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SHORT COMMUNICATION

Nutrient Content of Leaf of Three Selected Tree Species of Flood Plains of Assam, India

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ABSTRACT

Livestock plays an important role in sustaining rural livelihood, nutritional and environmental security and growth of Indian Agriculture. Fodder trees are an important feed resource for livestock, particularly during dry months and flood season when all the other fodder sources have been exhausted. Commonly available fodder tree leaves used as goat forage such as *Ficus rumphii* and *Streblus asper* and *Litsea monopetela* from flood plains of Assam were selected to determine the content of proximate principles, macro- and micro-nutrients and anti-nutritional factors. Considerable variations were observed in the nutrient profile of the studied species. Micro-minerals such as Cu, Zn and Co were lower than required level, while the content of macro-minerals *viz.*, Ca, Mg and P was higher than required level. Saponin was not detected in any of the three species. Based on the nutrient content of the three selected species, it was concluded that either of them can be used as a source of forage for ruminants, especially during the period of scarcity

Key words: Anti-nutritional factor, Fodder trees, Macro- and micro- minerals, Proximate principles

Tree fodder is a very useful resource, particularly during winter months when all the other fodder sources have been exhausted. Tree foliage is an important source of protein supplement for ruminants fed low protein forages (Leng, 1997; Das and Ghosh, 2001; Das, 2005). During the lean season when available grazing is not sufficient to meet the maintenance requirements, the contribution from trees and shrubs is significant. It has been well recognized that some tree leaves are palatable, digestible and high in protein content (Palmer and Schlink, 1992; Subba *et al.,* 1994; Leng 1997; Das and Ghosh, 2001; Das, 2005). Tree foliage makes a significant contribution to meet the nutritional requirements of the ruminants during the winter (Raghavan, 1989) and if used in an appropriate manner can replace part of the concentrates (Das and Ghosh, 2007; Das *et al.,* 2010). In spite of the importance of tree fodders particularly under small holder farming system, information on the nutritional value of fodder of the region is scanty which mostly pertains to the nutritive value (Das and Ghosh, 2001; Das, 2005) and replacement value of fodders like *Artocarpus lakocha, Artocarpus heterophyllus and Ficus hookerii* (Das and Ghosh, 2007; Das *et al.,* 2010). *Ficus rumphii* Blume, *Streblus asper* Lour and *Litsea monopetela* are three important species of fodder tree of flooded plains of Assam. Hence, it would be desirable to generate data on nutrient composition of these tree fodders that would contribute to development of feeding strategy to augment livestock productivity in the region. The specific objective was to determine the nutrient profile of these three fodder.

Fresh leaves were picked from randomly selected trees. The air-dried leaves were cut into small pieces, ground to pass through 1-mm sieve and the ground samples were stored in tight plastic container at room temperature for subsequent chemical analysis. Proximate principle such as dry matter (DM), total ash, crude protein (CP), ether extract (EE), crude fibre (CF), acid insoluble ash and nitrogen free extract (NFE) were estimated following methods of AOAC (1995). Phosphorus was determined by spectrophotometric method as described by AOAC, (1995). Macro-minerals such as K, Ca and Mg, and micro-minerals were determined using MP-AES 4100 (Microwave Plasma Atomic Emission Spectroscopy). Total carbon

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Table 1. Proximate composition of three selected tree species

Components	F. rumphii	L. monopetela	S. asper
Dry matter	16.66±0.03	7.52±0.135	9.06±0.07
	on % dry matter basis		
Ash	15.17±0.58	6.52±0.06	28.23±0.33
Organic matter	84.83±4.31	93.48±0.68	71.77±1.30
Crude protein	12.17±4.89	7.21±2.28	9.68±0.16
Crude fibre	14.21±1.85	9.51±0.56	11.55±0.10
Ether extract	2.55±0.47	5.02±0.20	1.8354±0.05
Nitrogen free extract	55.87±4.19	71.72±2.61	48.49±3.49

was estimated using CHNS (O) Analyzer-Euroea 3000. Sulphur content was estimated spectrophotometrically after digesting the samples in tri-acid mixture. Tannins, cyanogenic glycosides and saponins were estimated by using methods of AOAC (1995).

Data pertaining to proximate principles are presented in Table 1. *F. rumphii* leaves was found to be the best protein supplement among the selected species whereas the lowest value was found in L. *monopetela*. Samanta *et al.,* 2015) reported that there was a wide variation in the crude protein content of the top foliages. Subba (1999) reported that tree leaves containing more than 14% CP is sufficient for medium level of production performances from the ruminants. However, the CP content obtained in the present investigation was lower than the reported values for many tree foliage. The highest content of CF was observed in *F. rumphii* (14.21%) and *L. monopetela* had the lowest CF content (9.51%). However, EE content was the highest in *L. monopetela (*5.02 %) and lowest in *S. asper* (1.83 %). Values reported herein are within the range reported by Samanta *et al.* (2015).

Carbon content in the leaf fodder samples ranged from 17.34 % to 25.19 %. The highest C content was observed in *L. monopetela with* 25.19 % and the lowest was found in *S. asper* (17.34 %). Calcium content of *S. asper* was maximum (31.37 g/kg) as compared to *F. rumphii* (26.57 g/kg) and *L. monpetela* (16.17 g/kg). *F. rumphii* recorded the highest magnesium and potassium contents (6.29 g/kg and 24.79 g/kg, respectively) followed by S. *asper* and *L. monopetela*. Phosphorus and sulphur concentrations were also reported to be maximum in *F. Rumphii* (4.0 g/kg and 1.46 g/kg, respectively) and minimum in *S. asper* (3.7g/kg and 1.25 g/kg, respectively) (Table 2).

Most of tropical legumes contain Ca levels ranging from 8.6-10.2 g/kg DM (Minson, 1990; Rubanza *et al.,* 2005) which was much lower than the Ca content of the tree fodder reported in the present study. However, our result is in conformity to previous reports (Rubanza *et al.,* 2006; Mtui *et al.,* 2009) that reported a higher range of Ca (6.6-35.6 g/kg DM). Phosphorus levels for most browse species ranged from 1-5 g/kg DM as noted earlier (Rubanza *et al.,* 2006; Mtengeti and *Mhelela,* 2006; Mtui *et al.,* 2008) which is comparable to the P concentrations obtained in the present study. Ca: P ratio recommended for normal physiological function of ruminants is 2:1. Browse species in most cases have much wider Ca: P because of their higher Ca and comparatively lower P content

Table 2. Macro-mineral content (g/kg) of the leaf of the three selected tree species

Macro nutrient	*F. rumphii*	*L. monopetela*	*S. asper*
Calcium	26.57±1.53	16.17±3.10	31.37±1.00
Magnesium	6.29±0.07	3.32±0.07	5.29±0.38
Potassium	24.79±0.14	11.63±0.77	23.36±2.95
Phosphorous	4.0±0.90	2.0±0.20	3.7±0.40
Sulphur	1.46±0.17	1.45±0.16	1.25±0.08

Table 3. Micro-mineral content (ppm) of the leaf of three selected tree species

Micro minerals	*F. rumphii*	*L. monopetela*	*S. asper*
Boron	9.0±0.1	3.3±0.13	11.0±0.3
Copper	9.0±0.2	14.3±0.9	3.3±0.003
Iron	18.9±0.20	12.6±0.10	22.9±0.10
Manganese	8.0±0.3	13.0±0.4	9.8±0.6
Zinc	15.0±1.0	20.0±0.5	18.0±3.0
Aluminium	1.09±0.12	1.48±0.08	1.21±0.02
Chromium	4.8±0.37	1.0±0.03	1.0±0.06
Cadmium	0.1±0.0	0.1±0.0	0.1±0.0
Lead	0.6±0.03	0.6±0.03	0.7±0.0
Cobalt	0.3±0.0	0.2±0.0	0.3±0.0
Sodium	3.86±0.19	2.51±0.27	3.92±0.52

and the ratio may be as wider as 6.6:1-55.1:1 (Rubanza *et al.,* 2005; 2006) In the present study a high Ca:P ratio was estimated for all the three fodder species which ranged from 6.64:1 to 8.48:1 Magnesium concentrations in most browse species ranged from 1.3-6.6 g/kg DM (Abdulrazak *et al.,*2000; Rubanza *et al.,* 2006; Mtengeti and *Mhelela,* 2006). Concentrations of sulfur in most tropical legumes ranges from 15-35 mg/kg DM (Minson, 1990). All the three fodders investigated had comparable concentrations of Mg and S as mentioned above.

Boron, sodium and iron contents were maximum in *S. asper* (11.0 ppm, 22.9 ppm and 3.92 ppm, respectively) and minimum in *L. monopetela* (3.3 ppm, 12.6 ppm and 2.51 ppm, respectively). The highest copper (Cu) concentration was recorded in *L. monopetela* (14.3 ppm) followed by *F. rumphii* (9.0 ppm) and *S. asper* (3.3 ppm). Manganese, zinc and aluminum contents were maximum in *L. monopetela* while the lowest concentrations were observed in *F. rumphii*. *F. rumphii* contained significantly higher chromium as compared to the other two species Cadmium, lead and cobalt were found in very low concentrations and did not vary among the species (Table 3). All the tree fodder contained these micro-nutrients within the comparable range of other tree fodders (Abdulrazak *et al.,* 2000; Rubanza *et al.,* 2006 and Kakengi *et al.,* 2007).

Foliage of *F. rumphii* contained the highest amount of tannins, whereas the lowest tannin content was recorded in *S. asper*. *L. monopetela* and *S. asper* was reported to have similar level of (0.17%) cyanogen, while the lowest concentration was found in *F. rumphii* (0.03%). Saponin was not detected in any of the three fodder species studied. Tannin content varies among the foliage samples of many tree species used as ruminant fodder. Tannins content as observed in this study was comparable for *F. rumphii* with those reported earlier (Khatta *et al.,* 1999; Kumar and Sharma, 2003). However, tannin contents were much lower in other two species (Table 4).

From, the present study, it can be concluded that a considerable variation was observed in the nutrient profile of the leaves of the three selected fodder species. From the nutrient profile and content of anti-nutritional factor it is evident that these three tree

Table 4. Content (%) of anti-nutritional factors in the leaf of three selected tree species

Micro nutrients	*F. rumphii*	*L. monopetela*	*S. asper*
Anti-nutrient compounds	*F. rumphii*	*L. monopetela*	*S. asper*
Tannins (%)	6.46±0.17	0.02±0.006	0.0007±0.00023
Cyanogen (%)	0.03±0.0004	0.17±0.16	0.17±0.16
Saponin (%)	Nil	Nil	Nil

fodders can be potentially used as ruminant feed particularly during lean period. However, further studies involving animal trial is warranted.

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