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NUTRITIVE VALUE OF CORN STEEP LIQUOR FOR LACTATING BUFFALOES

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The nutritive value of corn steep liquor was tested in four feeding trials on lactating buffaloes on 4 x 4 latin square design. Each trial lasted for 2 weeks: the first week being the preliminary period and the subsequent week being the actual collection period. All the records on feed consumption, fat corrected milk produced, butter fat percentage, digestibility of nutrients and cost per kg. of fat corrected milk produced were duly maintained. The results showed that the daily fat corrected milk production on rations C and D was significantly better than that on rations A and B. This showed that addition of corn steep liquor at 40 to 60 per cent levels helped to achieve a better production. Observations on butter fat contents revealed that the use of corn steep liquor had no good or adverse effect on it. The data on cost per kg. of milk produced showed that it was minimum on ration C containing 60 per cent corn steep liquor.

INTRODUCTION

The corn steep liquor is a thick brownish-black viscous type of product of corn industry and has 17-19 per cent protein and about 1,560 calories per kg. on as-such basis. The product, apparently compares very favourably with undecorticated cotton seed cake which contains about 22 per cent protein and is the most favourite ingredient with our farmers for feeding to their animals. The production of corn steep liquor has been estimated to be 2500 tons per annum (Sial, 1975). Based on its nutrient contents, although it merited an actual feeding and disgestibility trial much earlier but the use of corn steep liquor as an animal feed remained, like that of many other agro-industrial by-products, obscure and unexplored till now. It was in this background that the present experiment was conducted to study (i) if corn steep liquor could be used as a substitute for cotton seed cake in lactating buffalo rations; (ii) the effect of feeding corn steep liquor on the quantity and quality of milk produced, (iii) and to ascertain the economics of milk production on rations with or without corn steep liquor.

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MATERIALS AND METHODS

Four digestion trials were conducted on milking buffaloes at the Nutrition Research Centre, University of Agriculture, Lyallpur. Four lactating buffaloes of approximately the same age, weight, milk yield and lactation number were purchased and numbered as buffalo 1, 2, 3 and 4. The buffaloes were kept under observation for 10 days before the actual start of the experiment. Four isonitrogenous rations were formulated on the basis of crude protein and were designated as A, B, C and D respectively. Ration A served as control. The composition of the experimental rations is shown in Table 1.

TABLE 1. *Composition of the experimental rations,*

Ingredients	A (kg)	B (kg)	C (kg)	D (kg)
Cotton seed cake	51	34	17	—
Corn steep liquor	–	20	40	60
Wheat straw	30	30	30	30
Molasses	19	16	13	10
Total:	100	100	100	100

The experiment was conducted on a 4 x 4 latin square design. Four digestion trials were conducted for a period of 8 days each and the buffaloes were rotated on each ration after each trial in a cyclic order.

The amount of green fodder and experimental rations to be fed was calculated on the basis of requirements of the animals depending upon their body weight, milk yield and fat percentage. The requirement figures followed were taken from N.R.C. because of their being latest on the subject, on the one hand and having greater acceptability with the scientists these days, on the other. All the records of feed consumption and milk produced, etc. were maintained in kilogrammes. The green fodder (green maize) was fed at the rate of 25 kgs per day to each buffalo which covered a large per cent of the maintenance requirements of the animal. The balance of the maintenance requirements alongwith the production requirements were taken care of through the allowance of experimental rations.

The data were analysed using the analysis of variance method (Snedecor, 1957) and comparison of mean differences was made by Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Milk Yield (Fat Corrected Milk)

A realistic comparison of milk yield can be made only after the yield has been standardized on the basis of fat content. The data on the butter fat percentage of milk and the average daily yield of fat corrected milk on various rations is presented in Table 2 and their statistical analysis in Table 3.

TABLE 2. *Data on butter fat percentage and daily yield of fat corrected milk (4 per cent fat).*

(Average of four trials)

Ration	Level of corn steep liquor	Butter fat percentage	Average daily yield of fat corrected milk (kg)
A	0%	6.05	8.72
B	20—	6.30	9.41
C	40—	6.75	12.68
D	60 —	6.85	12.83

TABLE 3. *Analysis of variance of the data on butter fat percentage and daily yield of fat corrected milk*

S.O.V.	D.F.	Average daily yield of fat corrected milk (kg)		Average butter fat percentage	
		M.S.	F. Ratio	M.S.	F. Ratio
Buffaloes	3	0.3438	1.0433N.S.	0.1512	0.143N.S.
Trials	3	1.1408	3.4653N.S.	0.0708	0.067N.S.
Rations	3	18.5118	56.2326*	0.5691	0.538N.S.
Error	6	0.3292		0.1056	

N.S. — Non-significant.
* — Significant at 5% level.

D	C	B	A
12.83	12.66	9.41	8.72

A careful perusal of Table 2 would reveal that there was a general trend of improvement in the milk yield when the level of corn steep liquor increased in the ration: The statistical analysis of the data (Table 3) revealed that the production of milk on rations C and D was significantly higher as compared to the one on rations A and B. This showed that corn steep liquor when used at levels of 40 or 60 per cent of the ration produced significantly better results than when it was either used at 0 or 20 per cent level. When rations A and B were compared with each other, the differences were found to be non-significant. This may be possibly due to the narrow magnitude of difference (20 per cent) in the levels of corn steep liquor used in the two rations. The same reason appeared to hold good in the case of ration C Vs D.

The production of milk tended to increase as the level of corn steep liquor in the ration increased. It was found to be especially significantly higher on the higher levels of corn steep liquor (40 and 60 per cent) than on the low levels (0 & 20 per cent). This suggested that to secure significantly beneficial results, at least 40 per cent level of corn steep liquor should be used in the ration.

Butter fat Percentage

As shown in Table 3 average butter fat content of milk on rations A, B, C and D was observed to be 6.05, 6.30, 6.75 and 6.85 per cent, respectively. There occurred a clear trend toward an increase in fat content of milk as the level of corn steep liquor increased in the ration The differences were, however, found to be non-significant statistically. It may also be pointed out that the good effect of higher butter fat percentage became more perceptible when the yield were corrected to the 4 per cent fat level.

Feed Consumption and cost of milk production

The summary of the data on the daily production of fat corrected milk, consumption of experimental ration and green fodder, and cost per kg of fat corrected milk produced is presented in Table 4. The cost (per 100 kg) of concentrate rations A, B, C and D was Rs. 48.25, 53.75, 59.25 and 64.75, respectively. Apparently, ration D would look costlier to a lay-man but the correct parameter of judging the economics of a ration is the cost per unit of milk produced and not the apparent price of the ration. When Compared on these basis the cost per kg. of fat corrected milk produced on ration A, B, C and D was Rs 0.92, 0.96, 0.73 and 0.78, respectively. This showed that ration C was the most economical one, followed in order by rations D, A and B.

TABLE 4. *Summary of the data on feed consumption and cost of milk production.*

Particulars	Rations			
	A	B	C	D
Average daily concentrate consumption (kg)	9.00	9.12	9.37	9.75
Average daily green fodder consumption (kg)	25.00	25.00	25.00	25.00
Cost of concentrate ration per 100 kg (Rs.)	48.25	53.75	59.25	64.75
Cost of green fodder per 100 kg (Rs.)—	15.00	15.00	15.00	15.00
Cost of concentrate consumed each day (Rs.)	4.34	5.26	5.55	6.31
Cost of green fodder consumed each day (Rs.)	3.75	3.75	3.75	3.75
Total cost of concentrate and green fodder consumed each day.	8.09	9.01	9.30	10.06
Average daily F.C.M. produced (kg.)	8.72	9.41	12.68	12.83
Cost per kg. of F.C.M. produced (Rs.)	0.92	0.96	0.73	0.98

* The market prices of different ingredients are shown below :

Cotton seed cake	Rs. 75/100 Kg
Corn steep liquor	Rs. 95/100 Kg
Wheat straw	Rs. 17.5/100 Kg
Molasses	Rs. 25/100 Kg.

** The market price for green fodder was Rs. 15/100 Kg.

The results thus indicated that the addition of corn steep liquor to a ration helped to obtain more milk from the animals. The present observations also served to dispell a common belief whereby illiterate farmers estimate the economics of a ration on its apparant market price. The overall picture of the results revealed that the cost of milk production decreased as the level of corn steep liquor in the ration was increased.

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