Effect of Replacing Til Oil Cake by Poultry Excreta on Growth and Nutrient Utilization in Growing Bull Calves

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ABSTRACT : An experiment was conducted for 90 days using 9 growing bull calves (initial LW 71.5 kg) to investigate the effect of replacing til oil cake by poultry excreta on growth performance and nutrient utilization. The animals were randomly divided into three groups. The control group A was fed with conventional concentrate mixture containing til oil cake, rice bran, wheat bran, bone meal and common salt and the groups B and C were offered diets in which 50 and 100 percent of til oil cake of diet A were replaced by dried poultry excreta. All the animals were fed urea soaked rice straw *ad libitum* and concentrate mixture was given at the rate of 10 g per kg LW. Towards the end of growth trial a conventional digestibility trial was conducted. Average daily live weight gain was 216, 211 and 188 g for animals fed diets A, B and C, respectively. Average daily dry matter intake in groups A, B and C was 3.42, 3.37 and 3.30 kg per 100 kg LW, respectively. The daily live weight gain and dry matter intake did not differ significantly ($p > 0.05$) among the dietary groups. The digestibility coefficient for DM or NFE was almost similar but that for OM, CP, CF and EE was significantly different ($p < 0.01$) among the dietary groups. TDN percent in diets A, B and C was 57.3 53.3 and 50.8, respectively and the difference was significant ($p < 0.01$). Animals in all the groups were in a state of positive nitrogen balance. The results indicated that til oil cake can be replaced by dried poultry excreta in bull calf ration.

(**Key Words:** Growing Calves, Poultry Excreta, Feed Intake, Live Weight Gain, Nutrient Utilization)

INTRODUCTION

Protein supplements are the most expensive feed ingredients in animal ration. Til oil cake, a by-product of oil industry, is widely used as a protein supplement of conventional concentrate mixture for feeding animals in Bangladesh. But its price is increasing day by day. On the other hand, poultry excreta available in different poultry farms of the country is creating environmental problems. Poultry excreta has been successfully used as a potential source of nitrogen both for ruminants (Reddy and Singh, 1991; Parthasarathy and Pradhan, 1986) and poultry (Kishan et al., 1976; Virk et al., 1986). Muftic et al. (1971) reported that when poultry litter was fed to fattening steers, there was a feed saving of 30-40 percent. Research indicates that the use of farm organic wastes as animal feed resource seems to be better than its disposal as organic fertilizer (Fontenot and Jurubescu, 1980).

Ruminants particularly cattle and buffaloes in Bangladesh are maintained by feeding rice straw as a sole roughage. Ammonification is one of the popular methods of enriching nitrogen content and its utilization through increased dry matter digestibility and voluntary consumption (Sundstol et al., 1981). Although recently urea treatment of straw has got wide publicity but not yet easily adopted by the farmers of Bangladesh as the method is tedious, labourious and time consuming. Soaking of chopped straw in urea mixed water before feeding animals is comparatively easy method (Islam and Tareque, 1989) which can be easily adopted by the rural farmers in Bangladesh. The work reported here was therefore, conducted to study the effect of replacement of til oil cake with dried poultry excreta on the performance of growing bull calves fed urea soaked rice straw based ration.

MATERIALS AND METHODS

Nine growing bull (local non-descriptive) calves (71-72 kg LW) were randomly divided into 3 groups (A, B and C) having 3 animals in each group. The animals were dewormed by administering antihelmintic drug. All the animals were fed urea soaked rice straw (10 g urea dissolved in 1,000 ml water and then sprayed over 1 kg rice straw) as roughage source. Control group A received concentrate mixture containing til oil cake, rice bran, wheat bran, bone meal and common salt at 30, 35, 32, 2

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and 1 percent, respectively. Til oil cake of concentrate mixtures (diet A) was replaced by 50 (diet B) and 100 (diet C) percent poultry excreta which provided 25.5 and 50.0 percent of crude protein content of total concentrate mixture. Poultry excreta collected from the Bangladesh Agricultural University Poultry Farm, Mymensingh was dried in the sun and ground in a Wiley mill before inclusion in the concentrate mixture.

Feed was offered at the rate of 3.5 kg DM per 100 kg live weight of the animals. Concentrate mixture was provided to all the dietary groups at the rate of 10 g per kg live weight and urea soaked rice straw was fed to appetite for a period of 90 days (table 1). The amount of feed offered was adjusted fortnightly on the basis of the highest average live weight of the calves in various groups. Clean water was provided at all times. Computed diets were fed to the animals twice daily, morning at 08:00 A.M. and afternoon at 4:00 P.M. All the animals were reared in same managemental condition. Live weight of all the animals was recorded first before the commencement of the experiment and then at fortnight intervals for two consecutive days. At the end of the feeding trial a 8 day metabolic trial was conducted using all the animals fed diets A, B and C. Represenative samples of feed, leftover, faeces and urine were analysed for proximate composition (AOAC, 1984). Blood samples, collected in the morning before feeding were analysed for urea and haemoglobin.

The experimental data were analysed statistically using analysis of variance technique for a completely randomised design and significant differences among the treatment means were determined using least significant difference test (Steel and Torrie, 1980).

Table 1. Composition of different diets

Particulars	Diets#		
	A	B	C
Soaked rice straw	*Ad libitum*	*Ad libitum*	*Ad libitum*
Concentrate mixture (g/kg LW)	10	10	10
Chemical composition (g/100 g DM)			
Organic matter (OM)	91.96	87.64	86.28
Crude protein (CP)	10.36	10.06	10.04
Crude fibre (CF)	24.04	26.08	28.76
Ether extract (EE)	2.36	2.26	2.24
Nitrogen free extract (NFE)	55.20	49.24	45.24
Total ash	8.04	12.36	13.52
DCP (g/kg DM)	65.40	57.50	55.00
TDN (g/kg DM)	575.30	532.50	508.30

# A = No poultry excreta.
B = 50% poultry excreta.
C = 100% poultry excreta.

RESULTS AND DISCUSSION

Chemical composition

The chemical composition of different feed ingredients are presented in table 2. The dried poultry excreta contained CP 28.14, CF 26.28, EE 1.9, NFE 21.43 and ash 22.25 g per 100 g DM.

Bhattacharya and Taylor (1975) reported 28.0, 12.7, 2.0, 28.7 and 28.0 percent CP, CF, EE, NFE and ash, respectively in poultry excreta which are similar in CP and EE contents but slightly lower in CF than the present findings. The chemical composition (g/100 g DM) of poultry excreta as reported by Kishan and Husain (1977) was CP 20.5, CF 13.4, EE 1.9, NFE 42.7 and ash 20.3. These findings indicate that the composition and nutritive value of poultry excreta are quite variable depending on the type and quality of feed ingredients fed to the birds, variable feed spillage into the manure, poultry rearing system, type of birds or bedding materials, length of storage of excreta, diffrences in laying stage of hens and feather shedding (Ichhponani and Lodhi, 1976; Adeleye and kitts, 1983; Roothaert and Matthewman, 1992). Feeding of birds with good quality feeds produces better quality poultry droppings, richer in protein and

digestible energy than those of poor quality feeds (Roothaert and Mattewman, 1992).

The proximate components of poultry excreta is comparable to many conventional grain and grain byproducts. Chemical composition of diets fed to different groups of bull calves is shown in table 1. Diets B and C where til oil cake was replaced by poultry excreta, contained slightly less CP and more CF than those in diet A.

Table 2. Chemical composition of different feed ingredients

Ingredients	DM (g/100 g)	Composition (g/100 g DM)				
		CP	CF	EE	NFE	Ash
Urea soaked rice straw	45.65	5.45	30.66	1.45	48.18	14.26
Til oil cake	89.24	32.06	9.26	10.24	37.04	11.40
Rice bran	90.66	10.62	22.74	8.40	45.62	12.62
Poultry excreta	87.80	28.14	26.28	1.90	21.43	22.25
Wheat bran	88.26	12.60	11.38	3.46	66.16	6.40

Growth, feed intake and feed efficiency

It is revealed in table 3 that all the animals fed different diets gained live weight. Total average live weight gains in 90 days feeding trial were 19.5, 19.0 and 17.0 kg for animals fed diets A, B and C, respectively. The animals in control group A fed diet A gained highest average live weight followed by those fed diets B and C but the difference was not statistically significant ($p > 0.05$). The average daily live weight gain of animals fed diet A was 216.7 g followed by B (211.1 g) and C (188.9 g) where 50 and 100 percent til oil cake was replaced by dried poultry excreta (table 3). A linear decrease in average live weight gain was observed with increasing level of poultry excreta. Similar trends were also reported by Srinivas et al. (1989) and Malik et al. (1985). Mudgal (1985) observed non-significant differences in body weight gains on different rations containing 0, 25 and 50 percent poultry litter.

The daily dry matter intake (DMI) of all the animals was above 3.0 kg per 100 kg live weight. Intake of total DM as well as average daily DM was higher in animals fed control diet A and followed by diets B and C but the differences were not significant ($p > 0.05$). Similar trends were also reported by Toro and Mudgal (1984) and Srinivas et al. (1989). The CP intake in calves fed diet A. The CP intake in calves fed diet A (288 g/d) was slightly higher followed by those given diets B (278 g/d) and C (272 g/d) but the difference was not significant ($p > 0.05$).

Table 3. Performance of growing bull calves fed different diets

Parameters	Diets#		
	A	B	C
Initial live weight (kg)	71.66 ± 13.65	72.66 ± 2.56	72.33 ± 10.69
Final live weight (kg)	91.16 ± 15.59	91.66 ± 3.05	89.33 ± 9.82
Daily LW gain (g)	216.66 ± 5.45	211.10 ± 5.55	188.88 ± 14.69
Total DM consumed (90 d, kg)	250.26 ± 21.64	249.45 ± 14.98	239.58 ± 26.23
DM intake (kg/d)	2.78 ± 0.46	2.77 ± 0.16	2.66 ± 0.29
DM intake (kg/100 kg LW)	3.42 ± 0.07	3.37 ± 0.11	3.30 ± 0.07
CP intake (g/d)	288.07 ± 27.93	278.82 ± 16.75	272.58 ± 29.85
Feed efficiency (kg DMI/kg LWG)	12.79 ± 1.13	13.11 ± 0.45	14.20 ± 2.48
Feed cost (Taka/animal/d)	5.50	4.25	3.80
Feed cost (*Taka/kg LW gain)	25.30	20.11	19.28

# A = No poultry excreta.
B = 50% poultry excreta.
C = 100% poultry excreta.
* 1 US doller = 43.8 BD Taka.

The dry matter requirement per kg live weight gain increased with the replacement of increasing levels of til oil cake by poultry excreta. For example, animal fed rations B and C converted DM less efficiently (13.11 and 14.20 kg DMI/kg LW gain, respectively) than those given control ration A (12.79 kg DMI/kg LW gain) but the difference among the groups was not significant ($p > 0.05$). Mudgal (1985) noted that feed conversion efficiency did not differ among various groups fed concentrate mixture containing 25 and 50 percent protein from poultry litter which corrosponds with the present findings. In contrast, Toro and Mudgal (1984) reported that feed conversion efficiency differed among various groups fed concentrate mixture containing 25 and 50 percent crude protein from poultry litter. The highest feed cost for feeding animals and that for each kg LW gain were recorded in animal group fed control diet A and lowest in diet C (table 3) which indicated overall economy of feeding poultry excreta.

Digestibility and nutritive value

The apparent digestibility and nutritive value of different diets are given in table 4. It appears from the table that the digestibility coefficients of DM and NFE were similar in all the dietary groups. But CP digestibility of diets B and C were significantly ($p < 0.01$) lower than that of diet A. Decrease in CP digestibility with the inclusion of increased level of poultry excreta in the diet might be attributed to corresponding increase in ash content (acid insoluble ash) in poultry excreta which is in agreement with the previous findings (Srinivas et al. 1989; Ragghunandan et al., 1993). The digestibility of CF was significantly ($p < 0.01$) higher in group fed diet A than that received diets B and C where 50 and 100 percent til oil cake of concentrate mixture were replaced by poultry excreta. But there was no significant difference ($p > 0.05$) between diets B and C. Similar results were also reported by Kishan et al. (1984).

Digestible crude protein (DCP) and total digestible nutrient (TDN) concentrations were significantly ($p < 0.01$) higher in control diet A than poultry excreta containing diets B and C. No difference in DCP or TDN value was observed between the diets B and C. Ragghunandan et al. (1993) reported that decreased CP digestibility resulted in lower DCP content in the diet. Low organic matter and high ash contents in poultry excreta may have affected nutrient digestibility which ultimately resulted in lowering TDN value in poultry excreta containing diets B and C.

Table 4. Digestibility coefficient and nutritive value of diets

Parameters	Diets#		
	A	B	C
Nutrient digestibility (%)			
DM	60.27 ± 1.54	59.35 ± 1.04	58.79 ± 0.64
OM	62.76^{a} ± 1.36	60.77^{b} ± 0.53	59.61^{b} ± 0.27
CP	63.24^{a} ± 0.62	60.19^{b} ± 1.24	54.45^{c} ± 0.76
CF	57.33^{a} ± 0.87	53.79^{b} ± 0.57	51.73^{b} ± 0.71
EE	65.57^{a} ± 0.33	62.88^{ab} ± 0.87	60.56^{b} ± 2.68
NFE	64.61 ± 2.46	64.88 ± 0.96	64.11 ± 0.44
Nutritive value (%)			
DCP	6.54^{a} ± 0.06	5.75^{b} ± 0.14	5.50^{b} ± 0.16
DCF	13.77 ± 0.21	14.12 ± 0.13	14.90 ± 0.23
DEE	1.55^{a} ± 0.01	1.42^{b} ± 0.02	1.35^{b} ± 0.06
DNFE	35.66^{a} ± 1.35	31.94^{b} ± 0.47	29.00^{c} ± 0.19
TDN	57.53^{a} ± 1.49	53.25^{b} ± 0.68	50.83^{b} ± 0.39

# A = No poultry excreta.
B = 50% poultry excreta.
C = 100% poultry excreta.
^{a,b,c} Mean values having different superscripts in a row differ significantly ($p < 0.05$).

Nitrogen balance

The animals in all the dietary groups were in positive nitrogen balance (table 5). Nitrogen retention decreased progressively ($p < 0.01$) with the inclusion of increased poultry excreta in the concentrate mixture which was attributed due to lower digestibility of protein in poultry excreta containing diets. Similar trend was also reported by Toro and Mudgal (1984).

Although the faecal and urinary nitrogen excretion were higher in animals fed poultry excreta containing ration than in those fed ration containing no poultry excreta, the differences were not statistically significant ($p > 0.05$). Menawat and Sharma (1973) observed positive nitrogen balance in cows fed rations containing auto-claved poultry litter at 0, 25 and 50 percent which agrees with the present findings.

Table 5. Nitrogen balance and blood parameter of animals fed different diets

Parameters	Diets#		
	A	B	C
Nitrogen intake (g/d)	46.08 ± 7.67	44.60 ± 2.68	43.61 ± 4.77
Nitrogen excreted (g/d):			
Faeces	16.92 ± 2.78	19.10 ± 1.50	19.84 ± 2.07
Urine	8.64 ± 1.87	8.51 ± 0.69	11.22 ± 1.86
Total	25.56 ± 4.65	27.61 ± 2.19	31.06 ± 3.43
Nitrogen retention (g/d)	20.52^{a} ± 3.06	16.99^{a} ± 1.00	12.54^{b} ± 1.89
Nitrogen retention (g/100 g N intake)	44.63^{a} ± 1.18	38.11^{b} ± 1.88	28.73^{c} ± 2.43
Blood parameter:			
Urea (mg/dl)	20.7 ± 2.65	22.5 ± 3.43	23.7 ± 2.20
Haemoglobin (g/100 ml)	9.5 ± 1.34	9.1 ± 1.86	9.4 ± 2.32

# A = No poultry excreta.
B = 50% poultry excreta.
C = 100% poultry excreta.
[a,b,c] Mean values having different superscripts in a row differ significantly ($p < 0.05$).

Blood parameter

Blood urea level was higher in animals fed diets B and C compared with those given diet A (table 5) but the difference among the groups was not significant ($p > 0.05$). Venkatachar et al. (1971) reported that the feeding of urea or other non protein nitrogenous substances may increase the blood NPN concentration in cattle. An irregular trend was observed in haemoglobin content of the animals fed diets with or without poultry excreta. The results reported here for blood urea and haemoglobin concentrations were within the normal limits in animals of all the dietary groups.

CONCLUSION

The results suggest that poultry excreta can be used as a substitute of til oil cake in growing animal ration without any harmful effect. Considering growth performance, feed conversion efficiency and cost of production, 50 percent replacement of til oil cake by ground dried poultry excreta may be recommended for feeding growing bull calves.

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