

USE OF FILTER CAKE IN ANIMAL DIET PART I. EFFECT OF USING FILTER CAKE IN THE DIET ON THE WEIGHT GAIN OF YOUNG BUFFALO CALVES

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To economize the feeding expenditure, a mixture of filter cake (a sugar industry by-product) and cotton seed cake in addition to other feed ingredients, was fed to the young buffalo calves. In addition, the animals were fed on maize fodder in Kharif season (summer) and berseem in Rabi season (winter) *ad-libitum*. The duration of experiments varied from 121 to 150 days. In all the experiments, weight gained by the animals increased with increasing quantity of filter cake in the diet. The trend in weight gain due to treatments remained almost similar and filter cake containing diet gave higher weight gains over pure cotton seed cake. Weight gain(%) by animals receiving pure cotton seed cake varied from 18.1 to 24.7 %, whereas filter cake containing diets gave 20.6 to 37.7% weight gain.

Key words: Filter cake, Buffalo calves, Diet.

Introduction

Unplanned increase in population certainly cause food and socio-economic problems. In developing countries like Pakistan, the food used by the majority of population is unbalanced and substandard. Protein deficiency is one of the main health problems in our population. Meat is one of the best sources of protein but its per capita availability in Pakistan is very low as compared with the developed countries. To cope with the increasing demand of growing population, the production of meat needs to be increased.

Goat farming and calf rearing is the need of time to increase the meat production. In Pakistan, 30 % of total red meat comes from buffalo (Anon 1991). For fattening the animals, the feed should contain 14-15 % protein (Backer 1968). The conventional protein sources in Pakistan normally consist of cotton seed cake but at present, livestock pool in Pakistan is deficient by 21 % of crude protein requirements (Anon 1991). In developed countries other sources of protein like soybean and fish meal are quite common.

For the farmers, high cost ration for calves mean less profit. It is, therefore, necessary to reduce the cost of ration for earning reasonable profit using some alternative cheaper sources of animal nutrition. Backer (1968) suggested dried-molassed-beet pulp to replace up to 30 % of the cereal in the fattening diet. He reported that inclusion of 10 % beet pulp (wet) has shown an increase in the palatability and intake of the diet. The diet suggested by him for intensive fattening contained

25 % sugar beet pulp, 60 % rolled barley and 15 % protein supplement. It has been observed that inclusion of orange waste (pulp) upto 30% in diet gave satisfactory results and has no adverse effect on animal growth or health (Gampawar and Nimberty 1984; Rodriguez and Gonzalez 1973). Filter cake (Pressmud) is a by-product of sugar industry and its annual production is about 0.6 million tons (Pacolae 1988). Filter cake contains crude protein, carbohydrates and minerals (Ca, P, Mg, Cu, Mn, Fe) essential for animals (Kaushal *et al* 1981; Gupta *et al* 1987; Rodriguez and Esturo 1989). It is proposed by Rodriguez and Gonzalez (1973) that unfiltered clarification mud from cane sugar factories can be used as live stock feed during long droughts. At present major part of filter cake is used as fuel for baking bricks in kilns. Such indiscriminate burning not only causes atmospheric pollution but also wastes tons of nutrients essential for animals and plants. Its judicious use as farm yard manure and / or mixing it in animal diets will certainly reduce inputs needed in the agriculture and live stock industry. An attempt therefore, has been made to use filter cake as a substitute wholly or partly for cotton seed cake in animal diets. If it proves beneficial, a cheaper source of nutrients will be available for formulating inexpensive and nutritious diet for the meat animals.

Materials and Methods

Three experiments were conducted at Ayub Agricultural Research Institute, Faisalabad during 1991-1993. In the first two experiments, cotton seed cake was replaced by dry filter cake in feed at the rate of 0, 10, 20 and 30 % (Table 1a) and

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900 g of the mixture was fed to each calf daily. In the third experiment it was replaced at the rate of 0, 20, 40 and 60 % (Table 1b) and 1000 g was fed to each calf daily. The quantity of wheat bran, wheat straw, molasses, NaCl and CaHPO₄ was the same in all diets. The duration of experiments varied between 121 to 150 days. The experiments were repeated three times keeping one animal per treatment. In each replication animals were grouped according to their weight and age. The initial weights of the calves were noted at zero day and then weighed fortnightly. The animals were fed on maize fodder in summer and berseem in winter ad-libitum. In each experiment a fresh lot of buffalo calves was taken. The diets used in experiment were analysed for protein (Jackson 1962) and other constituents using methods described by Allen *et al* (1986) (Table 2a and 2b). At the end of the 3rd experiment a calf randomly selected from each treatment was slaughtered to see any abnormality in size and weight of kidney, liver and heart. The stone formation in the kidney was also observed. Significance of treatments was compared by using Duncan's Multiple Range test (Steel and Torrie 1980).

Processing of filtercake. Fresh filter cake was collected from the Crescent Sugar Mills, Faisalabad, air dried in the sun, clods were crushed, sieved and stored for further use.

Results and Discussion

Three experiments were conducted to study the filtercake effects on weight gain of young buffalo calves. First two trials were conducted during the summer seasons of 1991 and 1992

and the third was during winter 1993. Weight gain over the initial weight of animals was taken as feed (treatment) effect. The results of the first two experiments (150 days each) presented in Table 3 and 4 showed that the trends in weight gain due to different feeds were quite similar in both the experiments. The weight gain by calves increased progressively as quantity of filtercake increased in feed from 0 to 120 g day⁻¹ (Table 3-4). Weight gain in first experiment (Table 3) ranged from 18.1 (control) to 27.7 % (120 g filter cake) and in second experiment it ranged from 19.2 (control) to 29.1 % (120 g filter cake) (Table 4). Although the percentage of weight increase showed a positive relationship with the quantity of filter cake fed to the animals in both experiments, only the highest quantity (120 g) containing treatment in first experiment showed the significant increase (Table 4). This variation might be caused by different factors like animal age, initial weight, type of fodder, seasonal variation etc.

To reconfirm the summer results of experiments 1 and 2 conducted during 1991 and 1992 in which shredded wheat straw was fed as bulk fodder, a third experiment was conducted during winter 1993 (26 Dec 1992 to 25 April 1993) and berseem fodder was fed to the animals. The quantity of filter cake fed to the animals in different treatments was also increased as compared with the previous two experiments. Increase in weight showed quite similar trend (Table 5) as in previous two experiments (Table 2-3) where wheat straw was fed as bulk fodder. The responses to all the treatments in general, were higher as compared with the previous two ex-

Table 1a

Daily amounts of cotton seed cake, filter cake and other ingredients fed to animals in experiment No 1 and 2

Feed	Cotton seed cake (g)	Filter cake (g)	%	Wheat bran (g)	Wheat straw (g)	Molasses (g)	NaCl (g)	CaHPO ₄ (g)
1	400	00	00	130	200	150	10	10
2	360	40	10	130	200	150	10	10
3	320	80	20	130	200	150	10	10
4	280	120	30	130	200	150	10	10

Total weight = 900 g

Table 1b

Daily amounts of cotton seed cake, filter cake and other ingredients fed to animals in experiment No 3

Feed	Cotton seed cake (g)	Filter cake (g)	%	Wheat bran (g)	Wheat straw (g)	Molasses (g)	NaCl (g)	CaHPO ₄ (g)
1	500	000	00	130	200	150	10	10
2	400	100	20	130	200	150	10	10
3	300	200	40	130	200	150	10	10
4	200	300	60	130	200	150	10	10

Total weight = 1000 g

periments. The percent increase in weight varied from 27.7 (control) to 37.7 % (300 g filter cake). Rodriguez and Gonzalez (1973) found no difference in daily milk yield or daily live weight gain in cows when diets containing 5, 10 and 15 % filter cake mud replaced forage on a dry matter basis were given for 4 periods of 4 weeks. Mean daily live weight gain was 0.757 kg to 0.880 kg when balanced mixed diets with filter cake (35 to 50 %) were fed to steers (Jackson 1962).

Table 2a

Chemical analysis of feeds used in experiments
No 1 and 2

Determinations	Feed 1	Feed 2	Feed 3	Feed 4
Crude protein (%)	20.5	13.1	14.2	15.5
Crude fat (%)	3.6	4.1	4.4	3.7
Crude fibre (%)	23.6	24.4	25.0	27.5
Ash (%)	16.6	16.7	20.4	21.7
Phosphorus (%)	0.36	0.41	0.41	0.50
Potassium (%)	1.2	1.3	1.4	1.3
Copper ($\mu\text{g g}^{-1}$)	3.0	4.2	5.4	9.8
Zinc ($\mu\text{g g}^{-1}$)	18.8	21.6	22.8	25.8
Iron ($\mu\text{g g}^{-1}$)	221.2	511.5	628.8	967.6
Manganese ($\mu\text{g g}^{-1}$)	26.6	35.4	36.8	51.6

Table 2b

Chemical analysis of feeds used in experiment No 3

Determinations	Feed 1	Feed 2	Feed 3	Feed 4
Crude protein (%)	16.4	12.0	14.2	12.0
Crude fat (%)	4.3	6.6	8.5	4.9
Crude fibre (%)	22.0	25.5	26.8	27.7
Ash (%)	16.4	18.3	24.0	30.9
Phosphorus (%)	0.46	0.53	0.55	0.60
Potassium (%)	1.3	1.2	1.2	1.2
Copper ($\mu\text{g g}^{-1}$)	4.8	9.0	16.4	22.6
Zinc ($\mu\text{g g}^{-1}$)	22.0	29.0	42.0	51.0
Iron ($\mu\text{g g}^{-1}$)	174.0	284.4	1280.0	1574.2
Manganese ($\mu\text{g g}^{-1}$)	25.8	37.2	66.0	76.6

The higher increase in weight gain in experiment 3 (120 days) as compared with the previous experiments 1 and 2 was perhaps due to the higher quantity of filter cake in ration and green berseem fed as bulk fodder to the animals (Table 5). Certainly the higher concentration of protein in berseem fodder was one of the reasons for gaining higher weight in addition to additional minerals and readily metabolizable carbohydrates present in filter cake.

It is very clear from the results obtained from all these experiments (spread over three years period 1991-93) that feeding of filter cake caused higher weight gain in animals regardless of nature of fodder and season which certainly had their own effects. The significance of treatment effects varied from experiment to experiment but the superiority of filter cake over cotton seed cake is very clear from the results of all the experiments. The results proved that use of filter cake in animal ration specially for the animals used for meat purpose gives better results than cotton seed cake. This establishes that cotton seed cake can be substituted with filter cake in feeds for animals for more meat production. This will introduce the cheaper feed formulation among the animal growers and enhance meat production in the country.

Increased quantity of filter cake in cotton seed cake upto 300 g day⁻¹ in 1000 g ration showed positive relationship which suggests that the experiments should be continued with increasing quantity of filter cake upto the stage of inflection point or where the filter cake effect get levelled off.

Gain in animal weight as discussed above is physical which does not necessarily reflect any internal abnormality like, heart and liver enlargement or kidney stone. For this purpose, at the end of the 3rd experiment, one animal from each treatment was slaughtered to note such observations. There were small variations in these organs' size and weight which may be related to the size and age of animals (Table 6) but no abnormality was observed at this stage.

It is thus, concluded that the replacement of 300 g cotton seed cake by same quantity of dried filter cake in 1000 g of ration is quite safe and provide cheaper source of minerals

Table 3

Effect of filter cake feeding on weight gain of buffalo calves (experiment No1 summer season)

Feed	Treatment (feeds) (g)		Weights (kg)			Increase in weight (%)
	Cotton seed cake	Filter cake	Initial	Final	Gain	
1	400	0	137.3	162.2	24.9	18.1 b
2	360	40	136.0	164.0	28.0	20.6 b
3	320	80	131.3	159.3	28.0	21.3 b
4	280	120	132.3	171.6	39.3	29.7 a

Table 4
Effect of filter cake feeding on weight gain of buffalo calves (experiment No 2 summer season)

Feed	Treatment (feeds) (g)		Weight (kg)			Increase in weight (%)
	Cotton seed cake	Filter cake	Initial	Final	Gain	
1	400	0	156.0	186.0	30.0	19.2 a
2	360	40	157.7	192.3	34.6	21.9 a
3	320	80	159.6	200.3	40.7	25.5 a
4	280	120	161.0	208.0	47.0	29.1 a

Table 5
Effect of filter cake feeding on weight gain of buffalo calves (experiment No 3 winter season)

Feed	Treatment (feeds) (g)		Weight (kg)			Increase in weight (%)
	Cotton seed cake	Filter cake	Initial	Final	Gain	
1	500	0	189.3	236.0	46.7	24.7 c
2	400	100	174.6	224.0	49.4	28.2 bc
3	300	200	180.7	241.3	60.6	33.5 ab
4	200	300	166.3	229.0	62.7	37.7 a

Table 6
Effect of filter cake feeding on kidney, liver and heart of calves used in experiment No 3

Feed	Treatment (feeds) (g)		Animal weight (kg)		Kidney weight (kg)	Liver weight (kg)	Heart weight (kg)
	Cotton seed cake	Filter cake	Alive	Meat			
1	400	0	179	73	0.30	1.75	0.85
2	360	40	164	75	0.33	1.80	0.80
3	320	80	205	88	0.49	1.85	0.75
4	280	120	183	85	0.33	1.54	0.77

and energy for the young buffalo calves used for meat production. Such utilization of filter cake in feed will recycle the plant nutrients removed from soil and also cut down the atmospheric pollution caused by burning of filter cake in brick kilns.

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