reported by Helal and Abdel – Rahman (2010), Abd El-Ghani, (2012), Kumar *et al*. (2013) and Aazami *et al*. (2017). Also, results here are in line with those reported by Abou'l Ella (2007) who found that most nutrients digestibilities and feeding values were significantly higher with ration supplemented with both dried yeast and bentonite (together) than those of ration that free from these supplements. Additionally the same author proved that the together supplements gave insignificantly better digestibility and feeding values than if each one given in individual case. Earlier, El –Tahan *et al*. (2005) found similar results to those of the current study respecting digestion coefficients and feeding values when fed growing calves on rations supplemented with 2% or 4% tafla clay. However, yeast/ yeast cultures had been used as supplements in animal feeds for long time ago and numerous studies proved its greatly positive effects on the digestibility and feeding values of ruminants' rations (El –Ashry *et al* 2001, Mousa *et al*. 2012 and Habeeb, 2017). Lastly it could be emphasized that the effects of together yeast and bentonite supplementation have an advantage over the use of each one alone in the rations of ruminant animals. Undoubtedly there is a kind of positive associative effects between the two supplements and even with the other ingredients of the rations, and as a result, it reflected positively on feed utilization and the productive performance of the experimental animals.

Rumen parameters:

The results of ruminal parameters are presented in (Table 3). The results of ruminal pH values before feeding showed that T2 had significantly (p < 0.05) higher values (7.80) compared with that of T3, T4, but there were no significant difference between T2 and control (T1) ration, the lowest value was obtained with T4 ration (7.37). But, the results of ruminal pH values at 3 and 6 hrs. after feeding showed insignificant differences among the dietary treatments. Similar results were reported by, Helal and Abdel-Rahman (2010), Habeeb (2017) and Mohsen Kazemi *et al*. (2017) who evaluated the effect of supplemented yeast or bentonite on some rumen parameters of farm animals.

The results of NH_3–N concentration values showed lower NH3 –N concentration values before feeding (zero time) compared with 3 and 6 hrs. after feeding. However, over the three sampling times, three were no clear trend respecting ammonia-N concentration values among the experimental dietary treatments. But almostly the concentration of NH3-N was higher by different degree than that of control rations that have the lowest NH3-N values over all sampling times. The highest values was obtained with T3 at zero sampling time and also with T2 at 3 hrs sampling time and with T4 at 6 hrs sampling time. The variation in the concentrations of NH3-N among treatments over the different sampling times might be due to the numerous factors which exceedingly affecting rumen fermentative parameters. The fluctuation of NH3-N concentration of yeast treatment may be attributed to the inhibitory effect of some growth promoters on proteolysis and ruminal urease enzyme activity and also the rate of incorporation of ammonia into microbial protein synthesis. The result obtained by Abou 'l Ella (2007) revealed that no significant effects in NH3-N concentration due to supplementing the lactating ewe's rations by either dry yeast or bentonite or their dry yeast or bentonite or their mixture. These results are in agreement with those of Aguilera Soto *et al*. (2009), and Abd El-Ghani, ((2012).

Table (3): Effect of feeding the experimental rations on rumen liquor parameters.

Item	Treatments			
	T1	T2	T3	T4
PH				
Zero	7.00[ab]	7.20[a]	6.90[b]	6.77[b]
3hrs	6.6	6.20	6.85	6.55
6hrs	6.85	7.00	6.90	7.05
NH3-N(mg/100 ml)				
Zero	7.29[c]	9.79[b]	14[a]	7.83[bc]
3hrs	15.87[c]	32.32[a]	24.27[b]	17.62[c]
6hrs	8.17[c]	28.58[b]	29.40[ab]	30.57[a]
TVF's (meq/100ml)				
Zero	7.27[b]	8.95[b]	13.38[a]	13.07[a]
3hrs	16.32[b]	11.52[c]	19.28[a]	14.72[b]
6hrs	8.60[c]	10.87[b]	13.65[a]	12.88[a]

a ,b and c means the same row with different superscripts differ (P<0.05).

(Control)T1= 60% CFM+40% BR+ R.S., T2=60% CFM+40% BR+ R.S.+ yeast T3=60% CFM+40% BR+ R.S. + Bentonite and T4= 60% CFM+40% BR+ R.S. + yeast +Bentonite.

Concerning, the results of TVFA,s overall sampling times, the bentonite – rations has achieved the highest value o TVFAs among the experimental treatments, being the differences were mostly significant between the bentonite- rations (T3) vs. both yeast- ration and control one, while the differences not significant between T3 and T4 over the most sampling times (zero and 6 hrs ones). The present results are in harmony with those obtained by Abou 'l Ella (2007) who demonstrated that TVFAs concentrations behaved similar trend to that of the current study among treatments of zero supplement (control), yeast, bentonite or their mixture of lactating ewes, ration, the differences among these ration did not significant, El-Tahan *et al*; (2005) found similar trend when supplementing ration of growing calves with tafla clay at 2% or 4% of the silage portion in their ration. In the same trend, results of Helal and Abdel-Rahman (2010), Abd El-Ghani, (2012) and Aazami *et al*. (2017) were obtained.

Blood Parameter:

The results of Total protein, albumin, globulin and urea, are presented in (Table 4). The mean values of serum total protein, albumin, globulin and albumin/globulin ratio showed insignificant differences among all treatments. The mean values of serum total protein and globulin showed the highest values with control (T1), but T4 recorded highest values of albumin and albumin/ globulin ratio. The results of serum urea concentration showed significant lower ($P<0.05$) value with bentonite – ration (T3) than that insignificant lower values of control ration (T1). These results were similar of those found by Sangmo lee *et al*. (2010), Helal and Abdel – Rahman (2010), Wan Sup *et al*. (2012) and Mohsen Kazemi *et al*. (2017). In relation to the present results similar values of blood total protein content was recorded by Salem and El-Shewy (2001) when fed the lactating goats with rations supplemented with zero (control), 3% bentonite or 3% dolomite, 6.57, 6.70 and 6.66g/100ml respectively. In consistent with the present results, Abou 'l Ella (2007) revealed that insignificant differences in respect of the concentrations of most blood metabolites measured (TP, Gl, AL / Gl ratio and urea) among the dietary treatments in which using supplements of zero (control, 0.5% yeast, 4% bentonite or their mixture, with lactating ewes' rations.

Table (4): Effect of feeding the experimental rations on blood parameters of buffalo calves.

Item	Treatments			
	T1	T2	T3	T4
Total protein (g/dl)	6.70±0.08	6.31±0.22	6.46±0.16	6.34±0.12
Albumin (g/dl)	3.45±0.11	3.57±0.03	3.47±0.08	3.64±0.06
Globulin (g/dl)	3.25±0.20	2.74±0.20	2.99±0.17	2.70±0.14
Albumin/globulin	1.07±0.10	1.30±0.08	1.16±0.08	1.36±0.08
Urea-N (mg/dl)	59.57^{a}±1.30	55.83^{ab}±1.84	48.87^{b}±0.78	54.43^{ab}±1.02

a ,b and c means the same row with different superscripts differ (P<0.05).
(Control)T1= 60% CFM+40% BR+ R.S., T2=60% CFM+40% BR+ R.S. + yeast, T3=60% CFM+40% BR+ R.S. + Bentonite and T4= 60% CFM+40% BR+ R.S. + yeast + Bentonite.

Growth Performance:

The results of the daily gain (Table 5) showed that the highest value was recorded with T3 treatment followed by T4 and then control ration (T1), while the lowest value was observed with T2, but the differences between all treatments were not significant. The data clearly showed that dietary supplementation with bentonite improved growth performance of buffalo calves. In the current study, the improvement in growth performance might be due to the interaction bentonite and its favorable modulatory effect which resulted in the enhanced of nutrients digestibility owing to a the delay in the passage of food Particles through the gut. Similar trend was obtained by Berthiaume *et al*. (2007), Lee *et al*. (2010) and Habeeb (2017. In matching with the current results, Abdel–Baki *et al*. (2001) found insignificant different respecting total gain and daily gain of crossbred Friesian calves fed diets without or with urea-tafla supplement being 168.41 vs. 168.29 kg as total gain and 0.752 vs. 0.715 kg as daily Al-Hamed *et al*. (2007) regarding total gain and daily gain were significant decreased when Awassi lambs fed diets supplemented with either 5% zeolite or 5% bentonite in comparison with the unsupplemented one. Otherwise, El-Tahan *et al*. (2005) found that growth rate of Friesian crossbred calves was significant increased with supplementation their diets with 2% or 4% tafla supplement. Also, milk yield of ewes was significant higher with supplemented their rations with 0.5% dry yeast, 4% bentonite and their mixture (Abou 'l Ella (2007).

Presumably, the explain of the modulatory effect of these supplements where such compounds have great capability to reduce the rate of passage of the digesta in the rumen and consequently increases the opportunity for absorption the nitrogen and also save the favorable ruminal environment for microorganisms for more utilization of dietary nutrients and all these vital processes could be positively reflected on the host animals in which the end products (particularly N- compounds), being enough available and then reaching by high level into the animal tissues (Salem *et al*. 2001). These findings are in disagreement with the results of Mohsen Kazemi *et al*. (2017) and Kim Young *et al*. (2017) who found that the inclusion of 0.1% and 0.3% bentonite in the diets of steers has significant (p<0.05) influence on final body weight, total body weight gain, and daily gain compared with the control. The values of total DM, TDN and DCP intake as (kg/h/d) of the experimental rations are presented in (Table 5). The results of dry matter intake (DMI) and DCP intake as (kg/h/d) showed no significant differences among all experimental rations. The highest value of dry matter intake was obtained with control (T1) (12.91 kg/h/d), while the lowest values were recorded with T3 (11.26 kg/h/d) T2 and T 4 rations had no intermediate values being 11.35 and 11.51 respectively. However, the results of TDN intake was significantly (P< 0.05) decreased when animals fed the supplemented rations compared to those fed the control one, with no significant differences among the tested rations. Otherwise, the DCP intake did affected significantly by dietary treatments. In relation to this point, Abu-Zanat (1997) and Al-Hamed *et al*. (2007) found that when using clay supplements (Zeolite and bentonite) could be decline the palatability of rations and in turn decreasing feed intake, where, they were observed some feed residue in trough due to the mentioned supplements. The results of feed conversion that expressed as TDN, DCP and DM feed unites intake per 1 kg gain are presented in (Table 5). The results of feed conversion as DM and TDN per kg gain showed significant (P<0.05) improvement with all tested rations in comparison with control one. Similar trend was occurred in case of DCP: gain among treatments, with the best feed conversion being associated with the bentonite-ration T3) the results are in harmony with those reported by El-Tahan (2005) who indicated that the feed conversion of feed consumed as DM, TDN AND DCP gain was markedly improved with supplementing rations of growing calves with 2% or 4% tafla compared with unsupplemented one. These results are in harmony with those reported by Aghashahi *et al* (2005), Helal and Abdel-Rahman (2010) and Mohsen Kazemi *et al*. (2017). The results of the economic efficiency showed that the calculated feed cost/kg gain for the tested rations were clearly lower than of control one. The daily profit values were11.50, 11.28, 18.07 and 15.11 L.E /kg gain for T1 , T2, T3 and T4 and also the improvement based on control ration (100%) were 98.09, (157 and 131% for the tested ration groups (T2, T3 and T4), respectively. These results are in harmony with those obtained by El-Tahan et al. (2005) Hassan (2009), Abd El-Baki et al. (2009) and Abd El-Ghani, (2012).

Table (5): Effect of feeding the experimental rations on productive performance of buffalo calves.

Items	T1	T2	T3	T4
Initial weight, kg	306.70±13.33	293.3±35.28	280±27.54	283.30±26.82
Final weight, kg	422±13.02	405.0±45.37	405.0±18.93	403±26.19
Total body gain, kg	115.30±7.64	111.70±13.02	125±8.66	119.70±2.98
Daily gain, (kg)	0.96±06	0.93±0.11	1.04±0.07	1.00±0.02
Daily feed intake,(kg/h/d) as fed:				
CFM	6.10	5.96	5.71	5.79
Berseem (BR)	33.50	28.50	28.62	28.85
Rice straw (R.S)	2.35	1.63	1.56	1.70
Bentonite	00	00	0.20	0.20
Yeast	00	0.01	00	0.01
Total intake (kg/h/d)				
DM	12.91±0.50	11.35±0.94	11.26±0.50	11.51±0.74
TDN	8.47^{a}±0.02	7.45^{b}±0.26	7.38^{b}±0.11	7.79^{b}±0.23
DCP	1.07±0.07	0.99±0.11	1.01±0.12	1.04±0.09
Feed conversion (kg feed/kg gain):				
DM	3.45^{a}±0.211	12.18^{b}±0.45	10.83^{c}±0.27	11.51^{bc}±0.15
TDN	8.82^{a}±0.21	8.02^{ab}±0.30	7.10^{b}±0.21	7.79^{b}±0.39
DCP	1.11±0.12	1.07±0.09	0.97±0.12	1.04±0.09
Economic efficiency				
Price of daily gain, L.E	46.08	44.64	49.92	48.00
Daily feed cost, L.E	34.58	33.36	31.85	32.89
Feed cost/kg gain, L.E	36.02	35.87	30.63	32.89
Daily profit, L.E	11.50	11.28	18.07	15.11
Improvement, %	100	98.09	157	131

a ,b and c means the same row with different superscripts differ (P<0.05). (Control)T1= 60% CFM+40% BR+ R.S., T2=60% CFM+40% BR+ R.S. +yeast, T3=60% CFM+40% BR+ R.S. +Bentonite and T4= 60% CFM+40% BR+ R.S. +yeast +Bentonite Calculation based on the following price in Egyptian pound (L.E) per kg , CFM = 3.9 L.E. /kg ,R.S=0.35 L.E. /kg, Berseem =0.30 L.E. /kg, bentonite = 0.25 L.E. /kg, yeast=100 L.E. /kg, and one kg of live body weight was 48 L.E..

From these results, it could be concluded that adding bentonite and /or yeast to rations of buffalo calves were more effective in decreasing the feed cost to produce 1kg live body weight than control.

CONCLUSION

It could be concluded that the supplementation of dry yeast and bentonite or both of them to rations of buffalo calves had positive effects on digestibility, feeding values, some rumen parameters and growth performance, beside better economic efficiency. In addition, the results obtained for the bentonite with yeast were not clear enough. So, we need to continue the researches on this point with different doses for both yeast and bentonite.

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تأثير إضافة كل من الخميرة الجافة أو البنتونيت أو مخلوطهما كإضافات غذائية على أداء النمو للعجول الجاموس.

عبدالغنى حسانين غنيم وعلى احمد عبده على و عزت عرفة البلتاجى ورأفت ابراهيم معوض وعلاء الدين احمد حسن الطحان

معهد بحوث الإنتاج الحيوانى – مركز البحوث الزراعية – الدقى – الجيزة – مصر

أجريت الدراسة لتقييم تأثير إضافة الخميرة الجافة النشطة والبنتونيت و كليهما إلى علائق العجول الجاموس على الهضم وقياسات الكرش وبعض مكونات الدم ومعدل النمو. وقد استخدام اثني عشر من العجول الجاموسي بمتوسط وزن الجسم من 290.83 ± 11.90 كجم وعمر ثلاثة عشر شهرا في تجربة التغذية التى استمرت لمدة 4 أشهر. وقد قسمت الحيوانات إلى اربع مجموعات متماثلة فى متوسط الوزن (3 فى كل مجموعة) وتم تغذية الحيوانات بشكل فردي وفقا لمقررات كيرل (1982)، غذيت المجموعة الأولى (الكنترول): 60% علف مركز+40% برسيم (على أساس الطاقة) بلإضافة كمية من قش الأرز تقدر 0.5% من وزن العجول , بينما المعاملة الثانية: عليقة الكنترول +10جرام /رأس/ يوم خميرة, المعاملة الثالثة: عليقة الكنترول +20جرام من البنتونيت / كجم عليقة اساسية, المعاملة الرابعة: غذيت على العليقة الكنترول + بالإضافة إلى الخميرة (10 جم / حيوان / يوم) + (20 جرام / كجم من الكمية الكلية من العليقة) .وقد أوضحت النتائج أن معاملات هضم كل من المادة الجافة والعضوية كانت معنويا (P<0.05) للعجول المغذاة على العليقة T4 مقارنة مع تلك التي تغذت T1، T2وT3 ، أظهرت القيم الغذائية المركبات الكلية المهضومة زيادة معنوية (p <0.05) للعجول الجاموس التي تغذت ايضا على المعاملة الرابعة مقارنة مع المجموعات الأخرى، وكانت قيم البروتين المهضوم (P <0.05) أعلى عندما كانت الحيوانات تتغذى على T2 و T3 و T4 من تلك التي تغذيها العليقة الكنترول. بالنسبة لقياسات سائل الكرش الأمونيا الأحماض الدهنية الطيارة (وجود فروق ذات معنوية (P <0.05) بين المجموعات حيث كان تركيزات الأحماض الدهنية هى الأعلى معنويا مع علائق البنتونيت أو مخلوط الخميرة والنتونيت (T3 ,T4) .بينما لم يلاحظ وجود فروق ذات معنوية لبعض مكونات الدم بين المعاملات فيهما عدا اليوريا التى أظهرت إنخفاضا معنويا مع عليقة البنتونيت وإنخفاض غير معنوى مع باقى العلائق المختبرة مقارنة بالكنترول.من ناحية أخرى،فقد إرتفع معدل النمو اليومى مع علائق البنتونيت والخميرة مع البنتونيت (T3 ,T4) ولكن الزيادة غير معنوية مقارنة بالكنترول ولكن معد التحويل الغذائى هو الأفضل معنويا مع هذه العلائق المختبرة مقارنة بالكنترول. من خلال النتائج يمكن استنتاج أن إضافة كلا من الخميرة الجافة والبنتونيت أو كلاهما لعلائق العجول الجاموسى له آثار إيجابية من الهضم، القيمة الغذائية، وبعض قياسات الكرش وكفاءة التحويلية كما تحسنت، الكفاءة الاقتصادية.وايضا كانت هناك زيادة فى معدل النمو ولكن غير معنوية للعلائق المختبرة مقارنة بالكنترول.