EFFECT OF FEEDING LEGUME FORAGE WITH STRAW SUPPLEMENTATION ON MILK PRODUCTION AT PABNA MILK SHED AREA

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Summary

An experiment was conducted at Pabna milkshed area under Bathan condition during November, 1992 to February 1993 with 16 milking cows fed legume forage with straw supplementation (treated group) and 8 milking cows fed legume forage only (control group). From the study, the results revealed that supplementation of straw with leguminous diet increases the total dry matter intake (DMI) of 11.83 kg/d/cow for the treated group and 11.53 kg/d/cow for the control group. The average daily legume forage intake was 37.39 ± 8.67 kg/d/cow and 49.62 ± 10.57 kg/d/cow for the treated and control group respectively and the difference was significant ($p < 0.05$). The results also exhibited that due to the supplementation of straw, the legume forage intake reduced by 12 kg/d/cow. The forage dry matter intake (DMI) kg/d/cow for the treated and control groups were 6.18 ± 1.44 kg and 8.38 ± 1.95 kg respectively. The milk production was 8.64 ± 1.15 litre/day for the treated group which was significantly ($p < 0.05$) higher than the control group (7.74 ± 1.24 litre/day). The average initial body weight of the supplemented and control groups were 338.06 ± 39.32 kg and 329.87 ± 48.03 kg respectively. Whereas, the final body weight of supplemented group was 344.33 ± 35.90 kg and control group was 330.35 ± 37.28 kg. It may be concluded that straw supplementation with legumes diet could save legume forage for further use as well as increase milk production.
(**Key Words**: Bathan, Legume Forage, Supplementation, Milk Production)

Introduction

Bathan is a basin like area along the river 'Boral' and 'Gohala' at greater Pabna district in North-West Bangladesh. In this area, farmers have developed a more specialized dairy type of animal popularly known as the Pabna Milking Cows (PMC). This cattle is originating from crossing of local cattle with Shahiwal, Hariyana and Red Sindhi bulls (Islam and Vaughan 1980; Udo et al, 1992; Ghosh, 1981). About 600 ha of this land is a unique source of seasonal legume production. Blackgram (*Vigna mungo*) and Grass pea (*Lathyrus sativus*) are the major forage species usually broadcast into silt deposited by the departing monsoon flood in this bathan area. Farmers usually cultivate these legume species without tillage (Vaughan et al., 1980). 'Bathan feeding system' is completely based on these leguminous fodder from November to March and on some common grass species from March to June. From October to May, milking cattle usually graze on this 'bathan' area by pasture rotation system. In that period farmers do not use straw, although straw could be abundantly used in Bangladesh as ruminant livestock roughage.

Leguminous fodder supplement increase the voluntary feed intake and nitrogen when low quality roughages are the major part of the diet (Ash, 1990), but sole leguminous forage diet may cause suiting diarrohea, bloat and other health hazards (Baneijee, 1987). Due to the existing bathan feeding practices, farmers do not use these quality forage properly and efficiently. An option that may be used to improve the nutritional status of cattle at Pabna milkshea area, particularly during the bathan season could be to give them straw in a fixed amount as the most available and economic roughages in Bangladesh. Straw can be used as a suitable supplement for cattle when grazed in the leguminous forages field as it can reduce the diet cost. Based on the above principles, the effect of feeding legume forage with straw supplementation on milk productiion of cows was investigated with the objective to evaluate the milk production performance and the

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economic benefit of cows fed straw and leguminous forage based diet.

Materials and Methods

The experiment was conducted at Resambari bathan in the Pabna milkshed area during November, 1992 to February, 1993. A 90 days feeding trial was designed to investigate the effect of straw supplementation on milk yield and leguminous forage intake. Legume forages used in this experiment were *Vigna mungo* (Black gram) and *Lathyrus sativus* (Grass pea). Forages were supplied to the animals at *ad lib* basis. The study involved determination of chemical composition of legumes, straw, nutrients intake, milk production and cost analysis of different diets. Detail experimental procedure are as follows:

Farmer and animal selection

It is very difficult to select research animal in the farmers house, Breed, age and parity could not be maintained in the selection of animal. Only those cows were selected which were in lst month of lactation. Before that two farmer's were selected having at least 15 milking cows in the same calving time. Then 24 milking cows were selected from two farmers of Resambari bathan. The animals were then divided into two groups, treated group having 16 milking cows which were fed 2.5 kg fresh straw as a supplement and control group having 8 cows which were maintained in the farmers existing feeding practices. Before the experiment, daily milk production was recorded for 45 days and feeding and management practices were also recorded to compare the performance of cows between experimental period and traditional management system. Daily milk yield, feed record and samples were collected from the bathan.

Analytical technique

For the determination of approximate body weight of cows, the following formula was used according to Williamson and Payne (1987).

$$\text{Body weight} = \text{length} \times (\text{girth})^2/300$$

(Girth and length is in inch)

Dry matter intake

The dry matter intake was estimated by 3.5% at the body weight basis. The fresh forage intake was calculated by computing the value of straw as 90% DM, concentrate mixture as 90% DM and legume forage as 16% DM.

Dry matter of the feed sample was determined by drying over night at 105℃ and ashing in a muffle furnace at 550℃ for 3 hours, Crude protein content was determined by an autoanalyzer following standard kjeldhal digestion technique. The neutral detergent fibre (NDF) and acid detergent fibre (ADF) was determined according to Georing and Van Soest (1970).

Data analysis

The data collected were analysed for analysis of variance according to Zaman et al. (1984). Significant differences between treatment means were compared by Duncan's New Multiple Range test by using SAS/PC package (1988).

Results and Discussion

The feeding and management practices followed by the two groups of farmers in the bathan feeding system during whole day were same except the supplementation of straw. In the morning and evening all the experimental animals were allowed to pasturing in the legume forages (Black gram and Grass pea). The concentrate mixtures were supplied two times in a day, half of the in the morning and half in the evening. The cows were milked twice in a day i.e. at 7:30 a.m. and at 6:00 p.m. During milking calves were permitted to suckle each teat of the udder before milking commenced to stimulate let down of milk. Straw was supplied in the evening in sufficient quantities during feeding time. All the experimental animals were subjected to same housing and managemental practices throughout the experimental period. The similar practice was also identified by Islam and Chowdhury (1993). According to the design of the experiment only straw feeding schedule was changed between the groups.

The concentrate mixture preparation by the farmers is presented in table 1. From table, it revealed that during preparation of concentrate mixture, farmers used coconut oil cake as a major parts (50%) of the diet. The other ingredients used in the concentrate mixture were wheat

TABLE 1. FORMULATION OF CONCENTRATE MIXTURE AND PRICE OF INGREDIENTS

Ingredients	Percent	Price / kg (Tk.)
Wheat bran	10	5.00
Coconut oil cake	50	2.70
Til oil cake	19	5.53
Kheshari bran	20	5.65
Common salt	1	5.10
Total	100	4.08

Tk. 40 = 1 US $

bran (20%), til oil cake (19%), Kheshari bran (20%), and common salt (1%). It was found that coconut oil cake is cheaper than any other ingredients of the diet and it also increased milk fat percent. So, the farmers used this ingredients for higher price of their milk. The chemical composition and nutritive value of the feed ingredients used in this experiment is exhibited in table 2. It was reported that the quality of the two diets were same except the composition and nutritive value of straw. Straw was used in the treated group only. From this feeding system, it was found that although the Pabna Milking Cows (PMC) produced more milk than native cows, farmers at Pabna do not use fish meal, bone meal or any other mineral mixture for these high producing animal. So, there was a lack for mineral in the concentrate mixture which might cause hypo-calcemia, hypomagnesia. In some cases there are acute milk fever in this area. Ranawana (1984), reported that problems with these minerals arise when the demand for them is great. They are needed in the proper balance for good health and production; the lack of or inadequacy or excess of even one of them can seriously affect production. It was also observed that growing calves and lactating and late-pregnant cows are easily susceptible to deficiencies. Banerjee (1987), also cited that the disadvantage of sole legumes fodder is that, they are liable to produce "Bloat" if given in large quantities.

The average initial body weight, total dry matter intake (DMI) are presented in table 3. It was found that the average body weight (±SD) of cows of the treated and control groups at the begining were 338.06 ± 39.32 kg and 329.87 ± 48.03 kg respectively. The DMI from green grass, straw and concentrate mixture was 11.83 kg/day/cow for the treated group and 11.55 kg/day/cow for the control group and there was no significant difference ($p >$

TABLE 2. CHEMICAL COMPOSITION OF DIFFERENT FEED INGREDIENTS USED IN THE EXPERIMENT

Ingredients	Dry matter(%)	On dry matter basis (%)				
		OM	Ash	NDF	ADF	CP
Blackgram	17.17	86.4	13.6	52.08	34.40	24.6
Grasspea	15.56	88.4	11.6	53.57	34.80	31.2
Straw	90.20	81.8	18.2	70.03	41.77	4.92
Wheat bran	88.30	92.6	7.45	49.15	36.01	12.5
Coconut oil cake	85.60	88.7	11.3	67.71	36.28	29.9
Til oil cake	87.80	85.2	14.8	47.65	36.58	40.4
Kheshari brans	91.40	94.2	5.8	70.50	58.93	14.8

TABLE 3. BODY WEIGHT (KG), DRY MATTER INTAKE (KG / D / COW) AND FORAGE INTAKE (KG / DAY) BY COWS FED BLACKGRAM AND GRASSPEA WITH OR WITHOUT STRAW SUPPLEMENTATION

Item	Legumes with straw supplementation (±SD) (treated)	Legumes only (±SD). (control)	
Initial body weight (kg)	$338.06^{a} \pm 39.32$	$329.87^{a} \pm 48.03$	
Final body weight (kg)	$344.33^{a} \pm 35.90$	$330.25^{a} \pm 37.28$	
Total dry matter intake (DMI) kg/d/cow	$11.83^{a} \pm 1.39$	$11.55^{a} \pm 1.68$	
Concentrate mixture intake (kg/cow/day)	4.0	4.0	
Straw intake (kg/cow/day)	2.5	–	
Green forage Blackgram/grasspea intake (kg/cow/day)	$37.39^{b} \pm 8.67$	$49.62^{a} \pm 10.5$	($p < 0.05$)
Forage dry matter intake (kg/cow/day)	$6.18^{b} \pm 1.44$	$8.38^{a} \pm 1.95$	

Figures in the dissimilar supercripts in the same row differ significantly ($p < 0.05$).

0.05) in DM intake among the control and treated groups. The feeding system and concentrate mixture was given similar but only straw supplementation resulted in lower intake of fresh legume in the treated group. The fresh legume intake of the control group (49.62 kg) was significantly higher ($p < 0.05$) than the treated group (37.39 kg).

Milk production performance of different groups are shown in table 4. During the experimental period milk production in the treated group was significantly higher ($p < 0.05$) than the control group. Differences of milk production between pre-experimental period and experimental period was 400 ml and 50 ml in the treated and control group respectively. Milk production of the treated group was higher, this because of efficient utilization of feed nutrients in the rumen and it supplied continuously energy and nitrogen for the microbes. Satter & Styler, (1974) reported that maximum microbial synthesis rates apparently occur at ammonia concentrations between 5-8 mg/100 ml rumen liquor. Campling et al. (1962) also emphasised that the need for a continuous supply of ammonia in the rumen in order to maintain high intake and digestibility of fibrous feed.

Economics of milk production of two different groups is prsented in table 5. The table, reveals that the cost of sole leguminous diet was slightly higher (Tk. 42.84) than the straw supplemented leguminous diet (Tk. 40.20). The average net profit in the straw supplemented group was higher (Tk. 55.84/day/Cow) than the sole leguminous diet (Tk. 42.30/day/Cow). The results further indicated that straw supplementation with leguminous fodder is more profitable during bathan feeding period.

TABLE 4. MILK PRODUCTION (LITRE / DAY / COW) PERFORMANCES OF COWS USED IN THE EXPERIMENT

	Legumes with straw supplementation (treated)	Legumes only (control)
Before expt. period	$8.24^{a} \pm 2.07$	$7.69^{a} \pm 2.11$
Experimental period	$8.64^{a} \pm 1.15$	$7.74^{b} \pm 1.24$

Figures in the dissimilar supercripts in the same row differ significantly ($p < 0.05$)

TABLE 5. COST ANALYSIS OF TWO DIETS USED IN THE EXPERIMENT

Item	Legumes with straw supplementation (treated)	Legumes only (control)
Cost :		
Concentrate mixture (Tk. 5.50/kg)	22.00	22.00
Straw (Tk. 1.00/kg)	2.50	—
Green forage (Tk. 0.42/kg)	15.70	20.84
Total diet cost/day (Tk.)	40.20	42.84
Gross income from milk/day/cow (Tk.) (11.00/litre)	95.04	85.14
Net-profit/day/cow (Tk.)	54.84	42.30

Conclusion

From this study, it may be concluded that due to straw supplementation @ 2.5 kg/day/cow fresh legume consumption decreased at the rate of 12 kg/cow/day. This surplus legume could be offered for further grazing and this will help to save the money for the farmers as well as increase milk production.

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