EFFECT OF FEEDING BROILER LITTER ON GROWTH AND NUTRIENT UTILIZATION BY BARBARI GOAT

M. A. Nadeem, A. Ali, A. Azim¹ and A. G. Khan

Animal Sciences Institute, National Agricultural Research Centre,
Park Road, Islamabad, Pakistan

Summary

Four isocaloric (68.71, 67.07, 66.68 and 66.25% TDN) and isonitrogenous (12.96, 13.36, 13.36 and 12.96% CP) diets without or with 20, 25 and 30% broiler litter were fed to 20 male kids for 90 days. Weight gain and feed efficiency were higher ($p < 0.05$) for kids offered control diets as compared to kids fed diets containing broiler litter. There was a significant ($p < 0.05$) decrease in the feed intake with increasing level of broiler litter in the diets. Digestibility for organic matter, crude protein and crude fibre were not affected ($p > 0.05$) by the inclusion of broiler litter in the diets, whereas inclusion of broiler litter depressed ($p < 0.05$) the digestibility of dry matter and ash. Nitrogen balance was positive for all diets, however, nitrogen retention decreased ($p < 0.01$) with the increased level of broiler litter. Blood Na, K, Ca, P and urea-N were within normal range.

(Key Words: Broiler Litter, Barbari Goat, Digestibility, Nitrogen Balance)

Introduction

A major factor limiting animal production in developing countries is inadequate availability of feedstuffs for providing required nutrients. Thus, it is necessary to identify the prospects of utilizing unconventional feed resources in order to promote production characteristics of livestock. Now-a-days, much emphasis is being given on the utilization of agro-industrial by-products and animal waste in livestock feeding. Poultry excreta being rich in nitrogen offers good prospects for its utilization in the ruminant ration. The crude protein content of broiler litter and caged layer manure is 28% or even higher (El-Sabban et al., 1970 and Fontenot et al., 1971). Nitrogen from poultry waste has been shown to be efficiently utilized by ruminants (Smith and Calvert, 1976). Incorporation of poultry manure has been reported to reduce the cost of concentrate upto 35% and the cost of production by 11.7% (Devyatkin et al., 1983). The objective of this work was to study the effect of broiler litter as a source of protein supplement on the production

performance, nutrient utilization and blood profile of Barbari kids.

Materials and Methods

Growth Trial

Four isocaloric and isonitrogenous diets without or with 20, 25 and 30% broiler litter on dry matter basis were prepared. Diets without broiler litter served as a control. Twenty male Barbari kids, approximately same age and weight were allocated at random to four dietary treatments and were individually fed *ad-libitum* basis for 90 days. The broiler litter obtained from a commercial poultry farm was sun dried (max. 40°C) to destroy the pathogenic bacteria. The broiler litter contained 20.0, 15.9 and 25.3% crude protein, crude fibre and ash. Ingredient and chemical composition of rations is presented in table 1. Before start of experiment all the kids were dewormed against internal and external parasites. Records of daily feed intake and weekly weight gain of all the kids were maintained. Fresh and clean water was made available round the clock.

Digestibility and Nitrogen Balance Trial

At the end of feeding trial four kids from each treatment were individually placed in metabolic cages and fed at approximately 90%

¹Address reprint requests to Dr. A. Azim, Senior Scientific Officer, Animal Nutrition, Animal Sciences Institute, NARC, Park Road, Islamabad, Pakistan.

Received February 12, 1992

Accepted October 26, 1992

TABLE 1. INGREDIENT AND CHEMICAL COMPOSITION OF EXPERIMENTAL DIETS

Item	Broiler litter added to the diet, %			
	0	20	25	30
	 % dry matter			
Ingredient Composition				
Broiler litter	—	20.00	25.00	30.00
Cottonseed cake (Undecorticated)	30.00	15.00	10.00	—
Wheat bran	25.00	15.00	15.00	15.00
Maize gluten meal (30%)	5.00	5.00	5.00	5.00
Rice polishing	20.00	25.00	25.00	30.00
Molasses	8.75	8.75	8.75	8.75
Vit. min. premix	0.50	0.50	0.50	0.50
Salt	0.75	0.75	0.75	0.75
Wheat straw	10.00	10.00	10.00	10.00
Chemical Composition				
Dry matter	88.86 ± 0.21	88.83 ± 0.07	88.83 ± 0.09	88.86 ± 0.18
Crude protein	12.96 ± 0.92	13.36 ± 0.72	13.36 ± 0.64	12.96 ± 0.43
Crude fibre	16.19 ± 0.82	15.64 ± 0.67	15.44 ± 0.43	14.83 ± 0.48
Ash	7.63 ± 0.22	12.07 ± 0.16	13.12 ± 0.06	14.56 ± 0.08
Total digestible nutrients	68.71 ± 1.63	67.07 ± 1.38	66.68 ± 0.96	66.25 ± 0.83

Mean ± SE.

of the *ad-libitum* consumption to ensure constant intake (table 3). Faeces and urine outputs were collected for 7 days. Daily faeces from each kid were weighed, mixed, subsampled and stored at 5°C. At the end of collection period, representative faecal samples were mixed and analysed for nitrogen (AOAC, 1984). Urine from each kid was also collected daily in plastic bottles containing 100 ml 3N HCl to prevent N losses. Urine was measured and immediately analysed for nitrogen. Representative samples of feed and refusal from each kid were taken daily. At the conclusion of trial, feed, refusal and faecal samples were dried at 60°C and ground through a 1 mm screen. Dried samples of feed and refusal were analysed for proximate chemical composition (AOAC, 1984), and faecal samples only for crude fibre and ash.

Blood Parameters

Blood samples were drawn before feeding from jugular vein of three kids on each treatment and serum was separated. The samples were analysed for Na, K, Ca, P and urea-N (Wootten, 1974). Data was statistically analysed by analysis of

variance for a completely randomized design (Steel and Torrie, 1980).

Results and Discussion

Growth Trial

Results of the growth trial are shown in table 2. Weight gain of kids offered control diet (70.83 g/d) was higher ($p < 0.05$) as compared with kids fed 20, 25 and 30% broiler litter in the diets (49.33, 45.00 and 41.67 g/d), respectively (table 2). The feed conversion efficiency of the kids fed diets containing 20, 25 and 30% broiler litter was 12.19, 12.27 and 12.45, respectively. These results significantly ($p < 0.05$) differ as compared to control (9.75). Dry matter intake by kids fed diets containing different levels of broiler litter ranged from 518.9 to 690.6 g/d. There was linear depression ($p < 0.05$) in feed consumption by increasing the broiler litter in the diets (table 2).

Goats are very selective feeder and the acceptability of rations containing broiler litter by kids was not so good due to sharp smelling sense of goat. Tinnimit et al. (1972) reported similar fin-

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TABLE 2. EFFECT OF BROILER LITTER ON WEIGHT GAIN, FEED INTAKE AND FEED EFFICIENCY OF KIDS

Description	Broiler litter added to the diet, %			
	0	20	25	30
Days on experiment	90	90	90	90
No. of kids	5	5	5	5
Initial weight (kg)	17.75 ± 1.32	17.45 ± 0.96	16.90 ± 1.5	16.50 ± 1.67
Final weight (kg)	24.12 ± 2.9	21.89 ± 1.86	20.95 ± 2.51	20.25 ± 3.92
Weight gain (g/d) (LWG)	70.83 ± 1.23 ^a	49.33 ± 1.16 ^b	45.00 ± 3.18 ^b	41.67 ± 3.56 ^b
Intake (g/d)				
Dry matter (DMI)	690.60 ± 40.32 ^a	601.34 ± 20.39 ^b	552.08 ± 19.83 ^c	518.90 ± 15.21 ^d
Nitrogen	14.32 ± 0.85 ^a	12.85 ± 0.38 ^b	11.80 ± 0.43 ^c	10.76 ± 0.37 ^d
Feed efficiency (DMI/LWG)	9.75 ± 0.72 ^a	12.19 ± 0.69 ^b	12.27 ± 0.58 ^b	12.45 ± 0.62 ^b

^{a,b,c,d} Means ± SE in the same row without a common superscript differ at $p < 0.05$.

ding that goats even refused to eat ration containing poultry excreta. Mineral contents of diets containing 20, 25 and 30% broiler litter were 58.19, 71.95 and 90.83% higher as compared to control (table 1). Broiler litter contained 6% more ash as compared to the values reported by the NRC (1984). The low weight gain in lambs due to poultry waste has also been reported by Vicovan et al. (1979) and Adu and Lakpini (1983) and also noted that replacing cottonseed cake with poultry waste reduced feed efficiency of Y, ankasa sheep. Low intake of diets having broiler litter may be due to low acceptability of broiler litter and its high mineral contents as reported by Ensminger and Olentine (1978), that high mineral content of ration reduce appetite of the animals. The low intake of diet has ultimately

adversely affected the weight gain and feed efficiency of kids. Two animals, each one from the groups fed on diets containing 25 and 30% broiler litter died on day 75 and 86 of the trial, respectively due to urinary calculi. Calculi formation in the urinary tract may be due to mineral imbalances in the animals fed broiler litter in the diets having high ash content.

Digestibility and Nitrogen Balance Trial

Digestibility of various nutrients is presented in table 3. Organic matter, crude protein and crude fibre digestibilities were not affected ($p > 0.05$) by the inclusion of broiler litter in the rations. However disappearance of ingested dry matter was greater ($p < 0.05$) for control diet (66.6%) as compared to diets with 20, 25 and

TABLE 3. EFFECT OF BROILER LITTER ON DIGESTIBILITY OF DIETARY COMPONENTS

Variable	Broiler litter added to the diet, %			
	0	20	25	30
Intake (g/d)				
Dry matter	686.70 ± 20.32 ^a	589.10 ± 26.54 ^b	537.20 ± 18.3 ^c	499.00 ± 15.32 ^d
Digest. dry matter	457.40 ± 15.37 ^a	371.50 ± 13.42 ^b	333.70 ± 10.63 ^c	307.70 ± 15.89 ^d
Digest. organic matter	439.20 ± 10.26 ^a	348.90 ± 10.45 ^b	315.40 ± 8.32 ^c	282.90 ± 9.96 ^d
Digestibility (%)				
Dry matter	66.60 ± 1.33 ^a	63.05 ± 0.97 ^b	62.11 ± 0.99 ^b	61.66 ± 2.03 ^b
Organic matter	69.24 ± 2.17	67.35 ± 1.67	66.97 ± 1.38	66.36 ± 1.54
Crude protein	66.20 ± 1.57 ^a	64.50 ± 0.92 ^{ab}	64.42 ± 0.87 ^{ab}	63.32 ± 0.85 ^b
Crude fibre	55.11 ± 2.36	53.44 ± 1.42	52.65 ± 1.39	52.05 ± 1.07
Ash	34.70 ± 1.73 ^a	31.72 ± 0.63 ^b	27.38 ± 0.63 ^c	23.68 ± 0.68 ^d

^{a,b,c,d} Mean ± SE in the same row without a common superscript differ at $p < 0.05$.

30% broiler litter (63.1, 62.1, 61.7% respectively). Data of nitrogen balance trial are presented in table 4. Nitrogen intake of kids fed diets without or with 20, 25 and 30% broiler litter was significantly different ($p < 0.05$) among each other (14.24, 12.59, 11.48 and 10.35 g/d). Nitrogen excretion through faeces was similar for all treatment groups. Nitrogen excretion through urine was significantly higher in kids fed diet containing 20, 25 and 30% broiler litter than control (1.61, 1.64 and 1.73 vs 1.53 g/d). Nitrogen retention as a percentage of nitrogen intake was significantly lower (45.41%) for kids fed diets containing 30% broiler litter as compared to kids fed on diets without or with 20 and 25% broiler litter (54.21, 51.15 and 50.35%). However, retention of absorbed N decreased significantly with the increased level of broiler litter in the diets (table 4).

During digestibility trial dry matter intake by kids followed the same pattern as in growth trial (table 3 & 4). The digestibility of organic matter, crude protein and crude fibre of all the diets were

similar. However, low digestibility of ash in the diets containing broiler litter might be due to availability of minerals or merely its high content. This is in agreement with Tinnimit et al. (1972) and Smith and Lindahl (1977), low digestibility of ash has ultimately affected the dry matter digestibility of diets containing broiler litter. Hadipanayiotou (1987), found depression in the dry matter digestibility in kids due to addition of poultry litter in the diet. Low dry matter intake of rations containing poultry litter resulted in low nitrogen intake, but the excretion of nitrogen through urine was 19.09, 33.05 and 55.59 % more in diets with 20, 25 and 30% broiler litter, respectively. Nitrogen retention gradually declined with the inclusion of broiler litter in the diet. It is in accordance with the findings of Swingle et al. (1977), and Smith & Lindahl (1977) who found that supplementing dried poultry excreta in the diet of lambs resulted in higher excretion of N through urine and lower retention in the body.

TABLE 4. EFFECT OF BROILER LITTER ON NITROGEN BALANCE OF DIETARY COMPONENTS

Variable	Broiler litter added to the diet, %			
	0	20	25	30
Nitrogen intake (g/d)	14.24 $\pm$ 0.96 ^a	12.59 $\pm$ 0.83 ^b	11.48 $\pm$ 0.35 ^c	10.35 $\pm$ 0.54 ^d
Nitrogen excretion (g/d)				
Faecal	4.99 $\pm$ 0.73	4.54 $\pm$ 0.62	4.06 $\pm$ 0.75	3.92 $\pm$ 0.43
Urinary	1.53 $\pm$ 0.04 ^a	1.61 $\pm$ 0.13 ^b	1.64 $\pm$ 0.09 ^b	1.73 $\pm$ 0.23 ^c
Nitrogen retention (g/d)				
(Grams per day)	7.72 $\pm$ 0.69 ^a	6.44 $\pm$ 0.97 ^a	5.78 $\pm$ 1.06 ^a	4.70 $\pm$ 0.65 ^b
% of intake	54.21 $\pm$ 3.59 ^a	51.15 $\pm$ 1.77 ^a	50.35 $\pm$ 1.92 ^a	45.41 $\pm$ 1.34 ^b
% of absorbed	83.45 $\pm$ 1.48 ^a	80.00 $\pm$ 1.06 ^b	77.90 $\pm$ 2.03 ^c	73.09 $\pm$ 1.75 ^d

^{a,b,c,d} Means $\pm$ SE in the same row without a common superscript differ at $p < 0.05$.

Blood Parameters

There was non-significant ($p > 0.05$) difference in the values of serum Na, K, and urea-N, when the kids were fed diets without or with 20, 25 and 30% broiler litter (table 5). There was an increasing trend in the values of Na, K and urea-N in blood as the proportion of broiler litter was raised, however, these values were within the normal range (Swenson, 1970). The values of

serum Ca and P were significantly higher in the group fed diet containing 30% broiler litter as compared to control.

The growth performance and nutrients digestion of poultry litter based diets suggested that cottonseed cake can be replaced with poultry litter up to 20% effectively and economically in complete formula diet of Barbari goats.

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TABLE 5. EFFECT OF FEEDING DIFFERENT LEVELS OF BROILER LITTER ON BLOOD ELECTROLYTES AND UREA-N

Broiler litter added to the ration, %	Electrolytes, mg/100 ml				Urea-N mg/100 ml
	Na	K	Ca	P	
0	360.0 ± 3.42 ^a	20.0 ± 1.34	20.0 ± 3.83 ^a	7.3 ± 1.63 ^a	16.9 ± 2.06
20	356.0 ± 4.58 ^a	20.0 ± 1.68	25.0 ± 3.21 ^a	9.1 ± 2.57 ^a	16.7 ± 1.34
25	370.0 ± 5.79 ^a	22.0 ± 1.26	30.0 ± 2.68 ^b	11.0 ± 2.15 ^{ab}	16.9 ± 1.58
30	390.0 ± 4.43 ^b	22.0 ± 2.08	33.0 ± 3.84 ^b	13.7 ± 2.68 ^b	17.3 ± 1.56

^{a,b} Means ± SE in the same column without a superscript differ at $p < 0.05$.

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