The Bangladesh Veterinarian (2008) 25(2) : 62 – 67

Broiler litter and layer manure in the diet of growing bull calves

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Abstract

An experiment was conducted for a period of 90 days with twelve local growing bull calves to study the effect of feeding broiler litter (BL) and layer manure (LM) on feed intake, digestibility, live weight gain (LWG) and feed costs. Calves were divided into four groups, three animals in each group and allocated four dietary treatments in a randomized block design. All animals were fed rice straw and green fodder *adlibitum* and 25% concentrate mixture was supplied. The concentrate mixture of control group A contained mustard oil cake, rice polish, wheat bran, di-calcium phosphate (DCP) and common salt. Instead of mustard oil cake, diet B contained 40% BL, diet C 40% LM, and diet D 20% BL and 20% LM. Differences in weight gain between groups were not significant ($p>0.05$). Feed conversion efficiency (FCE) of control group A was significantly ($p>0.05$) better than in group C. and non-significantly better than that of group B. The inclusion of broiler litter and layer manure in the ration did not significantly affect the digestibility of dry matter (DM), organic matter (OM), crude protein (CP), crude fibre (CF) and nitrogen free extract (NFE), but the digestibility of ether extract (EE) was significantly higher ($p<0.05$) in diet A than in C and D. Cost of meat production was significantly ($p<0.05$) higher for diet A than for diets B, C and D. (*Bangl. vet*. 2008. Vol. 25, No. 2, 62-67)

Introduction

Shortage of quantity and quality of feed are major factors limiting ruminant production. Straw-based diet with limited green fodder and a little or no concentrate is the main feed for cattle and buffaloes in Bangladesh. To overcome the scarcity of protein, agricultural and industrial wastes such as poultry manure, cow dung, sugarcane bagasse, wood pulp, slaughter house waste etc have been tested. Newton *et al.* (1977); Kumar *et al.* (1983) have described the economic and nutritional potential of these unconventional feeds in ruminant production.

Dried poultry manure can be successfully included in the feed of ruminants and non-ruminants (Akbar, 1983; Kumar *et al.,* 1983). Poultry manure contains about 28-30% crude protein (CP), of which 36-50% is true protein (Bhattacharya and Taylor, 1975). The use of broiler litter and layer manure in feed for ruminants decreases the cost and reduces their polluting effects on environment. They provide some of the animal's requirement for protein, energy and micronutrients.

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The present experiment was undertaken to assess the feed intake, nutrient digestibility and growth of bull calves fed broiler litter and layer manure as supplement, and to estimate the economic benefit.

Materials and Methods

Twelve growing indigenous bull calves, average body weight 66.5 ± 6.2 kg, were divided into four groups, three animals in each group. The animals were assigned to four rations A, B, C and D. The broiler litter and layer manure was dried in the sun up to about 85% DM. The material was ground in a Whiley mill and stored in a dry place. Concentrate mixture was prepared using wheat bran, rice polish, mustard oil cake, layer manure and broiler litter. The ingredients are shown in Table 1.

Table 1. Ingredient composition of concentrate mixture (kg/100kg) of the experimental diets

Ingredients	Concentrate mixture (kg/100kg)			
	A	B	C	D
Wheat bran	40.0	44.0	10.0	40.0
Rice polish	48.0	3.0	48.0	13.5
Mustard oil cake	10.0	11.0	-	4.5
Broiler litter	-	40.0	-	20.0
Layer manure	-	-	40.0	20.0
Di-calcium phosphate (DCP)	1.0	1.0	1.0	1.0
Salt	1.0	1.0	1.0	1.0
Total	100.0	100.0	100.0	100.0

Group A was fed rice straw and green *Dal* (*Hymenachne amplexicaulis*) grass as roughage and conventional concentrate mixture for 90 days. The other diets contained broiler litter and, or, layer manure. Each morning the required amount of concentrate was supplied to individual animals. The roughage was given to each animal twice daily, (8 AM and 4 PM). Fresh drinking water was given *adlibitum.*

Feed intake and live weight gain were recorded, and feed conversion efficiency calculated. In order to find out the digestibility of the components, a digestion trial was conducted for 10 days at the middle of the feeding trial. Representative samples of rice straw, green grass, concentrated mixture, refused feeds and faeces were collected daily and preserved for analysis (duplicate) of dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE), ash and nitrogen free extract (NFE) following the methods of AOAC (1990). In addition, fresh faeces were analyzed for nitrogen (N) and DM content.

Economic assessment was based on current feed cost and price of meat (August-October, 2007).

The experiment was conducted following the randomized block design. Analysis of variance (ANOVA) for experimental data was computed to determine the treatment effects using MSTAT program.

Results and Discussion

Feed and nutrient intake

Daily feed and nutrient intake are presented in Table 2. Dry matter intake of groups A, B, C and D was 2.4, 2.4, 2.3 and 2.4 kg/head per day, respectively. There is no significant difference between groups in mean DM and CP intake although animals receiving diet A containing mustard oil cake consumed higher CP (241.3g) than the animals receiving broiler litter (237.5g), layer manure (230.4g) and BL + LM (235.9g). These results are in agreement with the report of El-Sabban *et al.* (1970); Kishan and Hussain (1977); Toro and Mudgal (1984).

Live weight gain

The mean LWG are presented in Table 2. The gross LWG were 31.0, 29.7, 22.0 and 26.2 kg for groups A, B, C and D, respectively. Although the LWG of the animals receiving diet A was higher than for animals receiving other diets, the differences were not significant ($p>0.05$).

Feed conversion efficiency

There were significant differences ($p<0.05$) in the mean FCE between groups (Table 2). FCE of the animals receiving control diet (A) was significantly better than for groups C and D, but there was no significant difference between groups A and B, C and D ($p>0.05$) or B and D. Protein conversion efficiency of the different groups did not differ significantly ($p>0.05$), although the diet containing the layer manure gave slightly lower values than those containing broiler litter or mustard oil cake.

The results of feed efficiency are in agreement with those of Humaynul (2006), who found that FCE differed significantly between growing cattle fed concentrate mixture containing 0% BL or LM; 40% BL and 40% LM. The trend of worse FCE of animals fed BL and LM might be because they utilized feed nutrients less efficiently.

Digestibility and nutritive value of the diets

The digestibility of proximate components of diets is presented in Table 3. The DM, OM, CF, CP and NFE digestibility did not differ significantly between groups. However, digestibility values for EE different significantly ($p<0.05$) between groups. DM and OM digestibility of the diet containing BL and LM were slightly less than those of the control diet, but higher than those of Toro and Mudgal (1984) who

reported 61.5, 58.5 and 56.1% DM digestibility in crossbred calves fed rations containing poultry litter in which 0, 25 and 50% CP from conventional concentrate mixture was replaced.

Table 2. Intake of nutrients and growth performance of indigenous growing bulls fed diets with and without broiler litter and layer manure

Parameters	Experimental diets				SEM	Level of significance
	A	B	C	D		
Feed intake						
DM intake (kg/h/d)	2.42	2.38	2.33	2.35	0.15	NS
DM intake (kg/100kg LW)	3.02	2.97	2.91	2.94	0.026	NS
OM intake (kg/h/d)	2.17	2.12	2.07	2.09	0.13	NS
CP intake (g/h/d)	241.27	237.52	230.40	235.94	12.58	NS
CP intake (g/100 kg LW)	366.17	356.85	348.51	350.42	18.93	NS
Live weight gain						
Initial live wt. (kg)	65.89	66.59	66.10	67.33	4.50	NS
Final live wt. (kg)	96.83	96.28	88.32	93.56	7.28	NS
Total live wt. gain (kg)	30.95	29.69	22.01	26.22	2.98	NS
Live wt. gain (g/d)	343.85	329.92	244.59	291.37	33.06	NS
FCE (kg DMI /kg LWG)	7.06^{b}	7.35^{b}	9.59^{a}	8.11^{ab}	0.47	$p<0.05$
PCE (kg CPI /kg LWG)	0.77	0.80	1.002	0.87	0.053	NS

Table 3. Apparent digestibility and nutritive values of diets

Parameters	Experimental diets				SEM	Level of significance
	A	B	C	D		
Nutrient digestibility (g/100g)						
Dry matter	61.94	60.86	57.38	59.15	3.83	NS
Organic matter	65.08	63.46	61.07	62.26	3.61	NS
Crude protein	61.30	60.78	58.67	59.14	2.71	NS
Crude fibre	64.09	63.40	62.25	62.40	2.43	NS
Ether extract	81.94^{a}	78.10^{ab}	75.3^{b}	75.62^{b}	1.32	$p<0.05$
Nitrogen free extract	62.99	62.05	58.32	61.58	2.77	NS
Nutritive values (g/100g DM)						
Digestible organic matter	56.15	55.72	53.41	55.11	2.00	NS
Digestible crude protein	6.11	6.07	5.80	5.94	0.20	NS
Digestible crude fibre	18.56	19.23	18.26	18.61	0.74	NS
Digestible ether extract	2.93^{a}	1.88^{b}	2.35^{c}	1.85^{b}	.029	$p<0.05$
Digestible nitrogen free extract	29.73	27.90	26.23	27.87	1.19	NS
Total digestible nutrients (TDN)	60.99	57.43	55.58	56.58	5.07	NS

***A =** Roughage (Rice straw & *Dal* grass) + Concentrate mixture containing (15.28%CP); **B =** Roughage (Rice straw & *Dal* grass) + Concentrate mixture containing (15.22%CP); **C =** Roughage (Rice straw & *Dal* grass) + Concentrate mixture containing (15.21%CP); **D =** Roughage (Rice straw & *Dal* grass) +Concentrate mixture containing (15.22% CP); ^{ab} Mean values with different superscripts differ significantly ($p<0.05$); NS = Non-significant ($p>0.05$)

Economic assessment

Economic assessment is presented in Table 4. The total feed cost per head per day was highest for ration A (17.74 Taka), which contained mustard oil cake and the lowest for group C (Taka: 11.91) containing layer manure, showing significant ($p<0.05$) difference. Feed cost per Kg meat was the highest for the diet A (Taka: 97.35) and lowest for diet B (Taka: 84.16), which contained broiler litter. Difference in cost of meat production between groups was statistically significant ($p<0.05$), but there was no significant difference between B, C and D.

Table 4. Economic assessment of rearing growing bulls on different diets

Parameters	Experimental diets				SEM	Level of significance
	A	B	C	D		
Total feed cost (Tk/h/d)	17.74[a]	14.72[ab]	11.91[b]	14.07[b]	0.94	p<0.05
Feed cost/kg LWG (Tk)	51.66	45.44	48.96	48.43	2.31	NS
Total weight gain (kg)	30.95	26.69	22.01	26.22	2.98	NS
Estimated carcass yield (kg)@ 53% dressing percentage*	16.40	15.74	12.15	13.90	3.37	NS
Cost of meat production (Tk/kg meat)	97.35[a]	84.16[b]	88.08[b]	86.12[b]	2.94	p<0.05
Loss/gain in relation to control	-	+13.19	+9.27	+11.23	-	-

* = Dressing percentage 53% (DPIF, 2006)

It is concluded that using broiler litter and layer manure in the ration at 40% level did not significantly depress feed intake of growing bulls. Digestibility of feeds and live weight gain were not significantly affected by inclusion of poultry excreta in the ration. However, feed cost and cost of meat production were significantly lower in rations containing excreta compared to those containing oil cake.

Acknowledgements

The author gratefully acknowledges the financial support of Bangladesh Agricultural University Research System (2005/18/AU).

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