

## A STUDY ON CHEMICAL COMPOSITION AND NUTRITIVE VALUE OF ALBIZIA TREE LEAVES AS A LIVESTOCK FEED

P. Chitra\* and A. Balasubramanian

Assistant Professor (V & AS), Forest College and Research Institute,  
Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu - 641301

E-mail: drpchithupsc@gmail.com (\*Corresponding Author)

**Abstract:** The present study was conducted to determine the proximate composition and fibre fraction values of Albizia tree leaves used as a livestock feed at Forest College and Research Institute, Mettupalayam. A total of five species namely *Albizia lebbeck*, *Albizia saman*, *Albizia falcatariae*, *Albizia procera*, *Albizia guachapele* were identified and selected for the evaluation of proximate analysis i.e. dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE), and total ash and fibre fraction analysis i.e. Neutral detergent fibre (NDF), Acid detergent fibre (ADF), Acid detergent lignin (ADL) and hemicellulose. The DM, CP, CF, EE and Total ash content of the foliages varied from 38.65 - 46.26%, 18.13 - 22.16%, 19.81 - 26.16%, 2.89 - 3.80%, 7.67 - 9.15%, of DM respectively. The NDF, ADF, ADL and hemicellulose content of foliages varied from 33.72 - 44.25%, 23.25 - 34.87%, 8.25-11.70%, 7.92-11.91% of DM respectively. From this study it was concluded that nutrient value particularly crude protein content are rich in leaves of Albizia and they serve as a better tree fodder for livestock.

**Keywords:** Tree fodder, Albizia, proximate composition, fibre analysis.

### Introduction

Feed and fodder availability in India is not sufficient to meet growing ruminant population, there is need to explore new feed resources which do not compete with human feed chain (Raghuvansi et al., 2007) Adequate supply of nutrients from any feed resources depends upon the quantity as well as quality of feed which in turn affects the productivity of livestock. Livestock rearing mainly practiced range land grazing. Due to increasing range land degradation, livestock feeding is facing serious difficulties related to quantitative and qualitative provision of nutrients and this exacerbated by the continuous increase of feedstuffs prices. Nowadays the availability of conventional feed resources is reduced to fulfill the requirements of ruminants and small ruminants. So other possible avenue is to find out non conventional feed resources which do not compete with human feed.

Tree leaves as an alternative feed source for small ruminants (Bakshi and Wadhwa, 2007) and can help to minimize the wide gap between demand and supply of nutrients. Trees are wider adaptability to harsh agro climatic condition and ability to produce throughout the

year. As tree requires little care after the establishment, the cost of production will be low. In dry season, fodder tree leaves as an important source of nutrients for small ruminants. Supplementation of tree leaves have positive impact on rumen microbial growth and digestion resulting in improved growth and enhanced productivity in ruminants (Tessema and Boars, 2004). Protein content of leguminous fodder tree leaves is usually high compared with that of mature grasses. The protein is digested in the rumen to provide ammonia and aminoacids for microbial protein synthesis. Feed containing less than 8 per cent crude protein are considered deficient and they cannot provide the minimum ammonia levels required. All leguminous tree leaves have high protein content and may be used as an adequate protein source.

*Albizia* is a genus of about 150 species mostly fast growing subtropical and tropical trees and shrubs in the subfamily of *Mimosoideae* of the family *Leguminosae* (*Fabaceae*). Leguminous tree leaves are rich in crude protein. Supplementation of these tree leaves provide protein source to the animal. Nutritional value of different species of *Albizia* leaves varies, but there is no information on the nutritional profile of *Albizia* leaves. The present study was to find out the chemical composition and nutrient content of five species of *Albizia* trees available in Forest College and Research Institute, Mettupalayam.

## **Materials and methods**

### **Source of sample**

In this study, *Albizia* species namely *Albizia lebbbeck*, *Albizia saman*, *Albizia falcatariae*, *Albizia procera*, *Albizia guachapele* were identified and selected for collecting fresh leaf samples from Forest College and Research Institute Campus, Mettupalayam, Tamil Nadu during November, 2015. Each tree was sampled from five sites (east, west, north, south and canopy). The collected leaf samples were dried separately in hot air oven at 65° C for 24 hrs and then ground to pass a 1mm sieve in wiley mill and then stored in air tight polythene bags at room temperature making composite sample from each tree. All the sample of tree leaves was collected within one week to minimize chemical analysis effects of sampling time on nutrient composition.

### **Chemical analysis**

Proximate composition such as crude protein (CP), ether extract (EE), crude fibre (CF) and total ash (TA) were analysed by standard methods (AOAC, 2012). The fibre fractions viz. Neutral detergent fiber, (NDF), Acid detergent fiber (ADF) and Acid detergent lignin (ADL) were determined by Van Soest *et al.* (1991). Dry matter content was determined by drying

the sample at 105°C in hot air oven till the constant weight. Ash content was measured after igniting sample in a muffle furnace at 550° C for 4 hrs to burn all the organic matter and leftover was weighed as ash.

### Results and Discussion

The quality of the tree leaves used as a fodder are decided based upon the proximate composition and fibre fraction. The proximate composition values of different Albizia tree species are summarized in Table 1.

**Table 1. Proximate composition of Albizia tree species (% on DM basis)**

Albizia Species	Dry Matter (DM)	Crude protein (CP)	Crude fibre (CF)	Ether extract (EE)	Total ash
<i>Albizia lebbbeck</i>	46.26 ± 0.09	19.91±0.13	26.82 ±0.36	3.48 ±0.58	8.47 ±0.49
<i>Albizia saman</i>	38.65 ± 0.15	22.16 ±0.25	25.48 ±0.29	2.89 ±0.76	9.15 ±0.28
<i>Albizia falcatariae</i>	43.78 ±0.56	18.13 ±0.76	19.81 ±0.73	3.34 ±0.02	7.67 ±0.92
<i>Albizia procera</i>	39.56 ±0.22	20.40 ±0.24	25.96 ±0.31	3.80 ±0.60	8.14 ±0.86
<i>Albizia guachapele</i>	40.65 ±0.69	18.90 ±0.23	24.39 ±0.74	3.14 ±0.79	8.81 ±0.14

In this study revealed that CP content of Albizia species varied from 18.13 - 22.16 per cent. The highest CP value was observed in *Albizia saman* followed by *Albizia procera*, *Albizia lebbbeck*, *Albizia guachapele*, *Albizia falcatariae*, respectively. CP contents of all the species of this study were higher than 10 per cent, sufficient for medium level of production from ruminant (Subba, 1999). Subba (1999) has reported that a higher proportion of the CP in the fodder tree leaves is actually in the form available to ruminants. CF content of Albizia species varied from 19.81- 26.16 per cent. The highest CF value was observed in *Albizia lebbbeck* followed by *Albizia procera*, *Albizia saman*, *Albizia guachapele*, *Albizia falcatariae* respectively. Similar findings were reported by Chandra and Mali (2014) and Cheema *et. al.* (2014).The crude protein content of *Albizia lebbbeck* was slightly higher value as that reported by Mtenga *et.al.* 2001 and Atiya *et al.* 2011.

The fibre fraction values of different Albizia tree species are summarized in Table 2.

**Table 2: Fibre analysis of Albizia tree species (% on DM basis)**

Albizia Species	Neutral detergent fibre (NDF)	Acid detergent fibre (ADF)	Acid detergent lignin (ADL)	Hemicellulose
<i>Albizia lebbbeck</i>	42.15 ±0.21	30.24±0.13	10.26±0.11	11.91
<i>Albizia saman</i>	38.39 ±0.16	29.43±0.19	9.56±0.07	8.96
<i>Albizia falcatariae</i>	33.72±0.09	23.25±0.12	8.25±0.08	10.47
<i>Albizia procera</i>	44.25±0.82	34.87±0.23	11.70±0.14	9.38
<i>Albizia guachapele</i>	41.64±0.31	33.72±0.31	10.15±0.21	7.92

NDF and ADF values are most common measure of fiber used for animal feed analysis and it measures the structural components in plant cells (hemicellulose, cellulose, lignin and pectin). These values are good indicator of forage used as an animal feed for livestock. Plant cells can be divided into less digestible cell wall (hemicellulose, cellulose, lignin and pectin) and mostly digestible (starch and sugar) cell contents. Cellulose and hemicellulose digested by micro organism in animal's rumen (cattle, sheep and goat) hind- gut fermentation (horses, rabbits and guinea pigs). NDF, ADF and ADL values indicates structural components in plant cells. NDF value is a good indicator of the bulkiness of forage and used to predict the amount of forage intake by the animal. NDF values increases dry matter intake generally decrease in the animal. In this study report that NDF values of Albizia tree leaves varied from 33.72 - 44.25 per cent. The highest NDF value was observed in *Albizia procera* followed by *Albizia lebbeck*, *Albizia guachapele*, *Albizia saman*, *Albizia falcatariae* respectively. ADF values of Albizia varied from 23.25–30.24 per cent. The lowest value was observed in *Albizia falcatariae* followed by *Albizia saman*, *Albizia lebbeck*, *Albizia guachapele*, *Albizia procera* respectively. Similar findings were reported by Chandra and Mali (2014) and Cheema et.al. (2014). ADF values indicate highly indigestible fibre portion. Increase ADF value indicates decrease the digestibility of forage and nutrient availability in animals. Lignin is the indigestible fibre portion. As lignin content increased in forage that reduced the digestibility and feed intake of animal and also affect the performance of animal. The variations in crude protein and crude fibre values and in tree leaves could be attributed to the differences to stage of growth, proportion of young leaves and mature leaves (Reddy et al., 2009).

### **Conclusion**

The present study on nutritional evaluation of foliage have revealed that trees are good source of nutrients especially rich in protein content and can be used as a supplemental feed in livestock.

### **References**

- [1] AOAC, 2012. Official methods of Analysis, (19<sup>th</sup> Ed). Association of Official Analytical Chemist. Washington D.C.
- [2] Atiya, A., Shakira, G., Asma L. and Mukhtar, A.N. 2011. Nutritional evaluation of some top fodder tree leaves and shrubs of district chakwal, Pakistan in relation to ruminant requirements. *Pakistan Journal of Nutrition*. Vol 10 (1): 54-59.
- [3] Bakshi, M.P.S. and M. Wadhwa, 2007. Tree leaves as complete feed for goat kids. *Small Rumin. Res.* Vol 69: 74-78.

- [4] Chandra, J and M.C. Mali, 2014. Nutritional evaluation of top five fodder tree leaves of mimosaceae family of arid region of Rajasthan. *I. J. Innovative Res. Rev.* Vol. 2 (1) : 14-16.
- [5] Cheema,U.B. J.I. Sultan, A. Javaid, M.I. Mustafa and M. Younas, 2014. Screening of fodder tree leaves by chemical composition, mineral profile, antinutritional factors and in sacco digestion. *J. Agri. Sci.*, Vol 4(11 : 558-564.
- [6] Mtenga, L.A. D.M. Komwihangilo and G.C. Kifaro, 2001. Selectivity in sheep and goat fed Albizia, Leucaena and Tamarind multipurpose trees. *Small ruminant research network workshop.* 246-254
- [7] Paterson R.T, G.M. Karanja, O.Z. Nyaata, I,W Kariuki and R.L Roothaert . 1998. A review of treefodder production and utilization within smallholder agroforestry systems in Kenya. *Agroforestry Systems.* Vol 41:181-199.
- [8] Raghuvansi, S.K.S., R. Prasad, A.S. Mishra, O.H. Chaturvedi, M.K. Tripathi, A.K.Misra, B.L. Saraswat and R.C. Jakhmola. 2007. Effect of inclusion of tree leaves in feed on nutrient utilization and rumen fermentation in sheep. *Biores. Technol.*, Vol 98: 511-517.
- [9] Reddy, D.V., Tiwari, C.M., Elanchezhian, N. and Uma Maheswari, D. 2009. Evaluation of supplementary feeding value of local tree foliages in goats fed on Napier Bajra green fodder. *Anim. Nutr. Feed Technol.* Vol 9: 155-163
- [10] Singh, N.K. Sharma and J.L. Ogra, 1989. Chemical composition and nutritive value of Siris (*Albizia lebbeck*) and Subabul (*Leucaena leucocephala*) pods on goats. *Indian Journal of Animal Nutrition.* Vol 6(3):259-261.
- [11] Subba D.B .1999. Tree fodders and browse plants as potential nutrient suppliers for ruminants. In:*Proceedings of the 3rd National Workshop on Livestock and Fisheries Research, Nepal Agricultural Research Council, Kathmandu, Nepal.*
- [12] Tessema, Z. and R.M.T Baars, 2004. Chemical composition, in vitro dry matter digestibility and ruminal degradation of Napier grass (*Pennisetum purpureum* (L.) Schumach.) mixed with different levels of *Sesbania seban* (L.) merr. *Anim. Feed Sci. Technol.* Vol 117: 29-41.