

SHORT COMMUNICATION

VARIETAL DIFFERENCES IN PHOTOSYNTHETIC PIGMENTS AND BIOCHEMICAL CONSTITUENTS IN *LEUCAENA LEUCOCEPHALA*

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The present study was carried out to evaluate five selections of *Leucaena leucocephala* (S24, S22, S14, S10, K8) for their photosynthetic pigments, nitrate reductase activity, crude protein and sugar content in different seasons. It was observed that chlorophyll and pigment contents were maximum in S24 followed by S22, S14, S10 and K8 in September. Minimum chlorophyll content was noticed in the month of March. All the selections were at par with respect to their nitrate reductase activity (NRA) exhibiting significant differences in seasons. Higher crude protein and sugar contents were found in early stages of plant growth, maximum being in S14 and S10 respectively.

Key words : Chlorophyll, *Leucaena leucocephala*, nitrate reductase activity, protein.

Leucaena leucocephala (Lam.) de Wit. is proclaimed as the miracle tree because of its worldwide success as a long-lived and highly nutritious forage tree and its varied uses (Brewbaker and Sorenson 1990). The species distribution ranges from sea level to over 2000 m elevation in areas with annual rainfall between 500-2000 mm. It thrives well in waterlogged soils with high salinity and pH ranging from 5-8. However, quantitative estimation of some biochemical components is considered as an index for higher growth and productivity. A number of selections have been developed as part of the *Leucaena* improvement programme and out of them only five selections were selected as promising for their growth performance and biomass production. These selections were never been assessed for their qualitative characters. Therefore, the present study was carried out to evaluate different selections of *Leucaena leucocephala* for their photosynthetic pigments, nitrate reductase activity and crude protein in different seasons.

Seeds of five promising selections of *Leucaena leucocephala* (S24, S22, S14, S10 and K8) were sown in polythene bags containing 1:2:1 mixtures of farmyard

manure, garden soil and sand in the pot culture house of Plant Physiology and Biochemistry, IGFR, Jhansi during the year 1996. The uniform seedlings at 3-4 leaf stage were transplanted in porcelain pots (29.5 x 20.5 cm) and grown under natural condition with one seedling/pot. The annual mean maximum and minimum temperatures were 33°C and 17.4°C respectively. Chlorophyll content in fresh leaves was estimated by the method of Duxbury and Yentish (1956) and fractions of chlorophyll were calculated from the absorbance value using the equation given in AOAC (1970). Nitrate reductase activity in fresh leaves was determined by the methods of Bar Akiva and Sternbaum (1965) and modified by Kleeper *et al.* (1971). Crude protein in different plant parts was estimated by multiplying the values of total nitrogen by 6.25. Total nitrogen was determined by micro-Kjeldahl's method (AOAC 1960). Sugar content was estimated by anthrone method (Morris 1948). Final data were analyzed statistically at 5% level using the methods of Fisher and Yates (1963) and Panse and Sukhatme (1967).

Maximum accumulation of chlorophyll a and b were recorded in S14, S10 and K8 during seedling stage in the

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month of September, which decreases during December and reaches at minimum level in the month of March when the leaves start senescing. In S24 and S22 the reduction in chlorophyll a and b content was minimum in the month of December (Table 1) predicting that these genotypes are photosynthetically active even during winter months and greenness of leaves remains for longer period. The increase in chlorophyll content in June might be due to the flushing of new leaves (Kakati and Yadav 1990 and Naidu and Swami 1996). The chl a : b decreased with the maturation of leaves during autumn and winter months. Selections, months and their interactions were found to be significant ($P>0.05$) in case of chl a and chl b while chl a:b was significant at seasonal level.

NRA activity increased with growth of seedlings and reached at its maximum level in March at full mature stage of leaves (Muthuchelian *et al.* 1986) (Table 2). Minimum values of NRA were found in summer months (June) in all the selections due to high

temperature. It confirms the finding of Kauffaman *et al.* (1971). The highest value of NRA was in variety S14 (1237.27 nmol NO₂/g fw/h) during March. On an average all the selections were at par with respect to their NRA.

In the early stage of growth leaves were found to be rich in crude protein as observed in all the selections (Fig. 1). Similar trend was also reported by Majumdar (1967). The protein content was maximum in September (Gupta *et al.* 1992) and increased up to December, which is found to be positively related to leafiness (Paroda 1975). In stem crude protein content increased with the growth of trees (Mendoza *et al.* 1983). Leaves have maximum accumulation of crude protein than the stem. Although no significant variation was observed for crude protein content among the selections but the leaves of S14 had maximum crude protein content. The sugar content in leaves was found to increase with the age and growth of plant (Fig. 2) as also reported by Vandana (1995) in *Sesbania*

Table 1. Chlorophyll a and b content (mg g⁻¹ fw) in *L. leucocephala* selections during different months.

Month	Chlorophyll	Selection					Mean
		S24	S22	S14	S10	K8	
September	a	0.598	0.574	0.863	0.888	0.823	0.709
	b	0.191	0.181	0.242	0.293	0.229	0.210
	a+b	0.798	0.755	1.105	1.192	1.051	0.922
	a:b	3.130	3.171	3.566	3.594	3.594	3.500
December	a	0.622	0.578	0.603	0.720	0.642	0.633
	b	0.251	0.229	0.227	0.278	0.250	0.247
	a+b	0.873	0.807	0.83	1.021	0.891	0.884
	a:b	2.478	2.524	2.656	2.589	2.568	2.563
March	a	0.529	0.329	0.523	0.427	0.385	0.439
	b	0.236	0.105	0.143	0.102	0.165	0.150
	a+b	0.765	0.424	0.663	0.529	0.55	0.586
	a:b	2.750	3.410	3.700	4.500	2.33	3.340
June	a	0.548	0.444	0.531	0.498	0.497	0.458
	b	0.19	0.148	0.165	0.175	0.193	0.168
	a+b	0.738	0.592	0.696	0.673	0.69	0.665
	a:b	2.88	3.0	3.218	2.845	2.575	2.880
Grand Mean	a	0.574	0.481	0.635	0.633	0.586	0.558
	b	0.217	0.165	0.186	0.212	0.209	0.201
	a+b	0.791	0.663	0.816	0.854	0.795	0.754
	a:b	2.80	3.02	3.468	3.380	2.763	3.070
CD at 5% level		Chl a	Chl b	Chl a+b	Chl a:b		
Selection		0.0867	0.143	0.119	NS		
Months		0.0776	0.0403	0.107	0.63		
Interaction		0.1735	0.09	0.2382	NS		

Table 2. Nitrate reductase activity (nmol NO₂/g fw/h) in *L. leucocephala* selections during different months

Month	Selection					Mean
	S24	S22	S14	S10	K8	
September	332.75	246.53	225.12	318.865	309.84	225.449
December	842.02	839.12	786.455	777.78	922.45	833.566
March	997.65	1197.91	1237.27	1101.85	1117.48	1130.436
June	229.75	212.965	233.22	219.33	276.625	234.378
Mean	600.548	624.133	620.516	604.456	654.96	605.957

CD at 5% level: Selections= NS, Months= 252. 81, Interaction= NS

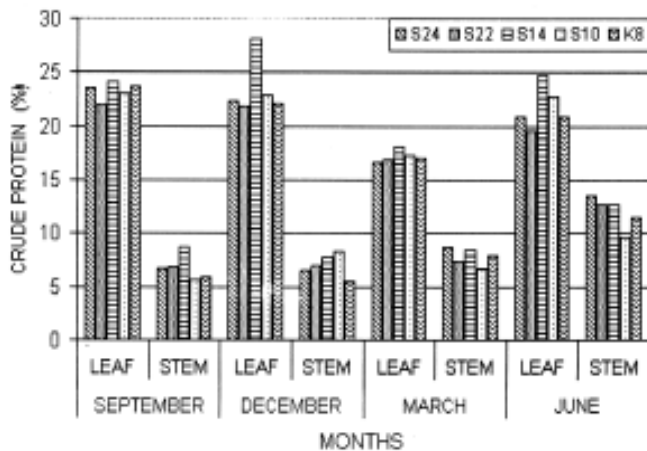


Fig. 1. Crude protein in *L. leucocephala* selections in different months.

(CD at 5%: Selection= NS, Months= 0.22 (leaf), NS (stem), Interaction= NS)

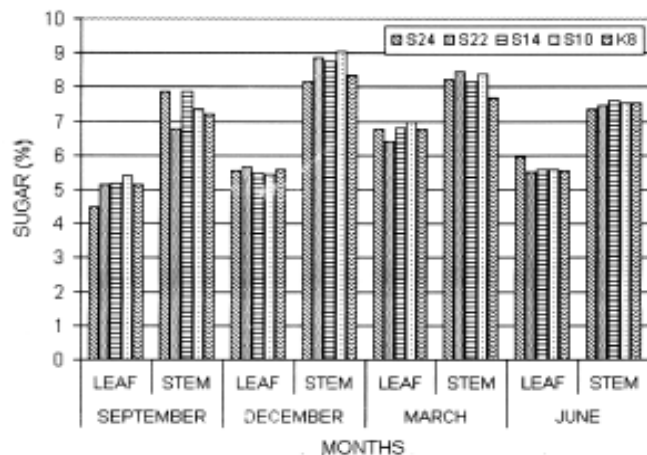


Fig. 1. Sugar content in leaves and stem of *L. leucocephala* selections in different months.

(CD at 5%: Selection= NS, Months= 0.37 (leaf), 0.34 (stem), Interaction= NS leaf, 0.76 stem)

species. Higher sugar content was estimated in stem as compared to leaves in different months. The accumulation of sugar was maximum in S10 and S14. Seasonal variations in sugar content were found to be significant at P 0.05.

The studies revealed that maximum protein and sugar contents were found in S14 and S10 thus indicating their superiority with respect to fodder quality. Further this will go a long way in upgrading the genotypes with low protein content through breeding programme.

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BIOCHEMICAL CONSTITUENTS IN *LEUCAENA*

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