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Supplementing Metafos and Biomix-DB as growth promoters on the performance of bull calves

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Abstract

The effect of two growth promoters Metafos and Biomix-DB was studied under 3 treatment groups having 4 animals in each and designed in RBD on growing crossbred bull calves. The treatment groups were: (i) T_0 = Green grass + concentrate (1.5 kg), (ii) T_1 = Green grass + concentrate (1.5 kg)+ Metafos and (iii) T_2 = Green grass + concentrate (1.5 kg)+ Metafos + Biomix-DB. The experiment was conducted for a period of 90 days. Digestion trial was performed in the last part of the experiment. Daily feed intake and weekly live weight gain was recorded. There was no significant ($P>0.05$) difference in daily dry matter intake among the animals of the treatment groups. The total live weight gain and the daily average live weight gain were 27.75, 32.50 and 45.25 kg and 0.308, 0.361 and 0.503 kg/d for treatments T_0, T_1 and T_2 respectively, of which T_2 was significantly ($P<0.05$) higher both in terms of total and daily live weight gain than those of the other treatments. Feed conversion efficiency (DMI/BWG) of different treatment groups were 10.17, 8.43 and 6.01 for T_0, T_1 and T_2 respectively, where the value for T_2 was significantly ($P<0.05$) higher than that of T_0. There was no significant ($P>0.05$) difference among the treatments for co-efficient of digestibility and nutritive value of different nutrients. The average total costs of T_0, T_1 and T_2 treatment group were Tk.4888, Tk.4948 and Tk.5010 respectively. The average net returns from T_0, T_1 and T_2 treatment group were Tk. 609, 749 and Tk.1238 respectively. It may concluded that, Metafos (15 ml/animal) combined with Biomix-DB (5 g/5 kg concentrate) may be used for fattening of bull calves which gives better results than Metafos alone or without Metafos.

Keywords: Bull calves, Growth promoters, Digestibility, Cost and return

Introduction

Livestock plays a potential role in the national economy of Bangladesh a vital component of agriculture. The contribution of the livestock to country's gross domestic product (GDP) is 2.95 per cent and to agriculture 15.10 per cent and also contributes 95 per cent of draught power to agriculture and provides full-time employment to about 25 per cent of total population (GOB, 2002). Cattle of Bangladesh ranks 12th in the world and in the Asian countries, her position is third (Alam *et al*., 1994). It is noted that 75 per cent cattle population of the world is in the developing countries but its contribution is only 34 per cent to the beef production. The annual meat production in Bangladesh was 4.60 lack MT in 1991/92 but in 2000- 01 it was increased to 7.30 lack MT (GOB, 2002). Beef is the major contributor to the total meat yield. Beef is the most preferred meat source than others in our country. The sources of beef are usually bull calves, unusable draught animals and culled dairy cows. There is a great scarcity of animal protein for human consumption in our country. The demand for beef and milk in Asia in 2020 was predicted to be 2.6 and 2.7 times of that in 1993 consequently (Delgado *et al.,* 1999). The increase in milk supply will most likely come from increasing number of dairy animals, which means that more male dairy calves will be available for beef production. According to Skunmun *et al.,* (2002) the increasing trends of beef demand have already been evident in several Southeast Asian countries such as Indonesia, Malaysia, Philippines and Thailand. Additional sources of beef supply could come from male dairy calves, which have not been utilize in most countries in Asia. In Bangladesh there is no beef breed and therefore, to meet up the beef deficiency, small scale dairy bull calves fattening is essential. In this context there is evidence of profitable beef production from dairy male calves which was reported by Buaphun *et al.*, (2000).

Furthermore, there are reasons to believe that the cost of dairy beef production can be further decreased through formulation of cheaper rations as well as improving calf management practices. Dairy beef production with appropriate economy of scale, through integrated farming approach utilizing crop by-products and wastes, with secured link to good quality beef market or cooperatives, can become a very viable enterprise in Southeast Asian countries in the coming decades. Modern technology is generated through research and adopted proper breeding, feeding, housing, management and disease control can raise the beef production to a higher extent. New products and technologies are continually introduced to beef producer. In general, most products or new technologies require an increase in input with the expectation of an improvement in animal performance that will return an increase in cash flow above the cost of implementing the new technology. Growth promoters are those non-nutritive substances, which enhance the body weight gain of animal. Growth implants were first approved for beef cattle in the 1950s (Raun and Preston 1997). Since that time a great deal of research has created growth-promoting products that yield consistent responses and are easy to use. A review by Selk (1997) concludes that implanting growth promoters in steer and heifer calves enhance average daily gain, improving the profitability of a ranching operation and the use of growth-promoting implants in suckling beef calves increases average daily gain (ADG) by 0.04 kg/day in steers and by 0.05 to 0.06 kg/day in heifers.

Special consideration also must be given to implant strategies for replacement heifers. There is a shortage of cattle feeds and fodder, so for successful cattle fattening, supplementation of growth promoters and feed additives is essential. Thus, the present study was undertaken with the following objectives: (i) To observe the effect of supplementing Metafos and Biomix-DB on feed intake, growth and digestibility of bull calves. (ii) To estimate the cost and return in fattening of bull calves using growth promoters.

Materials and Methods

Animals and experimental design

The experiment was carried out at the Dairy Farm of the Department of Dairy Science of Bangladesh Agricultural University, Mymensingh, Bangladesh from 9th September 2003 to 9th December 2003. The experiment was conducted with twelve crossbred bull calves nearly 1.5 year old under 3 treatment groups having 4 animals in each. The treatment groups were: (i) T_0 = Green grass (*ad libitum*) + concentrate (1.5 kg), (ii) T_1 = Green grass (*ad libitum*) + concentrate (1.5 kg) + Metafos and (iii) T_2 = Green grass (*ad libitum*) + concentrate (1.5 kg) + Metafos + Biomix-DB. Metafos and Biomix-DB were produced by Techno Drug, Dhaka, Bangladesh. The management conditions of the 3 treatment groups were similar. Animals were fed individually. Chemical ingredients of Metafos and Biomix-DB are given in below Table 1.

Daily ration and feeding method

The animals were supplied with *ad libitum* green grass and 1.5 kg concentrate mix (wheat bran + Sesame oil cake). They were also supplied roughages and concentrate at the rate of 3 kg DM/100 kg live weight to satisfy the maintenance requirement and expected 0.5 kg body weight gain/animal/day. The ration was formulated according to Agricultural Research Council (ARC, 1990). Common salt was supplied on the basis of 1 kg/100 kg concentrate mixture. Chemical composition of feed ingredients used in the experimental diet is shown in Table 2.

Table 1. Ingredients of Metafos and Biomix-DB with their dose and root of application

Growth promoter	Ingredients	Quantity	Dose	Root of application
		(per ml)		
Metafos (4 dimethylamino-0-tolyl phosphoric acid)	Toldimphos sodium INN	200 mg	15 ml/animal. 10 ml in 1st dose and 5 ml in 2nd dose. 2nd dose is applied after 1.5 months of 1st dose application.	From the total quantity 1/2 subcutaneous and rest 1/2 intravenous & intramuscularly injected.
		(per 1000 g)		
	Vitamin A	10,000,000 IU	@ 5 g in 5 kg concentrate feed	Mixed with concentrate feed and fed to animals.
	Vitamin D_3	1,000,000 IU		
	Vitamin E	10.00 g		
	Cobalt	0.8 g		
	Cupper	6.00g		
	Iron	80.00 g		
	Iodine	2.50 g		
	Manganize	50.00 g		
	Magnesium	100.00 g		
	Selenium	0.10 g		
	Zinc	45.00 g		

Source: Ali, M. A and M.J. Hossain. *Oushodh Nirtheshica* **.** Techno Drugs. ISO 9001 Certified. Dhaka, Bangladesh

Table 2. Chemical composition of feed ingredients used in the experimental diet

Feed ingredients	DM (g/100 g sample)	Chemical composition (g/100 g DM)					
		CP	CF	EE	Ash	NFE	OM
Green grass	23.07	8.71	35.17	2.31	9.30	44.51	90.70
Wheat bran	87.10	17.76	10.23	4.30	6.90	60.81	93.10
Sesame oil cake	90.05	32.70	10.97	11.34	10.78	34.21	89.22

Measurements

Feed intake: The animals consumed all of the concentrate (1.5 kg/animal/d) but there were some leftover of green grass every day. Green grass that was left in the individual manger of calves was weighed daily very early in the next morning before cleaning and offering feeds to the experimental animals. The green grass intake was calculated by subtracting the amount of leftover from the amount of green grass supplied on the previous day.

Live weight changes: The initial body weight of each animal was recorded and the animals were weighed weekly by using weigh band and the weightings were carried out at the same time (at 7.30 am) before offering feeds to them. The live weight gain was measured by subtracting the initial live weight from the final live weight. The rate of gain per day was calculated by dividing the total live weight gain by the number of total experimental days.

Digestibility trial: To find out the digestibility of nutrients, a conventional digestion trial was conducted for a period of 7 days at the end of the experiment. The total amount of feed supplied to each animal during 24 hours were recorded and the representative feed sample were collected daily and stored for proximate analysis. The total quantity of faeces excreted by each animal were weighed and recorded for 7 days. Faeces were collected for 24 hours

and kept in polythene bag in air tight condition to avoid moisture and volatile nitrogen loss and also to avoid contamination of faeces with dirt and urine. Every day about 5% of well mixed faeces sample were collected and sun dried separately for each animal. At the end of the digestibility trial the sun dried faeces sample of 7 days for individual animal were mixed together, dried and ground for chemical analysis. A few amount of fresh faeces sample were also collected every day for respective animals and stored in deep freezer at -20^{o} C in order to determine DM and CP.

Chemical analysis: The proximate components- crude protein (CP), crude fiber (CF), ether extract (EE), Ash, nitrogen free extract (NFE) of feed staff and faeces sample were determined following the method of AOAC (1990).

Calculation of cost and returns: Cost and returns in fattening of the experimental bull calves were calculated as follows: Calf buying cost: As per BAU Dairy Farm Rules. Feed cost: Feed ingredient cost was calculated based on the local market price. Green grass Tk.0.5/ kg, wheat bran Tk. 9.5/kg, oil cake Tk. 10/kg and salt Tk. 5/kg. Growth promoter and feed additive cost: Metafos Tk.250/ 50 ml, Biomix-DB Tk. 34/100g. Deworming cost: Tk 15/tablet. Miscellaneous cost: Average Tk. 40/treatment group. Labour cost: Labour cost has not been included because the experiment was conducted by researcher ownself. Return from cowdung selling: Tk. 0.35/ kg cowdung. Return from sac selling: Tk. 10/Sac. Return from bull selling: The sell values of bulls were based on BAU Dairy Farm Auction Price.

Statistical analyses: The experiment was conducted in a randomized block design (RBD) and data were analyzed for significant differences among various treatments by using MSTAT-C program. Duncan's Multiple Range Test (DMRT) was also done to compare the treatment means for different parameters.

Results and Discussion

Feed intake: The average daily total dry matter (DM) intake of different treatment groups of the experimental animals is shown in Table 3. It can be seen from the table that daily DM intake of the animals were 3.32, 3.31 and 3.26 kg for treatment groups T_0, T_1 and T_2 respectively. It was observed that the average DM intake was more or less similar for all treatment groups, i.e. there were no significant (P>0.05) difference in daily DM intake among the animals of T_0, T_1 and T_2 treatment groups. DM intake (kg per 100 kg live weight) of animals of different treatment groups is shown in Table 3. The DM intake kg per 100 kg live weight of animals were 2.99, 2.8 and 2.66 for T_0, T_1 and T_2 treatment groups respectively and there were no significant (P>0.05) differences among the treatments (T_0, T_1 and T_2). So, Metafos had no significant effect on feed intake.

Feed conversion efficiency: Feed conversion efficiency (DMI/LWG) of animals of different treatment groups are shown in Table 3. The amount of feed required per kg live weight gain of treatments T_0, T_1 and T_2 were 10.17, 8.43 and 6.01 kg respectively. The result showed that there were significant (P<0.05) differences among the animals of different treatment groups for feed conversion efficiency. The animals implanted with Metafos (T_1) alone or combined with Biomix-DB (T_2) showed significantly (P<0.05) superior values for feed conversion efficiency than that without Metafos (T_0). However, significant (P<0.05) difference was also observed between T_1 and T_2 treatment groups. The findings of the present study are in agreement with the findings of several researchers, for example, Holzer *et al.* (1999) found

that the average feed conversion efficiency were increased by recombinant somatotropin (rbST) treatment by 10% (P<0.016) in Holstein-Friesian bull calves . Similarly, Rausch *et al.* (2002) found that treatment with bovine somatotropin (bST) in growing beef cattle increased feed efficiency 8.1% (12.3 vs. 13.3 gain [g]: feed [kg]; P < 0.05). Bonomi (2000) found that addition of DL-carnitine (4-6 g/animal/day) to the diet of Italian Friesian steers improved feed conversion (by 12.5-17%).

Table 3. Intake and feed conversion efficiency of bull calves of different treatments

Parameters		Treatments[#]		SED	Level of significance
	T_0	T_1	T_2		
No. of animals	4	4	4		
Total DM intake (kg/d)	3.32	3.31	3.26	0.13	NS
DM intake (kg/100kg LW)	2.99	2.80	2.66	0.32	NS
Feed conversion efficiency (DMI/LWG)	10.17[a]	8.43[ab]	6.01[b]	1.04	*

[a,b] Mean values having different superscripts in a row differ significantly (P<0.05)
[#] T_0 = Green grass *ad libitum* + concentrate (1.5kg)
T_1= Green grass *ad libitum* + concentrate (1.5kg) +Metafos
T_2 = Green grass *ad libitum* + concentrate (1.5kg) +Metafos + Biomix- DB
NS = Non significant
P<0.05
SED = Standard error of difference

Growth performance

The mean values for live weight gain and cumulative live weight gain in animals of different treatment groups are presented in Table 4. Total live weight gain were 27.75, 32.50 and 45.25 kg for treatments T_0, T_1 and T_2 respectively. It is evident from the table that when Metafos is implanted with Biomix-DB, the live weight gain is higher than that of Metafos alone or Metafos un-implanted group. The animals of T_2 treatment groups showed significantly (P<0.05) higher total live weight gain than those of T_1 and T_0 treatment groups, but there were no significant (P>0.05) differences in the live weight gain between T_0 and T_1, though a linear increase in live weight gain was observed in treatment T_0 and T_1 (Figure 3). The total live weight gain of the present study are agrees with the findings of Keane (1988) who stated that Friesian steers implanted twice at an interval of 70 days with 20 mg oestradiol plus 200 mg progesterone (Implix BM), 20 mg oestradiol plus 200 mg progesterone (Synovex-S), Implix BM plus Finaplix, Synovex-S plus Finaplix, or 20 mg oestradiol plus 140 mg trenbolone acetate (Revalor); compared with the control group, treatments increased body weight gain by an average of 49.0, 55.2, 66.9, 58.9 and 61.8 kg respectively. Salles *et al.* (2000a) reported that monensin significantly (P<0.05) improved weight gain in Holstein bull calves. In another experiment Rumsey *et al.* (1999b) found final live weight were 38.7 kg greater (P<0.01), for growth promoter Synovex-S (SYN) implanted steers than that of not implanted. The daily average live weight gains in animals of T0, T1 and T2 treatment groups were 0.308, 0.361 and 0.503 kg respectively. Live weight gain (kg/d) in T_2 treatment group was significantly (P<0.05) higher than those of T_1 and T_0 treatment groups. However, animal in T_1 and T_0 treatment groups showed no significant (P>0.05) difference for live weight gain (kg/d). The daily average live weight gain of calves of present experiment are in agreement with those of Lopez and Vazquez (1984) who found daily gains averaged 530 g in crossbred zebu steers implanted with 24 mg oestradiol-17 beta.

Table 4. Growth performance of bull calves of different treatments

Parameters		Treatments[#]		SED	Level of significance
	T_0	T_1	T_2		
No. of animals	4	4	4		
Initial live weight (kg)	89.75	89.00	89.25	8.44	NS
Final live weight (kg)	117.50	121.50	134.50	7.71	NS
Total live weight gain (kg)	27.75[b]	32.50[b]	45.25[a]	4.72	*
Average live weight gain (kg/d)	0.308[b]	0.361[b]	0.503[a]	0.05	*

[a,b] Mean values having different superscripts in a row differ significantly (P<0.05)
[#] T_0 = Green grass *ad libitum* + concentrate (1.5kg)
T_1= Green grass *ad libitum* + concentrate (1.5kg) +Metafos
T_2 = Green grass *ad libitum* + concentrate (1.5kg) +Metafos + Biomix- DB
NS = Non significant
* = P<0.05
SED = Standard error of difference

Co-efficient of digestibility and nutritive value

The effect of Metafos and Biomix-DB on apparent digestibility of proximate components of experimental diets is shown in Table 5. There were no significant (P>0.05) differences among the treatments for co-efficient of digestibility of dry matter (DM), organic matter (OM), crude protein (CP), crude fiber (CF), ether extract (EE), and nitrogen free extract (NFE). From the Table 5, it is indicated that there was no effect of Metafos on co-efficient of digestibility of proximate nutrients. Though there are no significant differences among the treatments for co-efficient of digestibility of different nutrients but the values of T_2 treatment is slightly higher than those of T_0 and T_1 treatments. Roy *et al*. (1999) also observed those immunized (IMM) dairy calves against human-globulin (hG-IMM) and SRIF conjugated to hG (SRIF-IMM); nutrient digestibility, were not affected by SRIF immunization or GRF infusion.
Digestible organic nutrients- digestible crude protein (DCP), digestible crude fiber (DCF), digestible ether extract (DEE), digestible nitrogen free extract (DNFE), total digestible nutrients (TDN) and digestible organic matter (D' value) of different treatments are presented in Table 4. There were no significant (P>0.05) differences among the treatments for digestible organic nutrients.

Metafos and Biomix-DB are not hormone or enzymes. Metafos is a solution of organic phosphorus and Biomix-DB is a premix of vitamins and trace minerals. Thus, there no health hazard of Metafos and Biomix-DB on human body.

Cost and return

The cost and returns of different treatment groups of bull calves are shown in Table 6. The average total costs of T_0, T_1 and T_2 treatment groups for the study were Tk.4888, 4948 and Tk.5010 respectively. The average net returns (Tk.) of T_0, T_1 and T_2 treatment groups were 609, 749 and 1238, respectively. There were no significant differences among the treatment groups for cost and return but return from T_2 treatment was obviously higher than that of T_0 and T_2 treatments. Return from T_1 treatment was also higher than that of T_0. According to Ahmed *et al*., (2002) feed cost for 3 months cattle fattening involved Tk. 1500 and 2200 for control and treated groups, respectively. Average buying price of calves for the control and treated groups was Tk, 3833 and 3733 respectively. The corresponding returns were Tk. 1951.67 and 2050 for the control and treated groups respectively.

Table 5. Co-efficient of digestibility and nutritive value of different treatments

		Treatments[#]		SED	Level of significance
	T_0	T_1	T_2		
No. of animals	4	4	4		
Co-efficient of digestibility					
DM	56.5	59.0	61.3	3.16	NS
OM	61.2	63.2	65.3	3.16	NS
CP	62.1	65.2	64.9	2.23	NS
CF	42.2	47.0	53.0	6.70	NS
EE	59.0	60.2	62.8	3.16	NS
NFE	66.1	68.0	69.1	2.23	NS
Nutritive value (g/100g DM)					
DCP	7.70	7.63	7.60	0.46	NS
DCF	8.22	7.83	9.04	2.09	NS
DEE	2.10	2.07	2.12	0.23	NS
DNFE	22.71	22.31	22.72	2.72	NS
DOM or D' value	40.73	39.83	41.48	5.27	NS
TDN	43.35	42.41	44.13	5.54	NS

[#] T_0 = Green grass *ad libitum* + concentrate (1.5kg)
T_1= Green grass *ad libitum* + concentrate (1.5kg) + Metafos
T_2 = Green grass *ad libitum* + concentrate (1.5kg) + Metafos + Biomix-DB
NS = Non significant
SED = Standard error difference

Table 6. Cost and return (Taka) of fattening the experimental bull calves under different groups

Parameters	Mean ± SD		
	T_0	**T_1**	**T_2**
No.of animal	4	4	4
Calf buying cost	3141 ± 1288	3115 ± 618	3124 ± 727
Feed cost	1681 ± 44	1687 ± 80	1693 ± 91
Growth promoter & feed additive cost	_	82 ± 0	130 ± 0
Medication cost	25 ± 6	23.25 ± 3.5	23 ± 4
Miscellaneous cost	40 ± 0	40 ± 0	40 ± 0
Total cost	4887 ±1337	4947 ± 696	5010 ± 810
Return from cow dung	165 ± 35	153 ±19	158 ± 38
Return from sac selling	31 ± 0	31 ± 0	31 ± 0
Return from bull selling	5301 ± 1499	5512 ± 792	6059 ± 1312
Gross return	5497 ±1533	5696 ± 801	6248 ± 1347
Net return	609 ± 205	749 ± 107	1238 ± 543

T_0 = Green grass *ad libitum* + concentrate (1.5kg)
T_1= Green grass *ad libitum* + concentrate (1.5kg) +Metafos
T_2 = Green grass *ad libitum* + concentrate (1.5kg) +Metafos + Biomix-DB
SD= Standard deviation

Conclusion

The results of the present study suggested that Metafos combined with Biomix-DB implanted in bull calves on green grass and concentrate based diet improved live weight gain without increasing total dry matter intake, that is to say, feed conversion efficiency was improved. Therefore, it may be concluded that Metafos (15 ml/animal) combined with Biomix-DB (5 g/5 kg concentrate) may be used for bull calves fattening compared to Metafos alone or without Metafos.

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