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Use of Water-hyacinth Leaves (*Eichhorina crassipes*) Replacing Dhal Grass (*Hymenachne pseudointerrupta*) in the Diet of Goat

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Abstract: Proximate components, effect of water-hyacinth leaves (WHL), digestibility of different nutrients of WHL and its nutritive value were determined in the Animal Nutrition Laboratory, Bangladesh Agricultural University, Bangladesh to utilize WHL as feed for goat. Twelve Black Bengal goats of similar age, size and sex were divided into 4 groups having 3 goats in each and fed diets; A (100% Dhal grass- DG) to I, B (75% DG+ 25% WHL) to II, C (50% DG+ 50% WHL) to III, and D (100% WHL) to group IV up to 60 days. All the goats were provided 200g-concentrate mixture every day. Goats of group IV were used to determine the digestibility of various nutrients in water-hyacinth leaves. Water-hyacinth leaves contained higher percentage of crude protein, nitrogen free extract and organic matter, and lower percent of crude fibre than Dhal grass. Body weight gain, feed intake and feed conversion efficiency were not significant among the groups. Daily weight gain was 29, 27, 23, and 17g in group I, II, III and IV respectively. Feed conversion efficiency was 16.19, 17.99, 18.26 and 24.27 in group I, II, III and IV respectively. Daily dry matter intake in group I, II, III and IV were 0.47, 0.49, 0.42 and 0.42 kg respectively. Average COD of dry matter, crude fibre, ether extract and nitrogen free extract in water-hyacinth leaves were 58.39, 65.38, 59.97, 60.09 and 48.97% respectively. Average digestible nutrients; DCP, DCF, DEE, DNFE and TDN of water-hyacinth leaves were 11.81, 13.60, 2.28, 14.98 and 45.54% respectively.

Key words: Black Bengal goat, water-hyacinth leaves, dhal grass, concentrates, proximate components, diet, growth performance, feces, urine, COD, and TDN

Introduction

Goat play an important role in the agro-based economy of Bangladesh. About 8.75 million heads of goats in Bangladesh live on tree leaves, kitchen wastes and road side grass etc. (BBS, 1986). Due to shortage of feed or fodder, goats are suffered from malnutrition, and lost their productivity. To alleviate this shortage, unconventional feed stuff like water-hyacinth may be used as goat feed. Water-hyacinth (*Eichhorina crassipes*) is an aquatic plant abundantly available in our country, which is free floating fresh water plant with bright- green leaves on long stems. During natural calamity specially in summer when feed scarcity becomes severe, water- hyacinth is the only source of green fodder for them. Water-hyacinth contained higher percentage of protein (19%) (Reza and Khan, 1981; Boyd, 1968).

A study reported that water-hyacinth leaves contained sufficient amount of nutrients and can be considered as feed for goat (Linn *et al.*, 1975). Limited works have been done in Bangladesh using water- hyacinth in the diet of cattle (Khan, 1977; Reza, 1988). But there is no work on water-hyacinth as feed for goat. So, the present study was undertaken to assess the effect of water-hyacinth leaves replacing Dhal grass on the growth performance of goat.

Materials and Methods

The experiment was conducted for a period of 60 days in the Dept. of Animal Nutrition, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Proximate analysis: Representative samples of water-hyacinth leaves, Dhal grass and concentrates (wheat bran, sesame oil cake and fish meal) were collected, sun dried and preserved in polyethylene bags for proximate analysis. Proximate composition of feeds and feces of goat were analyzed following A. O. A. C. method (1980).

Feeding trial: A total of 12 Black Bengal goat approximately same size, sex and age were divided into 3 groups having 3 goats in each. Goat was kept separately giving the sufficient space in the house and maintained sanitary condition. Diet A (100% Dhal grass-DG), B (75% DG + 25% water-hyacinth leave-WHL), C (50% DG

+ 50% WHL) and D (100% WHL) were fed *ad libitum* by I, II, III and IV groups of Black Bengal goats respectively for 60 days. All the goats were provided 200 g concentrates mixture (Wheat bran + Till oil cake + Bone meal + Fish meal + Common salt) every day. Feed supplied to the goats as fresh basis at 8.00 AM and 4.00 PM.

Following data were recorded:

Body weight, initial body weight and fortnightly body weight of individual goat.

Feed supply = Feed /goat/ day

Left over feed = Residue feed / goat / day

Feed intake = Feed / goat/day

Representative samples of leftover were collected, sun dried and stored in polyethylene bags for proximate analysis.

Digestibility trial: At the end of feeding, goats of group IV were placed in metabolic crate for 5 days. During this period every day feed was supplied to the goat at 8.00 AM and 4.00 PM. In every morning feeding tray was cleaned and leftover if any was recorded. Water offered *ad libitum*. The amount of feed consumed and feces voided by individual goat was recorded daily. Representative samples of feed and feces were preserved for proximate analysis.

The co-efficients of digestibility of various nutrients were calculated using the following formula:

$$\text{COD of nutrient} = \frac{\text{g nutrient offered} - \text{g nutrient refused} - \text{g nutrient in feces}}{\text{g nutrient offered} - \text{g nutrient refused}} \times 100$$

Digestible nutrients as nutritive value of water-hyacinth leaves were calculated from proximate components and digestibility.

Feces and urine collection: Feces were collected 3 times a day at morning, afternoon and night avoiding contamination with urine up to 5 days. Total raw feces voided / goat /day during collection period were recorded. Twenty percent of well-mixed feces from each goat was dried in the sun and stored in polyethylene bags for proximate analysis.

Urine of individual goat was collected twice a day at 8.30 AM and

8.00 PM. Total amount of urine / goat /day was recorded. Ten percent of the total urine was preserved in a conical flask containing 6N HCl as preservatives.

Statistical analysis: The collected data were subjected to an analysis by CRD of variance according to the method of Steel and Torrie (1980).

Results and Discussion

Proximate composition of water- hyacinth and other feed ingredients are presented in Table 1. It had been observed that water-hyacinth leaves contained higher percentage of crude protein, NFE, organic matter and lower percentage of crude fibre than that of Dhal grass. Pathak *et al.* (1980) found 20.3% CP in water-hyacinth leaves which was similar to this findings but they found the lower percentage of ether extract, crude fibre and ash than the present findings. In this study, water-hyacinth leaves were found better than the findings of Reza and Khan (1981) in respect of Dry matter and crude fibre. They got 10.83% DM and 15.27% CF. Proximate composition depends on many factors such as type and water where it is grown (Linn *et al.*, 1975).

Feeding trial: Diet did not differ significantly for live weight gain, feed intake and feed conversion efficiency (Table 2). However average live weight gain, daily live weight gain and feed conversion efficiency were tended to decrease sequentially in groups I, II, III, and IV. The highest feed intake was found in group II, diet B,

intermediate in group I diet A, and the lowest in group III diet C and group IV diet D, which means Dhal grass was more palatable to water-hyacinth leaves. But the mixture of 25% water-hyacinth leaves and 75% Dhal grass might have increased the palatability of the diet. When water-hyacinth leaves fed to the goats as sole feed, showed poor performance but water-hyacinth with Dhal grass showed better performance in respect of body weight gain, closely related with the findings of Hossain (1959), Gupta *et al.* (1975) and Reza (1988). In this study, all goats gained live weight which indicate that water-hyacinth leaves have no adverse effects on the health of goats.

Digestibility trial: The co-efficient of digestibility (COD) of different nutrients; dry matter, organic matter, crude protein, crude fiber, ether extract and nitrogen free extract of water-hyacinth leaves are shown in Table 3. The average COD of dry matter of water - hyacinth leaves was 58.39% which was lower than 60.88 % and 72% observed by Khan (1977) and Rodriguezg and Ravo (1971) in lamb respectively. Average COD of crude protein of water-hyacinth leaves was 65.38% which was similar to the findings (65.5% CP) of Rodriguezg and Ravo (1971) and Baldwin *et al.* (1975) but higher than 46% observed by Linn *et al.* (1975). Average COD of organic matter, crude fibre, ether extract and nitrogen free extract of water- hyacinth was 56.80%, 59.97%, 60.09% and 48.97% respectively which was higher than the findings of Rodriguezg and Ravo (1971) in lambs.

Table 1: Proximate composition of feed stuffs

Feed ingredients	Dry matter	Crude protein (N x 6.25)	Crude fibre	Ether extract	Ash	Nitrogen free extract	Organic matter
g /100 g DM							
Water-hyacinth leaves	15.33	20.80	16.15	4.37	13.43	45.25	86.57
Dhal grass	17.82	12.35	38.67	3.45	16.63	28.90	83.37
Wheat bran	88.52	14.90	15.19	4.39	7.08	58.44	92.92
Till oil cake	91.82	35.16	23.52	5.52	9.98	25.82	90.02
Fish meal	84.60	48.73	4.05	7.50	27.60	12.12	72.40

Table 2: Effect of feeding different levels of water-hyacinth leaves on the growth performance of Black Bengal goat.

Groups	No. of Animals	Initial av. body weight kg± SEM	Final av. body weight kg± SEM	Av. live weight gain by 60 days Kg ± SEM	Av. live weight gain per day kg± SEM	Total amount of feed consumed by 60 days on DM basis	Amount of feed consumed per day DM basis kg + SEM	Feed conversion efficiency
I	3	11.05± 0.74	12.80± 0.75	1.75± 0.61	0.03± 0.05	28.34± 1.05	0.47± 0.13	16.19± 4.27
II	3	11.83± 0.57	12.71± 0.77	1.63± 0.57	0.03± 0.04	29.32± 0.49	0.49± 0.06	17.99± 2.61
III	2	9.65± 0.82	11.03± 0.84	1.37± 0.19	0.02± 0.02	25.02± 0.55	0.42± 0.07	18.26± 0.52
IV	3	11.63± 0.84	12.67± 0.94	1.03± 0.43	0.02± 0.04	25.00± 1.17	0.42± 0.15	24.27± 1.78
Level of Significance		NS	NS	NS	NS	NS	NS	NS

NS, P> 0.05, DM = Dry matter, SEM= standard error mean.

Table 3: Co-efficient of digestibility of water- hyacinth leaves in goats (percentage)

Animal No.	Dry matter	Organic matter	Crude protein	Crude fiber	Either extract	Nitrogen free extract
G 10	53.26	50.85	61.15	53.28	47.84	43.34
G 11	60.81	59.57	66.32	64.25	57.10	52.42
G 12	61.10	59.98	68.68	62.39	75.33	51.16
Average± SEM	58.39± 1.09	56.80± 1.18	65.38± 1.02	59.97± 1.26	60.09± 1.95	48.97± 1.16S

EM = Standard error mean.

Table 4: Digestible nutrients of water -hyacinth leaves (percent)

Animal No	Digestible crude protein (DCP)	Digestible crude fibre (DCF)	Digestible ether extract (DEE)	Digestible nitrogen free extract (DNFE))	Total digestible nutrient (TDN)
G 10	11.05	12.08	1.82	13.26	40.49
G 11	11.98	14.57	2.17	16.04	47.47
G 12	12.41	14.15	2.86	15.65	48.65
Average± SEM	11.81± 0.43	13.60± 0.60	2.28± 0.37	14.98± 0.64	45.54± 1.96

SEM = Standard error mean.

Nutritive value of water-hyacinth leaves: Digestible nutrients, of water-hyacinth leaves, digestible crude protein, ether extract, crude fibre, nitrogen free extract and total digestible nutrients (TDN) are shown in Table 4. Digestible crude protein of water-hyacinth leaves was much higher than the findings of Reza and Khan (1981) but lower than Biswas and Mandal (1988) found in growing bullock. TDN (45.54) in this study was lower than 57.88% and 69.00%, observed by Reza and Khan (1981) in growing bullock, and Biswas and Mandal (1988) in crossbred calves respectively.

The Present study revealed that water- hyacinth leaves may be used as green fodder in goat feeding. Nutritive value of water-hyacinth leaves can be improved by adding other green grass and little amount of concentrate mixture in the diet of goat.

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