

FEEDING POULTRY LITTER TO RUMINANTS

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Summary

Experiments were conducted to assess the feasibility of recycling poultry litter in the diets of young calves. Weaning rations containing 30% ensiled or unprocessed poultry litter gave unsatisfactory growth when fed to calves from two to twelve weeks of age. However, when these twelve week old calves were fed rations containing 30% or 50% poultry litter and sorghum, the costs/kg. gain were 19.5c and 19.8c respectively, compared with 32.9c for a high concentrate ration.

I. INTRODUCTION

Competition for energy and feed resources between humans and ruminants has influenced scientists to seek new forms of feed to which ruminants are uniquely adapted.

Poultry litter has been used to replace 25% to 50% of the concentrates in the diets of gestating-lactating ewes (Noland, Ford and Ray, 1955) ; wethers (Bhattacharya and Fontenot, 1966); six months old calves (Bosman, 1973) and yearling steers (Drake, McClure and Fontenot, 1965). Jacobs and Leibholz (1974) have also shown that when diets containing ensiled poultry litter and barley were fed to adult sheep there was a significant improvement in dry matter intake and nitrogen balance over unprocessed or partially-ensiled diets.

Experiments were carried out to evaluate the effect of including ensiled or unprocessed poultry litter in the rations of young calves (6 to 12 weeks of age) and the effect of including 30% or 50% unprocessed poultry litter in rations of older calves (12-18 weeks of age) adapted to poultry litter.

II. MATERIALS AND METHODS

Forty-five male Friesian calves, one to six days of age, were purchased in groups of 12 or 16. Twenty-two were assigned to the "experimental" group. Twenty-three were principally used for another experiment and were designated the "control" animals.

All calves were fed on a commercial milk replacer for five weeks and gradually weaned over the next six days. From two weeks of age, the "experimental" calves were offered one of two poultry litter diets (30W or 30D) and the "control" calves were offered diet "control 1". Diet 30D contained 30% unprocessed poultry litter (dry matter basis) 38.5% hammermilled sorghum and 6% meat meal, diet 30W contained 45% of poultry litter and sorghum ensiled together (anaerobically fermented at 55% dry matter - poultry litter: sorghum, 2:1), 23.5% hammermilled sorghum and 6% meat meal and diet "control 1" contained 63.4% barley, 10% meat meal and 1.1% urea. All diets contained 20% lucerne meal, 3% molasses, 2% sodium bicarbonate, 0.5% salt and vitamins, minerals and antibiotics. Chemical compositions of all diets are shown in Table 1.

At 12 weeks of age, 20 of the "experimental" calves were randomly allocated to one of two "growing" diets. Diet 30G contained 30% poultry

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litter and 70% hammermilled sorghum and diet 50G contained 50% poultry litter and 50% hammermilled sorghum. -The "control" calves were offered one of four barley-soyabean meal diets designated "control 2". Chemical compositions are also shown in Table 1.

The calves were penned individually on concrete floors with sawdust bedding. During the tenth and seventeenth weeks the calves were placed in metabolism cages and urine and faeces were collected daily, weighed and bulked for chemical analysis. A.O.A.C. (1970) methods were used to determine dry matter, organic matter, nitrogen and A.D.F.

TABLE 1

Chemical analysis of diets fed to the calves (% D.M.)

Diet	Poultry litter	D.M.	Ash	N	A.D.F.
Control 1		88.8	7.3	3.4	15.2
30D	30%	86.6	15.4	3.3	24.0
30W	30% ensiled	77.7	14.0	3.3	23.9
Control 2	-	89.0	4.9	2.9	8.0
30G	30%	87.6	4.9	2.5	16.4
50G	50%	84.7	11.1	2.9	23.1

III. RESULTS

Calves 6-12 weeks of age

The feed intake and average daily gains were significantly greater ($P<0.05$) and the feed conversion ratio was significantly lower ($P<0.05$) for the calves given the control diet from 6-12 weeks of age than for the calves given either of the poultry litter diets (Table 2). The average daily gains of the calves fed the diet containing unprocessed poultry litter (30D) were significantly higher ($P<0.05$) than those calves fed the diet containing ensiled poultry litter (30W).

Dry matter digestibility and nitrogen digestibility were both significantly higher ($P<0.05$) for the calves fed the control diet compared with those calves fed either poultry litter diets.

Calves 12-18 weeks of age

The feed intake and average daily gains of the calves fed the control diets from 12-18 weeks of age were significantly higher ($P<0.05$) than those of the calves fed either level of poultry litter in their diet (Table 3).

The average daily gains of the calves fed the diet containing 30% poultry litter (30G) were significantly higher ($P<0.05$) than those of the calves fed the diet containing 50% poultry litter (50G) - 56.7% and 47.1% of controls, respectively. The feed conversion ratios of the calves fed the control diets and diet 30G were significantly lower ($P<0.05$) than for the calves given diet 50G.

Dry matter digestibility, nitrogen digestibility, A.D.F. digestibility and nitrogen retention were similar for the calves fed either level of poultry litter. Organic matter digestibility was significantly higher ($P<0.05$) for those calves fed diet 30G compared with those calves fed diet 50G.

TABLE 2

Production and performance of calves from 6-12 weeks of age

	Control	Diet 30D	30W
<u>Weight gain</u>			
Dry matter intake (g/day)	2965 ^a	2103 ^b	1868 ^b
Average daily gain (g/day)	1037 ^a	442 ^b	325 ^c
Feed conversion ratio	2.87 ^a	5.04 ^b	6.06 ^b
<u>Digestibility (%)</u>			
Dry matter	71.0 ^a	56.5 ^b	52.3 ^b
Nitrogen	77.9 ^a	64.9 ^b	61.6 ^b
A.D.F.	29.5 ^a	22.0 ^a	17.3 ^a

TABLE 3

Production and performance of calves from 12-18 weeks of age

	Controls	Diet 30G	50G
<u>Weight gain</u>			
Dry matter intake (g/day)	4397 ^a	2695 ^b	2879 ^b
Average daily gain (g/day)	1220 ^a	692 ^b	575 ^c
Feed conversion ratio	3.61 ^a	3.90 ^a	5.15 ^b
<u>Digestibility (%)</u>			
Dry matter	72.5	64.5 ^a	57.8 ^a
Nitrogen	-	56.4 ^a	60.7 ^a
A.D.F.	-	13.6 ^a	11.4 ^a

a,b,c: means not containing a common superscript were significantly different (P<0.05).

IV. DISCUSSION

These experiments are the only reports on the feeding of poultry litter to young ruminants.

The basic chemical analysis of all three weaning rations fed to the calves from two to twelve weeks of age followed the criteria proposed by Leibholz and Naylor (1971), Leibholz and Kang (1972) and Kang and Leibholz (1973) that weaning diets should contain at least 12% true protein, about 15% crude protein and A.D.F. of about 16% for maximum weight gains.

Even though the A.D.F. content of the two poultry litter diets (30D and 30W) fed to the young calves was the same as one of the diets fed by Kang and Leibholz (1973) containing 30% wheat straw, the weight gains of the calves in this experiment were only 65% of the calves fed by Kang and Leibholz (1973). This was probably due to the different

proportions of cellulose, hemicellulose and lignin in the A.D.F. of the Poultry litter (wood-shavings base) compared with the wheat straw fed by Kang and Leibholz (1973). A similar suggestion has also been made by Leibholz (1975) when comparing wheat straw with lucerne meal.

Digestibilities of dry matter, organic matter, nitrogen and A.D.F. were reduced by the inclusion of poultry litter in the diet of early-weaned calves. However, digestibility coefficients of poultry litter diets increased as the calves became older (Tables 2 and 3) although these were lower than those obtained with adult sheep (Jacobs and Leibholz, 1974).

The performance of the calves fed diets containing poultry litter was better from 12 to 18 weeks than from 6 to 12 weeks of age, even when the proportion of poultry litter in the diet was increased. This can be attributed to the higher feed intakes and greater digestibility of nutrients by the calves in the second period.

The relative costs of production on diets 30G and 50G were almost exactly the same, based on the following costs of ingredients: \$7.00/tonne delivered for poultry litter, \$65.00/tonne for sorghum and 0.2c/kg feed for the mineral/vitamin supplement. Hence, the feed cost/kg gain for diet 30G was 19.5c and 19.8c for diet 50G. If sorghum were substituted for barley in the control diet the feed cost/kg gain would have been 32.9c.

The poor performance of the early-weaned calves fed the diets containing poultry litter would suggest that poultry litter with wood-shavings as the base should not be included in their diets for economic production. However, it appears that it is possible to feed levels of 30% or more of poultry litter to young calves (12 to 18 weeks of age) after an adaptation period and their subsequent performance can be regulated by the amount of poultry litter included to suit market conditions. There can also be a considerable saving in cost, especially in times of drought and depressed economic conditions.

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