EFFECT OF SUPPLEMENTATION OF DIFFERENT LEVELS OF TEA WASTE ON THE PERFORMANCE OF GROWING CALVES

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Summary

Twelve indigenous (*desi*) growing male calves of 9-12 months of age (95.3 ± 12.6 kg) were divided into 4 groups having 3 animals in each group. Each group of calves received 1 kg fresh concentrate mixtures where tea waste was supplemented as 0 (T_0), 50 (T_1), 100 (T_2) and 150 (T_3) g d^{-1} with the replacement of equal amount of concentrate mixtures. In addition, each calf received *ad libitum* chopped rice straw and 2 kg green grass a day. Dry matter intake increased by offering higher levels of tea waste except in the treatment T_3. Daily gain (g d^{-1}) was comparatively higher in T_2 group (314.6 g) compared to other treatments. Feed efficiency (kg DM kg^{-1} gain) was also higher in T_2 group (9.9) where feed cost kg^{-1} gain was also comparatively lower (Tk. 25.7) than the other treatments. Dry matter and CP digestibility increased with the increase in supplementation of tea wastes except in the treatment T_3.
(**Key Words** : Supplementation, Tea waste, Performances, *Desi* Calves, Digestibility).

Introduction

The shortage of feeds and fodder had long been identified as a serious constraint to the optimum development of livestock production in Bangladesh. While limitation of feeds and fodder was seriously recognised, it is also equally important on how the available unconventional feed resources and wastes are efficiently utilized. Developing technology utilizing these unconventional feedstuffs may reduce the cost of total ration and thereby would be practical for smallholder livestock production in village conditions (Doyle et al., 1986; Rahman et al., 1988; Islam, 1989).

Tea (*Camellia spp.*) wastes (liquor extracted tea leaves) would be a potential and valuable feed for livestock as it is available throughout the whole country's tea stalls as well as in some households. It was estimated that out of the total production of 40.63 million kg of tea in 1987, over 10 million kg were consumed domestically (Tea policy for Bangladesh, 1988-89). Tea waste is rich in protein (20-28% CP) and nitrogen-free extracts (Konwar et al., 1986; Sutradhar, 1990) which may be comparable to several legumes like ipil-ipil (*Leucaena spp.*), cow pea (*Vigna spp.*) etc. at least with respect to its crude protein content. Its utilization is however, impeded by tannin-a polyphenolic compound that may not be suitable for pigs and poultry. However, it could be a potential source of protein for ruminants as the rumen microbes are tolerant to tannin (Jayasuriya et al., 1978).

Not much attempt has yet been taken to utilize this waste as livestock feed (Sutradhar, 1990) because of the clear understanding about the potentiality of this waste as livestock feed. Keeping in view of their nutritive potentiality and easy availability in the market without or little cost, this study was taken to determine the effect of supplementation of different levels of tea waste on the performances of growing calves.

Materials and Methods

Animals, feeding and management

Twelve local (indigenous or *desi*) male calves of 9 to 12 months of age (95.3 ± SEM 12.6 kg) were divided at random into 4 groups having 3 animals in each group. All calves were dewormed with anthelmentics before the commencement of the study. The calves were fed *ad*

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libitum chopped (about 5 cm) rice straw and 2 kg roadside green grass per head per day. In addition, each calf received 1 kg concentrate mixtures (wheat bran : til (sesame) oil cake: leucaena leaf meal = 50:20:30) a day from which 0 (T_0), 50 (T_1), 100 (T_2) and 150 (T_3) g of the mixture was replaced by the equal amount of tea waste. The four treatments were randomly allotted to 4 groups of calves, so that each group of calves received only one diet. The feeding was lasted for 98 days. The composition of the diet is presented in table 1.

TABLE 1. COMPOSITION OF CONCENTRATE MIXTURES AND DIFFERENT TREATMENT COMBINATIONS

Ingredients of concentrate mixtures	%	Treatments	Concentrate mixtures(g kg^{-1})	Tea waste (g kg^{-1})
Wheat bran	50	T_0	1,000	0
Til oil cake	20	T_1	950	50
Leucaena leaf meal	30	T_2	900	100
Total	100	T_3	850	150

Chopped straw was fed *ad libitum* but the restricted amount of concentrate mixtures and green grasses were given into two equal amounts at 08:00 and 14:30 h. Residues were collected before morning feed, bulked and weighed. Dry matter (DM) intake of straw was recorded daily. The animals were fed in group while concentrate mixtures offered separately in the manger after locking the neck in a specially designed neck harness. Otherwise, animals were not tied during the whole experimental periods except during the digestibility trial. The animals have free access to water. Feed offered to the animals in the following sequential order: concentrates followed by green grass and then rice straw.

Tea waste

Tea waste was collected every day from a local restaurant. The preparation of tea was the same as described by Sutradhar (1990), where tea liquor prepared by boiling dry tea leaves with water at least for 15 to 30 minutes or more. These wastes were sundried and then kept in gunny bags. Any sorts of extraneous substances that might pollute wastes were left out during the collection and drying.

Housing

The calves were housed in a well-ventilated tin shed house. The herring bone brick floor of the calf pen was well drained and sloppy with an exercisable paved area. Feeding space was covered by a tin shed while paved area was open and the feeding space was separated from the paved area by a drain. The calves moved freely in the pen but they had no access to go outside. In the front (southern), manger was separated by the specially designed neck harness where the calves could let only their heads up to the neck for feeding. The harness was open during the straw feeding time but at the time of grass and concentrate feeding, the neck of an individual calf was arrested by the lock of the harness. So, none of the calves had access to the others feed.

Digestibility trial

The digestibilities of the chemical components of the diets were measured by total collection method (Banerjee, 1984). The amount of feed offered and refusals were recorded every day and the faeces were collected for seven days from each animal. As the animals were free and group fed during the feeding trial, these were tied with a rope at a safer distance from each other and as such collection was in progress. After each day of collection of faeces, the representative sample was dried and bulked to determine the proximate components as well as to calculate digestibility values of different treatments.

Weight recording

The animals were weighed at the beginning of the experiment and at every week thereafter. All weighings were made at 07:30.

Chemical analysis

The chemical analyses of feed, faeces and left overs were done according to the method described by AOAC (1965).

Statistical analysis

As the animals were fed in group, only the data on weight gains were analysed following Completely Randomized Design (Snedecor and Cochran, 1982).

Results and Discussion

Chemical composition of dietary ingredients

Tea waste contained 86.8% dry matter (DM), 22.2% crude protein (CP), 15.1% crude fibre (CF), 6.1% ether extract (EE) 7.5% ash and 49.2% nitrogen-free-extract (NFE) (table 2). The result agreed with Sutradhar (1990) and Konwar et al. (1986). The present result revealed that the CP content of tea waste is comparable to that of leucaena leaf meal (LLM) (Gupta et al., 1986; Sudhakar and Rao, 1987; Rahman et al., 1989, 1992; Lumanta et al., 1990).

Concentrate mixtures (including tea waste)

The CP content of treatments T_0, T_1, T_2 and T_3 was 17.8, 18.3, 19.0 and 19.7% respectively (table 2). The CP content of different treatments increased with the increase in tea waste content of the ration. Other components were about to similar in different treatments. The other chemical composition of different treatments is also presented in table 2.

Dry matter intake

The daily total dry matter intake of calves were 2.7, 2.8, 3.1 and 3.0 kg in T_0, T_1, T_2 and T_3 groups respectively (table 3). This finding was similar to Islam et al. (1992), they informed that the total DM intake of young calves fed on *ad libitum* rice straw, 2 kg green grass and 1 kg concentrate mixtures varied from 2.5 to 2.7 kg. In the present study, intakes of total concentrate mixture was increased with the increase in the amount of tea waste in ration. However, a slightly lower intake was observed in treatment T_3. Similar trend was observed when DM intake was calculated as per 100 kg body weight and metabolic body weight. Rahman et al. (1990) and Kumarasuntharam et al. (1984) also observed similar dry matter intake in non-descript calves.

TABLE 2. CHEMICAL COMPOSITION (MEAN ± SEM) OF FEED INGREDIENTS AND CONCENTRATE MIXTURES (DM BASIS) (IN %)

Ingredients / treatments	DM	CP	CF	EE	Ash	NFE
Rice straw	88.5 ±0.3	2.8±0.1	36.5±0.3	1.3±0.1	17.3±0.2	42.1
Green grass	21.0* ±0.7	9.3±0.6	21.8±0.6	1.5±0.2	17.8±0.5	49.6
Wheat bran	89.4 ±1.0	11.1±0.1	10.8±0.3	3.9±0.1	6.9±0.5	67.3
Til oil cake	87.9 ±0.4	31.0±0.5	10.9±0.4	10.2±0.3	11.1±0.1	36.7
Leucaena leaf meal	87.5 ±0.5	23.2±0.2	12.2±0.2	4.1±0.1	11.1±0.4	49.4
Tea waste	86.8 ±0.1	22.2±0.2	15.1±0.5	6.1±0.3	7.5±0.3	49.2
T_0	86.4 ±0.3	17.8±0.1	11.7±0.6	4.6±0.4	8.5±0.5	57.4
T_1	87.8 ±0.1	18.3±0.3	12.4±0.3	4.8±0.2	8.2±0.1	56.3
T_2	87.7 ±0.2	19.0±0.2	12.4±0.1	4.9±0.2	8.4±0.3	55.4
T_3	87.4 ±0.3	19.7±0.4	12.4±0.5	4.8±0.1	8.3±0.2	54.8

*Fresh basis.

TABLE 3. FEED INTAKE, OF CALVES SUPPLEMENTED WITH DIFFERENT LEVELS OF TEA WASTE (n = 3)

Item	T_0	T_1	T_2	T_3
DM intake (g kg^{-1} d^{-1})				
Straw	1.4	1.5	1.8	1.6
Green grass	0.4	0.4	0.4	0.4
Concentrate mixtures	0.9	0.9	1.0	1.0
Total	2.7	2.8	3.1	3.0
DM intake (kg 100 kg^{-1} LW d^{-1})				
Straw	1.3	1.4	1.6	1.4
Green grass	0.4	0.4	0.4	0.4
Concentrate mixtures	0.8	0.9	0.9	0.9
Total	2.5	2.6	2.8	2.8
DM intake (g kg^{-1} $W^{0.75}$ d^{-1})				
Straw	41.4	43.0	49.7	45.5
Green grass	12.3	12.3	12.0	12.3
Concentrate mixtures	25.3	26.9	26.9	29.1
Total	79.0	82.2	88.5	87.0

Animal performance

Liveweight gain

The average total gain in weight was 23.5, 24.3, 30.8 and 25.9 kg and average daily gain was 239.8, 247.7, 314.6 and 265.0 g in T_0, T_1, T_2 and T_3 group respectively (table 4). There were no significant differences in liveweight gain among the treatment groups although the treatment T_2 and T_3 appeared to give slightly higher gain than the others. Average daily gain of 271 to 274 g in Jersey calves was observed by Jayasuriya et al. (1978)

where calves fed on concentrate mixtures with 10 to 18% spent tea leaf. Similar daily gain of youngstocks was also observed by Rahman et al. (1989, 1990 and 1991) where calves fed on concentrate mixtures containing 17-18% crude protein. All calves maintained good health condition throughout the study period of 98 days, thus supporting the view that the ruminants are tolerant to polyphenolic compounds, tannin (Jayasuriya et al., 1978).

Feed efficiency

Feed efficiency (kg DM kg^{-1} gain) of different treatments were 11.2, 11.3, 9.9 and 11.2 in T_0, T_1, T_2 and T_3 group respectively (table 4). Although there were no differences between the treatments in feed efficiency, non-significant higher feed efficiency was observed in treatment T_2.

It appears that the inclusion of higher levels of tea waste (as in T_3) reduced gain and feed efficiency of calves. Although gain of calves was non-significant, it is apparent that the poor performance in T_3 may be due to the higher levels of tannin content in tea waste.

TABLE 4. GROWTH RATE (MEAN ± SEM), FEED EFFICIENCY AND COST OF FEED OF CALVES SUPPLEMENTED WITH DIFFERENT LEVELS OF TEA WASTE (n = 3)

Item	T_0	T_1	T_2	T_3
Initial weight (kg)	95.5 ± 17.0	95.0 ± 16.2	96.2 ± 17.0	94.5 ± 7.0
Final weight (kg)	119.0 ± 20.3	119.3 ± 18.0	127.0 ± 15.6	120.5 ± 7.7
Weight change (g d^{-1})*	239.8 ± 36.8	247.7 ± 22.0	314.6 ± 11.3	265.0 ± 36.6
Feed efficiency (kg DM kg^{-1} gain)	11.2	11.3	9.9	11.2
Cost of feed kg^{-1} gain (TK.)	33.7	32.7	25.7	30.6

* Values in rows did not differ significantly.

Digestibility of nutrients

Dry matter digestibilites of treatment diets were higher (although non-significant) than the control diet. Dry matter digestibility was 59.6, 61.9, 63.7 and 62.5% in T_0, T_1, T_2 and T_3 respectively (table 5). Similar trends were also observed in the case of organic matter (OM) digestibility. The result was similar to Kibria et al. (1989, 1991) where they stated that the addition of extra protein in concentrate mixture increased organic matter digestibility. Crude protein digestibility was also increased with the increased level of tea waste except slightly lower CP digestibility in treatment T_3. Similar trends were observed in the case of CF digestibility. Digestibility of EE was 54.5, 54.3, 54.5 and 55.1% in T_0, T_1, T_2 and T_3 groups respectively. The NFE digestibility was 50.8, 50.1, 51.2 and 51.1% respectively in the above stated treatment groups. The animals were in good health and easily accepted the concentrate mixtures prepared with tea waste.

TABLE 5. DIGESTIBILITIES OF NUTRIENTS BY GROWING CALVES

Item	T_0	T_1	T_2	T_3
Dry matter	59.6	61.9	63.7	62.5
Organic matter	59.3	61.9	62.9	64.1
Crude protein	67.2	70.9	73.1	72.6
Crude fibre	53.5	56.8	58.1	57.7
Ether extract	54.5	54.3	54.5	55.1
Nitrogen-free-extract	50.8	50.1	51.2	51.1

Conclusion

Tea waste could be a valuable source of protein in respect to its nutrient content. It may offer a scope of a potential cheaper and available source of livestock feed in Bangladesh as well as in the world. The results of the present study indicate the possibility of supplementing up to 100 g tea waste in ruminant diets through concentrate mixtures without any problem. Even 150 g tea wastes with concentrate mixture appear to be satisfactory with acceptability, digestibility and liveweight gain.

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