Feeding *Sesbania* Leaves as a Sole Feed on Growth and Nutrient Utilization in Goats

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ABSTRACT : An experiment was conducted for 56 days using nine castrated male Black Bengal goats (initial live weight 9.0 kg) aged about 5 months to study the effects of feeding *Sesbania* leaves as a sole feed on growth performance and nutrient utilization. The animals were fed *ad libitum* on either road-side grass, *Sesbania aculeata* leaves or *Sesbania rostrata* leaves. Average dry matter (DM) intake was 179, 229 and 259 g/d for goats fed road-side grass, *Sesbania aculeata* and *Sesbania rostrata*, respectively. Corresponding mean values for average daily live weight change were -6.6, 9.5 and 38.1 g, respectively. These values were higher ($p<0.05$) for goats fed *Sesbania* leaves than those given road-side grass. The apparent digestibility of all the proximate components except CF and the concentrations of DCP, TDN, DOM and ME of *Sesbania* leaves were higher ($p<0.05$) than those of road-side grass. *Sesbania rostrata* was superior ($p<0.05$) to *Sesbania aculeata* for nutrient digestibilities (except for NFE) and also for DOM, DCP and ME concentrations. Therefore, it may be concluded that the production of *Sesbania rostrata*, a legume fodder, should be encouraged for feeding goats. (***Asian-Aus. J. Anim. Sci. 2000. Vol. 13, No. 4 : 487-489***)

Key Words : Goats, *Sesbania* Leaves, Growth, Digestibility

INTRODUCTION

Sesbania species, tropical legume browses, produce green foliage with a high crude protein and low fibre content which can be used as high quality fodder for goats (Panda et al., 1988). These plants are able to fix atmospheric N and grow in water logged, saline, alkaline and highly cultivated soils (Barroga, 1989). In Bangladesh two species of *Sesbania*, *Sesbania aculeata* and a recently introduced African species *Sesbania rostrata* are cultivated during the rainy season for green manure, for use as a hedge and for fuel. Foliage from *Sesbania* species has considerable potential as a high protein forage supplement for ruminants in the tropics and may replace part of the fish meal or concentrate in dietary supplements (Amorcs, 1989; Khan et al., 1990). Limited information is available on digestibility and nutritive value of *Sesbania* fodder. In this study the effects of feeding *Sesbania* leaves as a sole feed on growth and nutrient utilization in growing Black Bengal goats were measured.

MATERIALS AND METHODS

Nine Black Bengal castrated male goats aged about 5 months and on average weighing 9.0 kg were used in a 56-day study. The goats were housed individually in pens with a slatted floor and were introduced to the experimental feeds over 2 weeks. The animals were allocated at random to one of three dietary treatments in a randomised block design according to live weight. One group was given naturally growing road-side grass and the other two groups were offered green leaves of either *Sesbania aculeata* or *Sesbania rostrata*. The green *Sesbania* leaves along with twigs (70 days after sowing) and the road-side grass were collected every morning and the animals were fed to appetite. In order to ensure *ad libitum* feeding, the feed was offered twice daily at 08:00 and 16:00 h. Fresh water was available at all times. Live weight at the end of each week and daily feed intakes were recorded.

At the end of the 56 day growth study, a 6-day digestibility trial was conducted. During growth trial, feed samples were collected every week (8 samples per feed) while in digestibility trial, samples of feed, refusals and faeces were collected daily. These were then bulked and representative samples were analysed for proximate constituents using published methods (AOAC, 1990). The digestible organic matter (DOM) and metabolizable energy (ME) concentrations of the feeds were calculated (MAFF, 1984). The experimental data were analysed using analysis of variance for a randomised block design and significant differences among the treatment means were identified by Duncan's New Multiple Range Test (SAS, 1985).

RESULTS AND DISCUSSION

The chemical composition of the different feeds is given in table 1. *Sesbania* leaves were high in crude protein (CP) and contained more ether extract (EE) but less crude fibre (CF) and nitrogen free extract

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(NFE) than road-side grass. *Sesbania rostrata* contained similar amounts of CF, EE and ash but higher levels of CP and lower NFE than *Sesbania aculeata*. *S. rostrata* fixes more N from the air than either azolla or other legumes because it has 5 to 10 times more nodules in its stems as well as in its roots (Barroga, 1989). Sahu et al. (1988) reported that the chemical composition (% DM) of the *S. aculeata* whole plant at the beginning of the flowering stage (60 days of age) was CP 18.7, EE 4.92, CF 35.4, NFE 32.0 and total ash 8.99. However, higher values for CP, EE and NFE were observed in the *S. aculeata* leaves (70 days after sowing) used in this study. Compared to *S. rostrata*, Panda et al. (1988) reported that the leaves of *S. grandiflora* were rich in protein (35.1%) and low in fibre (11.9%).

Table 1. Chemical composition of the experimental feeds

Components	Treatment means*		
	Road-side grass	*Sesbania aculeata*	*Sesbania rostrata*
Dry matter (%)	16.7	23.6	21.0
Composition (% DM):			
CP	11.0	25.4	32.7
CF	31.4	16.7	15.5
EE	1.89	7.74	8.65
NFE	47.1	41.7	34.0
Ash	8.57	8.46	9.18
OM	91.4	91.5	90.8

* Means of triplicate analysis.

Digestibility of all the nutrients except CF was higher ($p<0.05$) in the *Sesbania* species than in the grass (table 2). In general, all the nutrients in both *Sesbania* species showed high digestibility coefficients. Singh et al. (1980) observed high values for digestibility of DM, OM, CP and CF (66.5, 69.5, 80.8 and 56.1% respectively) when *S. aegyptiaca* fodder was fed exclusively to 6-7 months old Barbari goats. The findings for nutrient digestibility of *S. rostrata* leaves were better than those of *S. aegyptiaca* plants reported by Singh et al. (1980). Alam et al. (1978) reported that the digestibility coefficients (%) of various nutrients of *S. aculeata* plant were : DM 66, CP 76, EE 70, CF 57 and NFE 62, which agrees with the present findings for *S. aculeata* leaves.

The digestible crude protein (DCP), total digestible nutrients (TDN), digestible organic matter (DOM) and metabolizable energy (ME) concentrations of *Sesbania* leaves were higher ($p<0.05$) than those of road-side grass (table 2). The higher concentration of chemical constituents along with their higher digestibility coefficients caused these differences. Katiyar and Ranjhan (1969) found 20% DCP and 68% TDN in *S. aculeata* fodder when fed to Bikaneri rams whereas Panda et al. (1988), using goats, reported that *S. grandiflora* leaves had 27.7 and 72.9% DCP and TDN, respectively. These are in agreement with the values reported here for *S. aculeata* and *S. rostrata*. When the two *Sesbania* species were compared here, *S. rostrata* had higher ($p<0.05$) values for nutrient digestibilities (except for NFE) and for DCP, DOM and ME contents than *S. aculeata*.

Table 2. Nutrient digestibility and nutritive value of the three feeds

Parameter	Treatment means			SEM
	Road-side grass	*Sesbania aculeata*	*Sesbania rostrata*	
Apparent digestibility (%):				
DM	55	62^{b}	71^{c}	1.27
CP	49^{a}	69^{b}	84^{c}	1.59
CF	87^{a}	52^{b}	66^{c}	2.14
EE	23^{a}	65^{b}	75^{b}	4.84
NFE	42^{a}	65^{b}	54^{ab}	3.08
OM	61^{a}	63^{a}	72^{b}	1.34
Nutritive value (% DM):				
DCP	5.4^{a}	17.4^{b}	27.4^{c}	0.40
TDN	53.7^{a}	64.7^{b}	70.3^{b}	1.86
DOM	55.8^{a}	58.0^{a}	65.2^{b}	1.22
ME content[1] (MJ/kg DM)	8.9^{a}	9.3^{a}	10.4^{b}	0.18

[1] ME content was estimated from digestible organic matter as ME (MJ/Kg DM)=0.016DOM (MAFF, 1984).

[a,b,c] Mean values with different superscripts in a row differ significantly ($p<0.05$).

The growth of goats fed the different feeds is detailed in table 3. At the beginning, the goats were reluctant to consume *Sesbania* leaves but after a period of 7 to 10 days, they consumed the green material in amounts from 970 (*S. aculeata*) to 1,230 g/d (*S. rostrata*). Goats given *Sesbania* leaves had higher ($p<0.05$) DM intakes than those that received road-side grass. These results are in keeping with those reported by Ash and Petaia (1992). They found that goats offered *ad libitum Sesbania* foliage showed a greater feed intake than goats given grass alone. The average daily DM intakes were 21.0, 24.8 and 25.1 g/kg live weight for goats given road-side grass, *S. aculeata* and *S. rostrata*, respectively, which indicated that the leaves are more palatable and digestible to goats than road-side grass. However, daily DM consumption recorded for *S. aculeata* and *S. rostrata* leaves in this experiment were lower than the DM intakes of 33.1 g for *S. aculeata* whole plant (Sahu et al., 1988) and 35.0 g for *S. grandiflora* leaves (Panda

Table 3. Growth rate and intake of goats given a diet of one of three feeds

Parameter	Treatment means			SEM
	Road-side grass	*Sesbania aculeata*	*Sesbania rostrata*	
Initial live weight (kg)	8.70	8.97	9.27	0.29
Final live weight (kg)	8.33[a]	9.50[a]	11.40[b]	0.35
Total weight change (kg)	-0.37[a]	0.53[ab]	2.13[b]	0.41
Live weight change (g/d)	-6.6[a]	9.5[ab]	38.1[b]	7.38
Average fresh feed intake (kg/d)	1.07[a]	0.97[a]	1.23[b]	0.04
DM intake (g/d)	179[a]	229[b]	259[b]	7.88
Digestible OM intake (g/d)	95.8[a]	133[b]	162[b]	8.48

[a,b] Mean values in a row having different superscripts differ significantly ($p<0.05$).

et al., 1988) per kg live weight of goats. These variations in DM consumption may be due to differences in method of feeding and/or palatibility of the *Sesbania* fodder used in the experiment.

The greater DM consumption of *Sesbania* leaves along with the higher nutritive value of this diet resulted in a greater ($p<0.05$) live weight gain than that of goats consuming road-side grass (table 3). The average daily growth rates of goats fed *S. aculeata* and *S. rostrata* leaves were 9.5 and 38.1 g, respectively. Comparable results for live weight gains were observed in Black Bengal goats fed either *S. aculeata* (9.5 g/d; Sahu et al., 1988) or *S. grandiflora* (42.9 g/d; Panda et al., 1988).

The average daily DCP and TDN consumption of goats given road-side grass were 11.1 and 110 g /10 kg live weight, respectively. The recommended values for DCP and TDN requirements (NRC, 1981) for the maintenance of 10 kg goats are 15 and 159 g, respectively. This indicates that road-side grass do not supply sufficient nutrients to satisfy the maintenance requirements of stall-fed goats. However, *S. aculeata* and *S. rostrata* were found to supply 44.4 and 76.4 g DCP and 165 and 196 g TDN/10 kg body weight, respectively. This represents a high intake of DCP and an adequate intake of TDN. Therefore, the amounts of protein and energy available from *Sesbania* leaves resulted in slow growth (9.5 g/d) in goats fed on *S. aculeata* and in moderate growth (38.1 g/d) in goats fed on *S. rostrata*.

CONCLUSION

Foliage from *Sesbania* species given to goats resulted in a higher live weight gain and they had a higher nutrient digestibility and nutritive value than that observed for goats fed road-side grass. *Sesbania rostrata* was superior to *Sesbania aculeata* in nutrient digestibility and also DCP, DOM and ME concentrations. The results indicated that *Sesbania rostrata*, a high quality fodder, can be used as a feed source for growing goats.

REFERENCES

Alam, M. R., A. B. M. F. Wahed and M. Haque. 1978. Dhaincha (*Sesbania aculeata*) as a fodder for growth and fattening of Black Bengal goat. 1. Nutritive value of dhaincha plant in goat. Bang. Vet. J. 12:48-52.

Amores, B. G. 1989. Feeding value of *Sesbania rostrata* to goats. Laguna (Philippines), May 1989. p. 57.

AOAC. 1990. Official Methods of Analysis. 15th Ed. Association of Official Analytical Chemists, Washington, DC.

Ash, A. J. and L. Petaia. 1992. Nutritional value of *Sesbania grandiflora* leaves for monogastrics and ruminants. Trop. Agr. (Trinidad and Tobago). 69:223-228.

Barroga, R. F. 1989. *Sesbania rostrata* supplement feeds for broiler chicks. Azolla Notes (Philippines). 6:5-6.

Katiyar, R. C. and S. K. Ranjhan. 1969. Yield and chemical composition of dhaincha (*Sesbania aculeata*): its nutritive value for sheep. Ind. J. Dairy Sci. 22:33-36.

Khan, M. A. S., M. A. Jabbar, M. A. Akbar and J. H. Topps. 1990. A legume browse, *Sesbania sesban* as an alternative protein supplement to fish meal for lactating cows in Bangladesh. Anim. Prod. 50:590.

MAFF. 1984. Energy Allowances and Feeding Systems for Ruminants. Ref. Book 433. HMSO, London.

NRC. 1981. Nutrient Requirements of Goats:Angora, Dairy and Meat Goats in Temperate and Tropical Countries, No.15. National Academy Press, Washington, DC.

Panda, S. K., B. K. Sahu and N. C. Panda. 1988. Nutritive value of agasti (*Sesbania grandiflora*) leaves in goats. Ind. J. Anim. Nutr. 5:68-69.

Sahu, B. K., S. K. Panda and N. C. Panda. 1988. Yield, chemical composition and nutritive value of banicha (*Sesbania aculeata*) fodder for goats. Ind. J. Anim. Nutr. 5:61-63.

SAS. 1985. SAS User's Guide: Statistics, Version 5. SAS Institute Inc., Cary, NC.

Singh, C., P. Kumar and A. Rekib. 1980. Note on some aspects of the feeding value of *Sesbania aegyptiaca* fodder in goats. Ind. J. Anim. Sci. 50:1017-1020.