Value of Cottonseed Cake and Blood meal in Concentrate Mixture of Dairy Cows

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Five digestion trials were made on five milch cows of Sahiwal breed to study the comparative nutritive value of cottonseed cake and blood meal in concentrate mixture of dairy cows. The design of the experiment was 5×5 Latin Square. The maintenance requirements of the cows were met from green and dry roughages, green berseem adn wheat straw, whereas the production requirements were met from the experimental rations. Cottonseed cake (40 per cent), wheat bran (25 per cent), molasses (25 per cent) and wheat straw (8 per cent) constituted the basal ration. Blood meal was added at the cost of cottonsed cake at 10,20,30 and 40 per cent level so as to replace equal amount of cotton-seed cake. The apparent digestibility of dry matter and ether extract was observed to increase with increasing levels of blood meal, but the increase was statistically non-significant. Feeding of concentrate mixture with higher levels of blood meal, *viz.*, 20,30 and 40 per cent caused significant depression of digestibility of protein as compared to the mixture containing no blood meal. The digestibility of crude fibre of the ration containing 40 per cent blood meal was observed to be significantly lower than that of the ration containing 40 per cent cottonseed cake. The digestibility of the nitrogen free extract of different rations did not differ significantly. Non-significant differences were found in the percentages of nitrogen retained by cows fed different experimental rations. Similarly feeding of various concentrate mixtures to cows had no significant effect on milk yield and milk fat percentage.

INTRODUCTION

Blood meal is the largest of all the packing plant by-products and contains about 70 per cent digestible protein. Blood meal is commonly used in poultry rations and calf starters but has been less frequently used for dairy cows. Morrison (1959) stated that blood meal in lactating cows did not cause any significant increase in milk yield as compared to cottonseed cake or linseed cake. Sial and Sial (1965) observed that 3 per cent of blood meal in combination with cottonseed cake was perhaps the most optimum level to be used in sheep rations. They concluded that blood meal successfully served both as partial as well as sole source of proteins for sheep fattening rations. Archibald (1936)

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reported that blood meal was a satisfactory source of protein and could replace 10 per cent of mixture of soybean oil meal and cottonseed meal in the ration of dairy cows. Vickers *et al.* (1933) reported that addition of 5 pounds (12 per cent of winter concentrate mixture) of blood meal in concentrate mixture resulted in significant increase in wool production as compared to sheep fed on hay and cottonseed cake. Thus, an experiment was undertaken to study the nutritional value of blood meal and its influence on digestibility of mixed ration comparative to that of cottonseed cake, the most frequently used concentrate in dairy cows.

PROCEDURE

Five freshly calved Sahiwal cows of approximately same age, weight and stage of lactation were selected from the University dairy herd and were designated as No. 1, 2, 3, 4 and 5. A preliminary period of 10 days was observed to let the animals adjust to new feed. The ration was fed in dried form as the soaked ration was not liked by the cows.

The maintenance requirements of cows were met from roughages, *viz.*, green berseem and wheat straw according to Morrison (1959) feeding standards. Five experimental rations were formulated and were designated as A, B, C, D and E (Table 1). The rations were fed for milk production on the basis of fat content. Cottonseed cake (40 per cent), wheat bran (25 per cent), molasses (25 per cent) and wheat straw (8 per cent) constituted the basal ration. Bone meal and pulverised common salt were added at 1per cent level as mineral supplement to each ration. Blood meal was added at the cost of cottonseed cake at 0, 10, 20, 30 and 40 per cent levels to each of the experimental ration respectively so as to replace equal amounts of cottonseed cake.

The design of the experiment was 5×5 Latin Square. Five digestion trials were conducted for a period of 20 days each and the cows were rotated on each ration after each trial in a cyclic order.

The animals were fed green roughage at 8 A.M. while the dry roughage allowance was divided into three feedings and was fed at different intervals during the day. The experimental rations were fed during milking hours (2 A.M. and 2 P.M.) and the dairy production allowance was divided into two equal portions. Fresh and clean water was available to the animals at all times.

The animals were weighed at the start of the preliminary period. The daily milk yield was recorded and samples of milk were tested for fat content.

During the collection period the animals were fitted with harness for the collection of urine. The urine passed by the animals was directly conducted by a rubber tubing into urine recepticles placed in cemented pits fitted

with iron lids and especially made for the purpose. The faeces were collected manually soon after being voided and were put into labelled iron cans fitted with lids. The animals were weighed every ten days after the harness was removed. The cows were given a light walking exercise daily and arrangements were made for the collection of faeces and urine during the period. The animals were re-fitted with their usual harness and were put back into their respective stalls.

Each morning the weight of the faeces voided by individual cow during 24 hours was recorded. The faeces, thus collected were thoroughly mixed and then ten representative samples were taken for moisture determination and for chemical analysis. The fresh samples were weighed immediately and dried in hot air oven at 105°C. till constant weight was obtained. The dried samples were ground in a grinding machine using 1 millimeter mesh sieve. The ground samples were preserved in labelled air tight bottles for further chemical analysis. The total urine voided by each animal during twenty-four hours was measured and 1 c.c. per litre of total urine excreted daily was taken for the nitrogen estimation. The composite samples of rations, faeces and urine were kept in laboratory in labelled bottles for chemical analysis. The feeds and faeces were analysed for dry matter, crude protein, ether extract crude fibre and total ash according to A.O.A.C. (1955) methods prevalent at the Agricultural University, Lyallpur. The data collected were subjected to statistical analysis using analysis of variance methods (Snedecor, 1959).

TABLE I. *Composition of Experimental Rations*

Ingredients	Composition of Rations				
	A (per cent)	B (per cent)	C (per cent)	D (per cent)	E (per cent)
Cottonseed cake (undecorticated) ..	40	30	20	10	0
Blood meal ..	0	10	20	30	40
Wheat bran ..	25	25	25	25	25
Molasses ..	25	25	25	25	25
Wheat straw ..	8	8	8	8	8
Bone meal ..	1	1	1	1	1
Common salt (pulverised) ..	1	1	1	1	1
Total ..	100	100	100	100	100
Digestible protein ..	9.49	14.76	20.03	25.30	30.57
Total digestible nutrients. ..	67.67	68.01	68.35	68.69	69.03
Calcium ..	.739	.747	.755	.763	.771
Phosphorus ..	.760	.774	.788	.802	.816

RESULTS AND DISCUSSION

The data on the digestibility of various nutrients are summarised in Table 2.

TABLE 2. *Summary of Digestibility Data.*

Rations	A 40% Cottonseed Cake + 30% Blood meal	B 30% Cottonseed Cake + 10% Blood meal.	C 20% Cottonseed Cake + 20% Blood meal.	D 40% Cottonseed Cake + 30% Blood meal.	E 40% Cottonseed Cake + 40% Bolod meal.
Nutrients:					
Dry matter ..	42.7	42.5	44.3	44.8	44.8
Crude protein ..	79.5	77.9	76.2	75.5	75.3
Ether extract ..	67.6	65.5	64.5	62.8	61.3
Crude fibre ..	79.2	75.0	75.8	75.4	73.9
Nitrogen free extract	89.3	87.8	87.1	88.2	88.6

The apparent digestibility of dry matter was observed to increase gradually with the increase in the level of blood meal and a corresponding decrease in the level of cottonseed cake in concentrate mixture but differences were found to be non-significant. The digestibility of crude protein of ration A was highest as compared to that of rations B, C, D and E (79.5 *Vs.* 77.9, 76.2, 75.2 and 75.3) per cent and the differences between the digestion co-efficient of crude protein of ration A, C, D and E were observed to be highly significant ($P<0.01$). Non-significant differences were observed between rations A and B as well as between D, C and E. Ration B had also significantly ($P<0.05$) better digestibility of crude protein than that of ration D & E. The digestibility of ether extract of rations was lowered with the increasing level of blood meal.

Ration A had the best while ration E had the poorest digestibility of crude fibre. The difference in the digestibility of crude fibre of ration A, B, D and E and A and C were significant ($P<0.01$ and $P<0.05$, respectively). The apparent digestibility of nitrogen free extract of ration B and C was almost the same. Similarly, the digestibility of nitrogen free extract of Ration D and E differed very slightly. Although the digestibility of nitrogen free extract of

ration A, D and E was higher than that of B and C, but the differences were found to be non-significant.

All the rations were equally good in maintaining the animals in positive nitrogen balance although the animals fed ration E retained the least percentage of nitrogen as compared to those fed ration A, B, C and D (Table 3). But non-significant differences were observed in the per cent nitrogen retained by cows fed either of the experimental rations.

TABLE 3. *Data on Nitrogen Balance.*

Ration	Blood Meal (per cent)	Cottonseed Cake (per cent)	Nitrogen retained (per cent)
A ..	0	40	50.9
B ..	10	30	49.8
C ..	20	20	48.9
D ..	30	10	49.3
E ..	40	0	41.8

The data on milk production indicated that there was either very slight increase or no effect on milk yield when blood meal replaced cottonseed cake at 10 or 20 per cent level, while milk yield was slightly lower at 30 per cent or 40 per cent added level of the meal. Again very slight or no difference in milk fat percentage was observed among cows fed either of the rations.

TABLE 4. *Milk yield and milk fat percent of dairy cows.*

Rations	Blood Meal (per cent)	Cottonseed Cake (per cent)	Milk Yield (per cent)	Fat percentage (per cent)
A ..	0	40	14.04	4.14
B ..	10	30	14.12	4.08
C ..	20	20	14.04	4.08
D ..	30	10	13.80	4.08
E ..	40	0	13.92	4.28

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