

Chemical composition and feed value of fodder trees from Palpa District, Nepal

Mrigendra B. Malla¹

Chemical composition and feed value of the foliage of *Bauhinia purpurea* (Tanki), *Ficus nemoralis* (Dudhilo), *Ficus roxburghii* (Nibharo) and *Ficus subincisa* (Berulo), collected from Bhaluwachaur, Palpa District, were determined. Crude protein (35.3-15.2%) and phosphorus (0.44-0.15%) contents were well above the minimum required value (CP 7%; P 0.23%). Likewise neutral detergent fibre (NDF) (34.02-43.7%) and acid detergent fibre (ADF) (28.90-35.09%) contents were also nearly within desired levels (NDF<40%; ADF <30%). The established relative feed value (RFV) values for four species were in the order of *F. roxburghii* > *F. nemoralis* > *F. subincisa* > *B. purpurea*. All these species could be referred as highly nutritive fodder.

Keywords : Fodder trees, feed value, chemical composition, Relative feed value

Fodder trees contribute nearly 40 per cent of the total annual fodder requirement of the ruminants in the hills of Nepal. They are considered as one of the important sources of protein supplement in the straw based diet provided to the livestock. About hundred tree species varying greatly in their quality, palatability and preferences to the farmers are used for this purpose (Panday, 1982). Of these *B. purpurea*, *F. nemoralis*, *F. roxburghii* and *F. subincisa* are valued by the farmers as highly *poshilo* (nutritive) fodder that increase milk and fat (*ghee*) production (Thapa, 1994).

Nutrient contents are fairly high in all these species, however, their amount differs noticeably from one species to another (Subba, 1998, Amatya, *et al.*, 1997; Mahato and Subba, 1988). Differences in nutrient contents in an individual species also occur with the change in season. For example crude protein content in *B. purpurea* is highest in June while it is the lowest in April. Similar seasonal variations of the nutrients have been recorded in other species also (Amatya *et al.*, 1997).

Although chemical compositions of indigenous fodder species have been widely studied, investigation on quality ranking, particularly on the basis of relative feed value (RFV) seems to be lacking. The RFV system, which includes the important nutrition factor such as intake and digestibility, was developed for comparing forage on the basis of energy. It ranks forage in relation to full bloom alfalfa, having a RFV equal to 100 (Stokes and Prostko, 1998). Application of this technique for evaluating fodder species will

greatly help farmers to select useful fodder species in relatively short time and with little expenditure.

The present paper describes the chemical composition of four important fodder trees viz. *B. purpurea*, *F. nemoralis*, *F. roxburghii* and *F. subincisa* of Nepali Middle-Hills and ranks these species on the basis of their relative feed values and crude protein content. It is anticipated that the findings of this study will be of some use to the hill farmers in the management of fodder trees.

Material and methods

The present study has been conducted at Bhaluwachaur located in the Chirtung Dhara Village Development Committee (28° 52': 83° 35') of Palpa District at an altitude of about 800-900m a.s.l. It has a very gentle slope. The climate is sub-tropical and the annual rainfall is 1634mm. Temperature range from 7.7° C in January to 30.5° C in May (recorded in the Tansen Station in 1996) (CBS, 1999). The soil has sandy loam texture.

Sample collection

Foliage sample of each fodder species aged about five years was collected separately in different months in order to rank these fodder species when CP content, an essential nutrient for healthy growth for ruminants was the highest. Following this objective, leaf sample of *B. purpurea*, *F. nemoralis*, *F. roxburghii* and *F. subincisa* were taken in the months of May,

¹ Soil Chemist, Department of Forest Research and Survey, PO Box 3339, Kathmandu, Nepal, E mail: foresc@vlink.com.np

October, April and July respectively (Amatya *et al.*, 1997). A composite foliage sample was collected from four sides and three heights of each tree species and was placed into a suitable properly labeled plastic bag. After air drying, every sample was crushed in a plant grinder and 50g of each were stored into a clean and properly labeled plastic bottle for the laboratory analysis.

Chemical analysis

Samples were analysed for crude protein (CP) and phosphorus following the methods given in the manual by Anderson and Ingram (1993). Acid detergent fibre and neutral detergent fibre in the samples were determined by the Van Soest and Robertson's method (1985). Relative feed value was calculated using the equation used by Schroeder (1994).

Results

The results of laboratory analysis of the samples collected from the study plots are given in the Table 1. Crude protein contents in these species vary from 15 to 33 per cent with *B. purpurea* having the highest CP (33%) content while *F. subincisa* had the lowest (15%). *F. nemoralis* and *F. roxburghii* had 24 and 18 per cent respectively. The content of total phosphorus in foliar samples differed widely, ranging from 0.15% to 0.44% with *B. purpurea* having the highest where as *F. subincisa* had the lowest. The other two species have respectively 0.20 and 0.27 per cent.

Table 1 shows the relative feed value calculated on the basis of NDF and ADF contents in the foliar samples. The values obtained for RFV for the study samples when compared with the reference values (Table 2) all the species chosen for this study was found to be higher than the prime rank (Anipro, 2002; Stokes and Prostko, 1998). The estimated RFV values for four species were in the order of, *F. roxburghii* > *F. nemoralis* > *F. subincisa* > *B. purpurea* (Table 1).

Table 1 Analytical results of the plant samples collected from four fodder tree species

Species	Date of Sampling	CP (%)	TP (%)	NDF (%)	ADF (%)	RFV (%)
<i>Bauhinia purpurea</i> (Tanki)	May	35.3	0.44	43.70	35.09	154
<i>Ficus nemoralis</i> (Dudhilo)	October	23.4	0.20	37.25	29.12	213
<i>Ficus roxburghii</i> (Nibharo)	April	18.0	0.27	34.02	28.90	234
<i>Ficus subincisa</i> (Berulo)	July	15.2	0.15	38.45	33.20	197

NDF content in *B. purpurea*, *F. nemoralis*, *F. roxburghii* and *F. subincisa* were 43.70, 37.25, 34.02 and 38.45 per cent respectively. The concentration of ADF shows similar trend with *B. purpurea* having highest (35.09%) while *F. roxburghii* had the lowest (28.90%). *F. subincisa* had second highest ADF concentration (33.20%).

Discussion

Nutrient contents in the foliage samples collected from the study plots have displayed marked variation in their crude protein, phosphorus and fibre contents (Fig 1). Similar variations in the nutrient content have been reported in other species also (Malla and Amatya, 2002; Subba, 1998; Panday and Osti, 1993). The deviation in chemical composition among the species appears to be related with their inherent characteristics, as the site and climatic conditions were same for all the species.

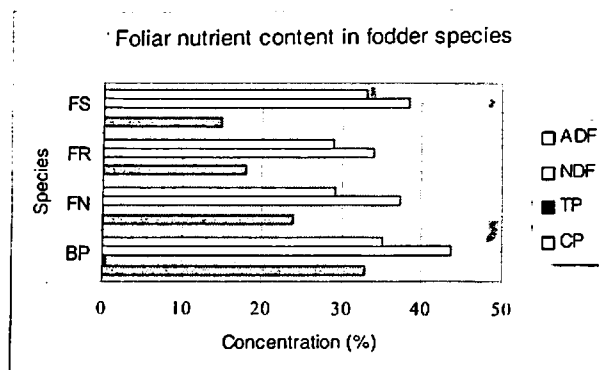


Fig 1. Foliar nutrient content in four fodder species

CP content in *B. purpurea* (29.7 %) compares quite well with the value reported by Panday (1976) but it is higher than the results obtained by Subba (1998), AND (2055) and Shrestha and Pakhrin (1989). *F. nemoralis* also has much higher CP content than the values reported by Subba (1998) and Panday (1976). The variation in CP content can be attributed to the difference in sampling time, age of the tree and site quality.

Likewise CP content in *F. roxburghii* (18%), agrees quite well with the result (17.3%) reported by Panday (1976), however, it disagrees with the result (12%) mentioned by Wood *et al.*, (1994). The disagreement in the CP content is probably due to the variation in the site characteristics as the sampling time is the same. *Ficus subincisa* has the lowest CP value (15.2%) among four species. It agrees with result is reported by AND (2055).

All the species have much higher CP content than the value (7-8%) considered essential by Preston and Murgeito (1987) and ARC, (1980) for the sustenance of the livestock. However, the CP content when compared with values recommended by ANIPRO (2002) *B. purpurea* and *F. nemoralis* fall in the prime quality while the other two, *F. roxburghii* and *F. subincisa* lie in the Standard 1 and 2 respectively.

Total phosphorus present in *F. nemoralis* and *F. roxburghii* compares well with Subba (1998), while *B. purpurea* disagrees with it. The higher phosphorus value in *B. purpurea* is probably due to reasons mentioned above. Total phosphorus is relatively higher in *B. purpurea* and *F. roxburghii*, while it is slightly lower in *F. nemoralis* and *F. subincisa* than required in leaf samples for healthy growth of animal (0.23-0.37 %) (NRC, Subcommittee, 1989).

An adequate level of fibre in the diet is essential for normal rumen functioning and maintenance of milk fat in ruminants. With exception of *F. roxburghii*, the other species have slightly higher NDF content than required (36%) in the diet (Mertens, 1983). These NDF values when weighed against ANIPRO (2002) *F. roxburghii*, *F. nemoralis* and *F. subincisa* occupy prime quality rank while *B. purpurea* falls in quality standard 1. Similarly, ADF contents in *F. roxburghii*, *F. nemoralis* fall in the prime quality standard where as the remaining two lie in the first quality standard. The content of NDF and ADF for *B. purpurea* is lower than the values reported by Panday and Osti (1993) and AND (2055). Of the three species, *B. purpurea* has the highest NDF but in the mean time it has highest crude protein as well. As long as there is high nitrogen content in the plant sample, high fibre contents are considered acceptable. RFVs of all the species, which were much higher in most cases than the prime value suggest that the intake and digestibility of these fodder are much superior than the Alfalfa.

In terms of overall quality ranking (including RFV and other nutrients) all the species fall in the prime quality standard, which interestingly agrees quite well with the farmers ranking (Thapa, 1994). Among four species *F. roxburghii* occupies highest position because of its low NDF and ADF contents. Although CP and P content in comparison to other species is slightly lower but they are still higher than required level. Tannin content is little higher (Subba, 1998), nonetheless, it is quite close to the dose found healthy for livestock (Ologhobo, 1989). It will, however, be safe to feed this species together with other fodder species that has low tannin content so that any possible deleterious effect of tannin will be diluted and in the mean crude protein content will be effectively used. *B. purpurea* with comparatively highest CP, P content and low tannin level (Ologhobo, 1989) still lies 4th in the quality ranking. This is mainly due to high NDF and ADF content. This species if fed by mixing with other species having low fibre such as *F. roxburghii* can provide optimum nutrition to the animals.

Conclusion

Despite the variation in foliar chemical composition, four fodder trees leaves with sufficient level of crude protein, phosphorus, fibre, tannin content and high level of RFV can be regarded as very good quality fodder. Among four fodder species *F. roxburghii* falls at the top while *F. nemoralis*, *F. subincisa* and *B. purpurea* lie in the 2nd, 3rd and 4th quality orders respectively. These species, if properly managed, can be very good source of fodder for the livestock.

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Table 2. Forage quality standards and their relative feed values (RFV)*

Quality Standard	Dry Matter Basis			
	CP (%)	ADF (%)	NDF(%)	RFV(%)
PRIME	>19	<31	<40	>151
1	17-19	31-35	40-46	125-151
2	14-16	36-40	47-53	103-124
3	11-13	41-42	54-60	87-102
4	8-10	43-45	61-65	74-86
5	<8	>45	>65	>75

*Source: ANIPRO, 2002

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