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EFFECT OF SUPPLEMINTING GROWING BUFFALO CALVES RATION WITH LACTOBACILLUS CONCENTRATE ON GROWTH RATE AND FEED EFFECIENCY

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SUMMARY

A total number of 14 growing male and female buffalo calves were used in this study. Mean initial weight was about 150 kg and mean age was 9 months. Animals were divided into two similar groups (7 heads from each sex). The control group was fed a daily ration of concentrate feed mixture, rice straw and berseem in 50:25:25 ratio on dry matter basis. The treated group received the control ration supplemented with 5 gm of Lactobacillus concentrate (LBC) h/d. The experiment was extended for 12 months (till animals reached 21 month old).

Results indicated that LBC supplementation resulted in a significant increase in average daily gain for the treated group during the different experimental periods except that of the 4th experimental interval.

Data also indicated that total DMI, SVI and DCPI values during the different experimental intervals were lower for treated group as compared to the control except that during the third experimental interval (15-18 month old).

In general feed efficiency values calculated on DM, SV and DCP were better for LBC supplemented group. Supplementation of LBC did not affect serum total protein, albumin, globulin, A/G, Ca, P or Mg concentrations.

Keywords: Buffalo calves, growth, feed utilization, lactobacillus

INTRODUCTION

The increasing demand for food by the growing world population has high lighted the importance of maximizing the efficiency of animal production.

An integrated approach to this problem involving inprovements in nutrition, genetics, husbandry, etc, has led to significant progress and shown that pharmacological growth-promoting agents have an important role to play.

Growth-promoting agents include all agents that improve the efficiency with which healthy animals convert feed nutrients into desirable animal products (Broome, 1980).

Lactic acid type of bacteria is known to utilize lactic acid, although it is not normally found in appreciable amounts in the gut unless in abnormal situations (Church, 1979).

Commercial production of lactobacillus culture concentrate has now entered a more a reputable era. It has been used to prevent scouring in calves (El-Garhy, 1982).

Moreover, it has been used for fattening buffalo calves (Hussein, 1986). El-Ashry *et al.* (1993) used LBC to enhance the performance of buffalo heifers. The objective of this trial is to study the effect of supplementing buffalo calves diets with LBC on their productive performance.

MATERIALS AND METHODS

A total number of 14 buffalo calves (about 9 months old, 150-156 kg live body weight (LBW) were used. Animals were divided into 2 similar groups (7 animals each), the first group received no LBC (control diet) while the second group received daily feed supplemented with 5 gm LBC/ h/day.

The experiment was extended till animals reached 21 months old. The experiment was divided into 4 experimental intervals each of 3 months. Rations were formulated from concentrate feed mixture (CFM), berseem and rice straw (50:25:25), dry matter basis. Fasting body weight was recorded twice a month. Daily feed was offered at the level of 2.5% of live body weight. The daily ration was offered in two portions daily at 9 a.m and 2 p.m. The daily dose of LBC was offered to each animal with CFM. Fresh water was available for the animals twice a day at 8 am and 3 pm. Chemical composition of different feedstuffs was determined according to A.O.A.C. (1995). The chemical composition of the ration ingredients is shown in Table 1. The feeding value of the experimental ration was calculated according to El-Ashry *et al.* (1994).

Table 1. Chemical composition of the feed mixture, rice straw and berseem (DM%)

Items	Diet ingredient		
	CFM	Rice straw	Berseem
DM	90.82	92.46	18.50
CP	17.08	2.03	13.10
CF	9.90	29.14	33.50
EE	2.80	0.49	2.90
NFE	63.32	50.54	37.60
Ash	6.90	17.80	12.90

Blood samples were taken from the jugular vein before morning feeding once monthly. A sample of ten ml of blood from each animal was withdrawn. Blood serum was obtained after incubation of blood samples for 2 hr at 38°C, then centrifuged at 3000 r.p.m for 15 min.

The blood serum was separated into clean dried glass vials and stored at -18°C until the analysis. Serum total protein was determined by a calorimetric method using the biuret reagent as described by Armstrong and Carr (1964). The determination of serum albumin was carried out according to the method of Doumas *et al.* (1971). The concentration of globulins was calculated by subtracting albumin from the total protein concentration. Serum transaminases (GOT and GPT) were determined calorimetrically by the method of Reitman and Frankel (1957). Serum urea was determined calorimetrically by the method of Patton and Crouch (1977).

The statistical analysis was computed using analysis of variance procedure described in the SAS (SAS, 1988) separation among means was carried out using the method of Duncan (1955).

The following fixed model was used to describe the data

Yijk = u + Ti + Mj + Tmij + Eijk (for productive performance)

Yijkl = U + Ti + Mj + Gk + Tmij + Eijkl (for blood parameters)

Where:

Yijk : is the parameter under analysis.

Y : overall mean.

Ti : treatment

Mj : effect due month of age

Tmij : interaction (treatment x month)

Eijk : error

Gk : effect due gender of animal

RESULTS AND DISCUSSION

Data in Table 2 show that mean initial live body weight of the two calf groups did not differ significantly. Starting from the first experimental interval mean body weight of lactobacillus supplemented group surpassed the control by about 6.8%; By the end of the second, third and fourth experimental interval, differences in mean live weights reached 9.9, 9.7% and 8.7%, respectively.

Mean body weights of the present study are lower than those reported by El-Ashry *et al.* (1993) who reported mean values of 228, 299, 347, 385 and 426 kg at 9, 12, 15, 18 and 21 month old for buffalo heifers fed rations supplemented with 6.5 gm LBC/h/d.

On the other hand, results of the present study are within the range reported by Ragab and Abdel Salam (1962) who reported mean body weights at 12, 18 and 24 months old, 218, 300 and 367 kg, respectively. Also, El-Nouty (1971) found that mean body weights of buffalo heifers raised on high plane of nutrition were 157.1, 210.5, 265.4, 313.7 and 350 kg at 9, 12, 15, 18 and 21 month old, respectively.

Considering mean daily gains, it is clear that starting from the first experimental interval, rates of improvement for treated males, females and overall treated group were 10.8, 24.3 and 18.1% respectively. Significant improvements in daily gains were also recorded during the second and third experimental intervals (Table 2). It is evident that the overall mean gain for LBC supplemented group showed 110.9% of the control. Similar results were reported by El-Ashry *et al.* (1993), when they used 6.5 and 13 g LBC/head/day.

Table 2. Mean live body weights and cumnulative daily gains of buffalo calves fed ration supplemented with LBC during different experiment intervals

Age/month	Control			Treatment			Male	Female
	Male	Female	Mean	Male	Female	Mean	(8 heads)	(6 heads)
Initial weight(9 mo.)	150.00	148.00	149.00	154.67	154.25	154.46	152.24	151.13
9-12								
LB w/kg	193.33	187.25	189.86±18.9^b	202.67	203.00	202.86±9.94^a	198.00±16.1	195.13±17.0
DG g.	481.33	436.00	455.43±64.9^b	533.33	541.75	538.14±65.7^a	507.33±40.3	488.88±96.9
Rate of improvement				+10.8%	+24.3%	+18.1%		
12-15								
LBW	230.33	235.00	233.00±30.6^b	253.00	259.50	256.71±24.2^a	241.67±23.6	247.25±4.24
DG	411.00	530.50	479.29±25.9^b	559.33	627.75	598.93±173^a	485.93±151	579.13±228
Rate of improvement				+36.1%	+18.3%	+24.8%		
15-18								
LBW	284.00	288.25	286.43±41.1^b	317.67	311.50	314.14±30.3^a	300.83±36.9	299.88±40.5
DG	596.33	591.50	593.57±192^b	718.33	577.75	638.00±144^a	657.33±190	584.63±148
Rate of improvement				+20.4%	-2.4%	+7.5%		
18-21								
LBW	340.67	333.75	336.71±46.9^b	360.00	360.25	362.71±30.5^a	353.33±40.6	347.33±42.7
DG	629.00	505.50	558.43±164^b	567.00	541.50	539.57±89^a	583.00±120	523.50±134
Rate of improvement				-9.86%	+7.0%	-3.5%		
Overall mean								
Total gain kg	190	185.75	187.7	211.33	206.0	208.30	201.10	195.80
Mean DG g	522.4	508.9	514.3	579.0	564.4	570.5	550.9	536.6
Rate of improvement				+10.9%	+11.0%	+10.9%		

Overall means within the same line bearing different superscripts differ significantly (P< 0.05).

The superiority of LBC treated group could be explained by the fact, that LBC supplement leads to some kind of domination of lactic acid bacteria, which lead to an increase in ruminal lactic acid production. The latter acts as a precursor of propionic acid. Consequently, propionate production is increased while acetate production is decreased. There is evidence that propionate is utilized by the tissue of ruminants more efficiently than acetate. Propionate is more flexible as an energy source than acetate. Propionate enjoys the luxury of having the potential to be used for gluconeogenesis in addition to direct oxidation by the citric acid cycle. Having more substrate for glycolysis may provide significant energetic advantages to the ruminant at certain times by generating more reduced co-enzyme outside the mitochondrial membrane. Such possible advantages of propionate had been reported by Chalupa (1977), Dennis *et al.* (1980) Nagaraja *et al.* (1982) and Schelling (1984).

In general, the mean daily gains obtained in the present study are higher than those of El-Nouty (1971) and El-Ashry *et al.* (1994) on growing heifers at the respective ages. Also, Ragab and Abdel Salam (1962) reported mean daily gains of 457, 389, 553 and 445 gm/d during age periods 4-6; 6-12; 12-18 and 18-24 months age.

Pooling the data to investigate sex effect, indicated that during first, third and fourth experimental intervales male calve showed higher daily gain by about 4, 12.5 and 11.5%. While during the second experimental interval (12-15 month of age); daily gain of male calves represented 85% of that of the females. The overall difference through out the whole experiment between male and female calves did not reach 3% which proved to be not significant (P>0.05).

Feed intake during the different experimental intervals are presented in Table 3. It is obvious that feed intake values for LBC treated group were insignificantly lower than control during the first and second experimental intervals. During the third experimental interval (15-18 month old), the LBC treated group showed significantly (P< 0.05) higher intake values; Thereafter, during the 4 experimental intervals treated group consumed significantly (P<0.05) lower DM, SV and DCP compared to control calf group.

Considering overall mean intake/head through out the whole experiment (Table 3) it is clear that LBC treated group consumed about 94% of the control treatment.

Concerning sex effect on intake, values in Table 3 indicated that female calves consumed 97, 105, 102, 113% of that consumed by male calves during the 1*st*, 2*nd*, 3*rd* and 4th experimental intervals respectively. The overall mean intake value for the whole experiment for female calves was higher than that of male calves by 4%.

Table 3. Mean total dry matter intake (DMI), starch value intake (SVI) and digestible crude protein intake (DPI) of buffalo calves fed ration supplemented with different levels of LBC, kg

Age/month	Control			Treatment			Male	Female
	Male	Female	Mean	Male	Female	Mean	(8 heads)	(6 heads)
9-12								
DMI	428.63	445.81	437.22±28.91	435.21	392.93	414.10±27.04	431.92±28.92	419.31±27.04
SVI	212.49	220.97	216.73±14.4	215.19	194.79	204.99±13.47	213.84±14.4	207.88±13.5
DCPI	64.58	67.40	65.99±3.67	65.42	61.10	63.26±3.43	65.00±3.67	64.25±3.43
12-15								
DMI	546.36	485.30	515.83±39.37	429.86	540.02	484.94±39.37	488.12±42.10	512.66±36.5
SVI	270.42	239.23	254.87±19.40	213.14	267.35	240.24±19.40	244.78±20.74	253.29±17.20
DCPI	82.03	72.16	77.10±5.95	64.69	81.11	73.00±5.95	73.36±6.40	76.64±5.51
15-18								
DMI	472.00	607.64	539.82±32.13^a	751.77	633.21	692.49±32.13^b	611.88±34.34	620.43±29.74
SVI	250.55	300.84	275.70±16.20^a	370.59	313.61	342.10±16.20^b	310.57±17.32	307.23±14.20
DCPI	71.16	91.53	81.34±4.10^a	112.49	95.22	104.00±4.10^b	91.83±5.12	93.37±4.34
18-21								
DMI	718.26	783.49	750.87±49.41^a	521.25	623.69	572.47±49.41^b	619.75±49.41	703.59±49.41
SVI	352.46	406.24	379.35±26.25^a	275.12	309.98	292.55±26.25^b	313.79±26.25	358.12±26.25
DCPI	107.78	122.76	115.27±8.00^a	83.16	94.51	88.84±8.00^b	95.47±8.00	108.64±8.00
Overall mean								
DMI	2165.26	2322.24	2243.74	2138.09	2189.85	2164.00	2151.67	2256.05
SVI	1085.92	1167.28	1126.60	1074.04	1085.73	1079.88	1079.98	1126.52
DCPI	325.6	353.85	339.7	325.76	331.94	329.07	325.66	342.9

Overall means within the same line bearing different superscripts differ significantly (P< 0.05).

Concerning feed efficiency values (Table 4); it is clear that best feed efficiency values calculated as DM, SV and DCP intake/gain were obtained during the first experimental interval (9-12 month old). Feed efficiency decreased gradually as experiment advances. Lowest values were recorded for the last experimental interval. It is of interest to note that feed efficiency calculated as DM, SV and DCP values were better for LBC treated group throughout the different experimental intervals. Differences in feed efficiency between control and treated group proved to be not significant (P>0.05).

Generally, the present results concerning feed efficiency are within the range reported by El-Baramony (1995) who reported mean values of 5.06, 5.56, 7.65 and 8.56 kg SV/kg LBWG. at 12, 15, 16 and 21 month old.

Pooling the data to study sex effect, it should be noted that different values of female feed efficiency were better than male values during the first and second experimental periods. On the other hand, male efficiency values proved to be better than female ones during the third and fourth experimental intervals.

Blood serum analysis presented in Table 5 indicate that no significant differences were detected between control and LBC supplemented calf groups in total protein.

The present total serum proteins are within the range reported by Fouad *et al.* (1975), Maareck (1990) and El-Baramony (1995). The present values are some what lower than the value reported by Mohi El-Din (1992). On the other hand, the total serum proteins of the present study are lower than those reported by El-Sayed (1991) and El-Ashry *et al.* (1994). Such differences may due to one or more of the following factors, (1) level of protein intake, (2) method of analysis applied for determining total protein content.

It is of interest to note that serum total proteins did not differ due to sex (male *vs* females). However, it should be noted that highest total proteins value was that recorded at 9 month old calves then a gradual decrease in total serum proteins was recorded with advancing age to reach lowest value at 21 month old.

No significant differences were detected between albumin values in control and LBC treated group.

Albumin values obtained in the present study are within the range reported for buffalo calves by Maareck (1990); Moreover the present results are in agreement with El-Ashry *et al.* (1994) and Hussein (1986).

The data in Table 5 showed non significant decrease for globulin content in LBC treated group as compared to control values. Pooling the data, indicated that female calves tended to show non-significant higher globulin content.

Table 4. Mean dry matter efficiency (EDM), starch value efficiency (ESV) and digestible crude protein efficiency (EDCP) of buffalo calves fed ration supplemented with LBC (kg/kg LBC)

Age/month	Control			Treatment			Male	Female
	Male	Female	Mean	Male	Female	Mean	(8 heads)	(6 heads)
9-12								
EDM	10.13	10.08	10.10±2.78	9.10	7.90	8.41±1.49	9.62±1.60	8.99±2.81
ESV	4.70	4.98	4.86±1.37	4.50	4.83	4.69±0.93	4.60±0.70	4.90±1.40
EDCP	1.43	1.53	1.49±0.43	1.37	1.25	1.30±0.19	1.40±0.22	1.39±0.42
12-15								
EDM	15.23	12.85	13.87±4.48	8.60	9.70	9.23±2.81	11.92±4.33	11.28±4.60
ESV	7.53	6.35	6.86±2.22	4.23	4.80	4.56±1.39	5.88±2.15	5.58±2.28
EDCP	2.30	1.92	2.08±0.67	1.30	1.48	1.40±0.44	1.80±0.65	1.70±0.69
15-18								
EDM	9.28	12.28	10.99±3.50	12.10	11.95	12.01±3.08	10.69±3.13	12.11±3.34
ESV	5.00	6.53	5.87±2.40	5.67	5.93	5.94±1.51	5.48±1.68	6.23±2.15
EDCP	1.37	1.98	1.71±0.70	1.80	1.83	1.81±0.46	1.58±0.47	1.90±0.63
18-21								
EDM	12.60	17.73	15.53±6.93	11.07	13.58	12.50±3.51	11.83±2.60	15.65±6.66
ESV	6.33	8.65	7.66±3.30	5.83	6.75	6.36±1.96	6.08±1.65	7.70±3.20
EDCP	1.93	2.63	2.33±0.98	1.73	2.05	1.91±0.60	1.83±0.53	2.34±0.95
Overall mean								
EDM			12.62			10.54	11.02	12.01
ESV			6.31			5.39	5.51	6.10
EDCP			1.90			1.61	1.65	1.83

Table 5. Effect of inclusion of LBC on mean blood parameters

Items	Treatment			Gender		
	Control	LBC	SE	Male	Female	SE
Total protein (g/100ml)	7.34	7.31	0.11	7.34	7.40	0.11
Albumin (g/100ml)	4.28	4.35	0.07	4.32	4.30	0.07
Globulin (g/100ml)	3.15	2.92	0.07	3.02	3.10	0.07
A/G	1.38	1.52	0.05	1.50	1.43	0.05
Urea (mg/100ml)	40.06	43.18	1.09	41.20	41.64	1.09
Ca (mg/100ml)	9.99	9.82	0.25	9.79	10.04	0.25
P (mg/100ml)	4.90	4.83	0.11	4.77	4.93	0.11
Mg (mg/100ml)	2.34	2.32	0.05	2.32	2.33	0.05

Considering age affect, (Table 6), it is clear that highest total protein content was that at 9 month of age and decreased gradually with age to reach the lowest value (7.01%) at 21 month of age. Also, serum albumin value was the highest at 9 month of age and tended to decrease to reach minimum value at 21 month old. Similar results were reported by El-Ashry *et al.* (1994). In general the present results of albumin are within the range reported by Maareck (1990) on buffalo calves.

Globulines tended to be higher for the control group. However, difference was not significant, female calves tended to show non significant higher values. Globulin values of the present study are within the range reported by Maareck (1990) and El-Ashry *et al.* (1994).

A/G of the present study ranged between 1.4 to 1.56. Also, Maareck (1990) report a range from 1.48 to 1.51. Neither differences due treatment, sex nor age proved to be significant.

Urea the only parameter which showed significant difference where LBC treated group showed higher value. No differences were detected between male and female calves (Table 5). Lowest urea level was recorded at 12 month of age while highest values was obtained at 21 month old. The present results of urea are higher than those reported by Zein El-Abdin *et al.* (1975).

Considering Ca in serum (Tables 5 & 6), it is clear that its content ranged between 9.60 and 10.31 mg% at 15 and 21 month old. Very close values for buffalo were reported by Zein El-Abdin *et al.* (1975). Also, inorganic phosphorus level was 4.91 for control and 4.8 mg % for LBC treated groups respectively. It is clear that P level in serum tended to be higher in female than in male calves.

Considering age effect, it is clear that highest inorganic phosphorus content was at 9 month old calves then decreased gradually to reach minimum at 21 month old calves. Very close results were reported by Boshra (1999). Higher values were reported by Zein El Abdin *et al.* (1975) namely 6.6 mg%).

Concerning serum Mg, it is clear that neither LBC treatment nor, sex did not affect its levels. However, highest Mg content was recorded for 12 month old calves thereafter its content decreased. The present values are higher than those reported by Boshra (1999) for Friesian calves (being 1.93 mg%). Such differences may be due to species differences.

Table 6. Effect of inclusion of LBC on LBC on mean blood parameters

Items	9	12	15	18	21	SE
Total protein (g/100ml)	7.61	7.47	7.41	7.39	7.01	0.11
Albumin (g/100ml)	4.44	4.31	4.32	4.31	4.23	0.07
Globulin (g/100ml)	3.19	3.17	3.09	3.08	2.78	0.07
A/G	1.40	1.42	1.44	1.43	1.56	0.05
Urea (mg/100ml)	41.73	39.61	42.45	41.23	43.10	1.09
Ca (mg/100ml)	9.83	10.04	9.63	9.73	10.31	0.25
P (mg/100ml)	5.41	5.10	4.39	4.76	4.67	0.11
Mg (mg/100ml)	2.40	2.44	2.26	2.30	2.26	0.05

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