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CHEMICAL COMPOSITION AND NUTRITIVE VALUE OF RICE BEAN STRAW

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INTRODUCTION

Rice bean (*Phaseolus calcaratus*), a kharif legume fodder, has become very popular as an excellent catch crop in West Bengal for sometime past. Banerjee *et al.* (1975) fed rice bean fodder to sheep and found it to be very palatable, containing 8.06% DCP and 52.84% TDN on dry matter basis. Gupta *et al.* (1981) have fed rice bean hay to cattle and found that it contained 8.67% DCP and 50.05% TDN on dry matter basis.

Due to popularity of the rice bean green fodder among the progressive dairy farmers in the Eastern Region the demand for its seeds is picking up steadily. However, after collection of seeds, the left overs which include stems, leafy portions, empty pods, and some seeds also are either burnt or thrown away. These left overs which constitute 3 parts to 1 part of seeds collected are termed as rice bean straw. On a preliminary examination, the crude protein content of the rice bean straw was found to be 10.0—13.5% on dry matter basis as compared to 20—22% in the green fodder. In view of this an experiment was conducted to utilize the rice bean straw as a feed for cattle and the results are recorded in this communication.

MATERIALS AND METHODS

The rice bean straw was collected from the Regional Station for Forage Production and Demonstration, Kalyani, which is the main seed production centre in the Eastern region.

Rice bean straw was fed to 4 healthy Red Sindhi bullocks as a sole feed with 60 g common salt per animal per day for 10 days with a view to determine its palatability. The average dry matter consumption was found to be 1.27 kg/100 kg body weight. This showed that the rice bean straw was moderately palatable. To determine the nutritive value, 5 Red Sindhi bullocks of body weights ranging from 210 to 255 kg were fed on rice straw along with 1.0 to 1.5 kg of paddy straw per animal per day. As usual water was offered 2 times a day. After a preliminary feeding period of 30 days, a metabolism trial for 8 days was conducted. At the end of the metabolism experiment blood samples were collected and analysed for haematological and biochemical constituents. Haemoglobin, RBC and WBC were determined by using technique of Schalm (1961) and Napier and Das Gupta (1946). Total serum protein, NPN, Ca and P were determined by techniques described by Hawk *et al.* (1954).

The methods of analysis of AOAC (1970) were followed. Calcium and phosphorus were estimated according to the modified methods of Talapatra *et al.* (1940).

RESULTS AND DISCUSSION

Chemical composition of rice bean straw and paddy straw offered to experimental animals along with those of some important pulse crop

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bhoosa and the oil seed crop straws are given in Table 1, for comparison. It would be seen that the rice bean straw contained the highest protein content and the lowest crude fibre. It also contained highest amount of calcium but was moderately rich in phosphorus.

Body weights of animals and their dry matter consumption during the metabolism trial are recorded in Table 2. On an average the dry matter consumption slightly increased to 1.37 kg/100 kg body weight (55.72 g/$W^{0.75}$ kg) as compared to 1.27 kg/100 kg body weight observed when rice bean straw alone was fed to the animals. However, it was lower than the normal feed intake of the animals of similar body weights on normal farm rations. Considering that the dry matter consumption of bullocks on the rice bean hay itself was only 1.81 kg/100 kg body weight (Gupta *et al.*, 1981), the con-

TABLE 1

Chemical composition of rice bean straw and paddy straw along with some pulse crop bhoosa and oil seed crop straws

Name of the sample	Crude protein	Ether extract	Crude fibre	Total ash	N-free extract	Calcium	Phosphorus	References
Rice bean straw	13·62	1·35	26·28	22·15	36·60	2·91	0·12	—
Paddy straw	3·20	0·89	31·15	13·62	51·14	0·19	0·05	—
Soyabean straw	6·31	1·59	41·00	12·48	38·62	0·97	0·12	Pachauri & Negi (1976)
Arahar bhoosa	10·74	1·90	28·71	10·57	48·08	1·23	0·14	Jayal *et al* (1970)
Urad bhoosa	11·42	1·88	36·16	8·33	42·21	1·49	0·14	—do—
Moong bhoosa	11·55	1·76	32·15	10·61	43·93	1·76	0·18	—do—
Moth bhoosa	8·13	0·93	40·35	4.90	45·69	0·84	0·09	—do—
Groundnut haulms	11·06	1·41	35·09	9·99	42·45	0·85	0·12	Amrithkumar & Sampath (1974)

TABLE 2

Body weights of the animals and their dry matter consumption during the metabolism trial

Animal No.	Body weight (kg)				DM consumption/day		
	At start of feeding	At start of metabolism expt.	At the end of metabolism expt.	Average during metabolism expt.	Total (kg)	Kg/100 kg body weight	g/$W^{0.75}$ kg
116	245	255	255	255	3·401	1·33	53.30
119	230	231	235	233	3·502	1·50	58·73
121	255	280	280	280	3·789	1·35	55·35
139	210	205	205	205	3·199	1·56	59·05
141	210	206	200	203	2·268	1·12	42·19
Average	230	235	235	235	3·232	1·37	53·72
±SE	±9·08	±14·46	±13·25	±14·75	±0·80	±0·07	±3·07

sumption of the straw at 1.37 kg/100 kg body weight may not be taken as unreasonably low.

The average digestibilities of dry matter and other proximate principles in the total rations for the respective animals are recorded in Table 3.

The DCP and TDN of straw have been worked out to be 6.92 and 31.20% respectively by the method of difference. Singh *et al.* (1976) have reported that the DCP and TDN contents were 3.96 and 48.60% in moong straw (*Phaseolus aureus*) and 3.89 and 49.20% in urad (*Phaseolus mungo*) straw respectively. Pachauri and Negi (1976) have reported that the DCP and TDN contents in soyabean straw were 1.64 and 44.9% respectively. The DCP and TDN contents of arhar *bhoosa* and groundnut haulms were 3.81 and 49.26% (Jayal *et al.*, 1970) and 5.39 and 50.86% (Amrithkumar and Sampath, 1974) respectively. However, the DCP content of rice bean straw was higher than that of any other similar straw reported so far.

The balances of nitrogen, calcium and phosphorus were also worked out and the results are given in Table 4.

TABLE 3

Digestibilities of dry matter and other proximate principles (%)

Animal No.	Dry matter	Organic matter	Crude protein	Ether extract	Crude fibre	Nitrogen-free extract
116	35·80	38·44	47·85	25·51	26·22	45·62
119	36·63	39·88	50·81	27·74	28·84	45·68
121	45·89	46·85	55·99	41·64	34·21	54·57
139	34·78	36·83	48·04	23·70	23·01	44·57
141	23·98	31·42	51·40	17·64	25·69	30·96
Mean ±	35·31	38·68	50·81	27·24	27·59	44·28
SE	±3·12	±2·23	±1·17	±3·56	±1·69	±3·39

TABLE 4

Balances of nitrogen, calcium and phosphorus (g/day)

Particulars	Nitrogen Mean±SE	Calcium Mean±SE	Phosphorus Mean±SE
Offered from ricebean straw	93·82±0·0	125·81±0·00	5·18±0·00
Offered from paddy straw	5·63±0·47	2·09±0·17	0·54±0·05
Offered from water	—	1·57±0·10	—
Left-in residue	40·85±3·14	64.79±4·98	2·63±0·19
Total intake	58·59±3·42	64·68±5·15	3·09±0·22
Outgo in faeces	28·87±1·69	53·90±3·86	2·68±0·05
Outgo in urine	14·27±0·27	1·42±0·26	0·17±0·04
Total outgo	43·15±1·75	55·32±3.91	2·83±0·05
Retention	15·44±2·15	9·36±2·91	0·25±0·29

TABLE 5

Haematological and biochemical constituents of blood

Animal No.	Blood			Serum				
	Hb g/100 ml	RBC $\times 10^6$/mm^3	WBC $\times 10^3$/mm^3	CP g/100 ml	NPN mg/100 ml	Calcium mg/100 ml	Phosphorus mg/100 ml	Magnesium mg/ 100 ml
116	10·4	6·12	8.40	7·53	53·76	11·20	4·13	2·98
119	9.0	5·47	7 50	7·18	55·44	12·00	4.27	2,58
121	13·8	7·73	8·70	7·79	52·08	10·80	3·60	2·38
139	9·4	5·81	9·30	7·61	67·76	11·00	3·87	2·98
141	10·0	6·37	4·50	7·35	58·24	12·20	4·00	3·17
Mean	10·52	6·03	7·68	7·49	57·46	11.44	3·97	2·82
±SE	±0·76	±0·34	±0·75	0·08	±2·47	±0·24	±0.10	±0·12

The data in Table 4 showed that out of 29.72 g of digested nitrogen, 15.44 g was retained in the animal body and was equivalent to 96.50 g of protein. The fact that about 52% of the total digested nitrogen was retained in the body indicated a high biological value of the proteins present in rice bean straw. The straw was also found to be rich in available calcium as indicated by the high figure of calcium retention (+9.36 g) The phosphorus balances were found to be marginally positive (+0.25 g/day).

At the end of the metabolism experiment blood was collected from the experimental animals and analysed for haematological and biochemical constituents (Table 5). It is seen (Table 5) that the major haematological and biochemical constituents of blood were well within the normal range. However, the NPN level in blood was somewhat higher than the normal values of 20—40 mg/100 ml reported for cattle by Swenson (1970). The lack of availability of energy in rice bean straw (31% TDN) seems to be responsible for reduced utilization of protein resulting in higher NPN values in the serum. Supplementation of energy rich feed materials like crushed barley oats or even wheat bran, therefore, are expected to be useful in enhancing the feeding value of the rice bean straw.

SUMMARY

A feeding experiment on 5 Red Sindhi bullocks fed on rice bean straw along with paddy straw was conducted. The average dry matter consumption of the animals was 1.37 kg/100 kg body weight.

The results of metabolism experiment showed that the rice bean straw contained 6.92% DCP and 31.20% TDN on dry matter basis. The average balances of nitrogen, calcium and phosphorus were 15.44±2.15, 9.36±2.91 and 0.25±0.29 g per day respectively.

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