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Suitable *Leucaena* Genotypes for Shallow Black Soils of Northern Dry Zone of Karnataka

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Abstract: *Leucaena leucocephala* is an important nitrogen fixing multipurpose tree recommended for shallow vertisols. It is a low fuel wood producer and is highly susceptible to psyllid bug, resulting in very low profit and affecting quality and quantity of forage. To identify suitable genotypes for minor timber and forage production, two separate studies were carried out at Regional Research Station, Bijapur (Karnataka) during 1990-95 and 1992-95, respectively. Results of first study indicated that among the eight genotypes, variety K-636 (*L. leucocephala*) produced high woody biomass and less seed, and had greater tolerance to psyllid bug. *Heteropsylla cubana* (Crawford) was found suitable for minor timber. In the second study, among 10 genotypes, provenance K-740 (*L. collensi*) was found better for forage production, since it was resistant to psyllid bug, which is detrimental for *Leucaena* based forage production system.

Key words: *Leucaena*, MPT, psyllid bug, timber, fuel, forage.

Leucaena leucocephala is a versatile, fast growing and nitrogen fixing tree species. It provides palatable nutritious fodder, fuel wood and timber. It is a plant of the tropics and subtropics, growing up to an elevation of 1500 m, and it can withstand large variations in rainfall, temperature, wind and drought. *Leucaena* has been identified as the most appropriate tree species for shallow black soils of northern dry zone of Karnataka (Devaranavadgi and Murthy, 1995) for both wood and forage production systems.

Studies on screening of *Leucaena* genotypes for higher wood production and psyllid resistant forage types are meagre in semi-arid conditions of northern dry zone of Karnataka. Therefore, two separate field studies were initiated during the year 1990 and 1992, at Regional Research Station, Bijapur. The first study was made to identify *Leucaena* genotypes which can yield higher woody biomass. The second study was aimed at identifying psyllid-resistant the forage yielding genotypes.

Materials and Methods

The first experiment was laid out in randomised block design with three replications during July 1990, having eight genotypes planted in each pit (1 cu. ft.). In each replication, each species was represented by 25 plants, planted at a spacing of 2 x 2 m in five rows, of which only the middle 9 plants were used for recording observations. Plant height and diameter at breast height (DBH) were recorded at the end of 5 years. These parameters were further used to calculate wood volume by using Huber's formula (Avery and Burkhart, 1983) and average annual increment $V = r^2 h \times 0.8$

Table 1. Performance of different Leucaena leucocephala genotypes for minor timber purpose (Age: 5 years)

Genotype	Plant height (m)	DBH (cm)	Wood vol. (m^3 ha^{-1})	Average wood vol. (m^3 ha^{-1} $year^{-1}$)
K 8 •	6.22	7.27	68.91	13.78
J 7 (Jhansi 7)	6.97	6.47	57.49	11.50
K 67	6.70	6.10	48.97	9.79
K 28	7.38	6.17	55.37	11.07
K 500	6.27	6.10	45.83	9.16
K 29	6.45	6.03	46.29	9.26
K 409	7.46	6.13	55.25	11.05
K 636	8.95	10.27	185.79	37.16
SEm±	0.351	0.629	–	–
CD 5% (P = 0.05)	1.064	1.918	–	–

where,

V = wood volume,
r = radius recorded at 1.3 m height,
h = height of the tree, 0.8 = form of quotient.

Another experiment was conducted to study the forage yielding ability and resistance to psyllid bug of *Leucaena* genotypes. The experiment was laid out in July 1992, in randomised block design with three replications having ten *Leucaena* genotypes planted at a spacing of 90 x 30 cm. The coppice shoots were harvested at 15 cm height, thrice a year at an interval of 60 days starting from August to January. The reaction of *Leucaena* genotypes to psyllid bug was assessed by using damage grade index at 0-5 scale, where, 0 represent resistant and 5 represent highly susceptible.

The soils of the experimental site were analysed for various physico-chemical properties. The results are as follows: sand 25%, silt 23%, clay 52%, bulk density 1.43 g/cc, pH 8.5, EC 0.35 dS m^{-1}, $CaCO_3$ 18.5% and soil depth 30-35 cm. The average rainfall of the site is 585 mm with 39 rainy days.

Results and Discussion

Among the eight genotypes tested for minor timber purpose, the highest plant height (Table 1) was recorded in K 636 (8.95 m), followed by K 409 (7.46 m) and K 28 (7.38). Guled *et al.* (1996) reported that on marginal spoils at Bijapur a plant height of 8.21 m with a rotation of six years was obtained for genotype K 8. Similarly, Gupta (1993) reported that on marginal sites at Dehradun plant height of 7.4 m was obtained in K 8 genotype with 66 months' rotation. Diameter at breast height (DBH) was the highest (10.27 cm) in genotype K 636, followed by K 8 (7.27 cm) and Jhansi 7 (6.47 cm). The lowest DBH was recorded in K 29 (6.03 cm).

The data on total woody biomass production after five years (Table 1) revealed that genotype K 636 had produced 185.79 m^3, followed by K 8 (68.91 m^3) and J-7 (57.49 m^3). According to Gupta (1993), 18.75-23.75 m^3 of average annual wood can be harvested from *Leucaena* on marginal sites with 6-8 years rotation. At Bijapur on marginal soils, 102.50 m^3 wood was

Table 2. Forage yielding ability of different Leucaena genotypes for 3 years

Genotypes	Forage yield (q ha^{-1})			Reaction of *Leucaena* genotype against *H. cubana*		
	1993	1994	1995	1994	1995	Mean
K 8 (*L. leucocephala*)	12.49	57.99	85.72	3.27	1.67	2.47
K 28 (*L. leucocephala*)	20.81	58.89	129.54	3.60	1.67	2.67
K 67 (*L. leucocephala*)	17.03	51.29	99.03	3.27	1.27	2.27
K 636 (*L. leucocephala*)	21.78	41.68	143.83	2.93	1.40	2.70
K 740 (*L. collensi*)	24.19	64.13	171.55	0.00	0.00	0.00
CPI-33820 (*L. diversifolia*)	10.64	53.53	119.66	2.07	0.47	1.27
52/87 (*L. esculanta*)	17.91	37.16	129.06	0.07	0.60	0.34
K 815 (*L. pallida*)	22.17	63.67	173.61	0.00	0.83	0.42
Hy K X 1 Comp 88a	23.81	59.69	136.07	0.57	0.53	0.40
Hy K X 2 Comp 88a	16.46	50.26	150.36	0.00	0.60	0.30
SEm±	0.61	1.47	6.00	0.25	0.13	–
CD P = 0.05	1.82	4.63	13.45	0.72	0.38	–

*DGI (0-5 scale).

harvested with 6 year rotation (Guled *et al.*, 1996).

Considering all these parameters, it may be inferred that *Leucaena* genotype, K 636, is the most promising to grow on shallow black soils of northern dry zone of Karnataka, for minor timber purpose. It also has added advantages like less seed producing nature (to check weed menace of *Leucaena* in adjacent fields), moderate resistance to psyllid bug (Table 2) and higher quotient (0.82).

Psyllid bug (*Heterospylla cubana*) has become a serious threat for cultivation of *Leucaena* in forage production systems. Therefore, 10 *Leucaena* genotypes, either resistant or tolerant (Devaranavadgi *et al.*, 1996), along with recommended genotypes, were evaluated for their forage yielding ability. The data (Table 2) revealed that highest forage production was obtained in genotype K 740 in all the three years, as compared to all other genotypes. However, during third year, K 815 had the higher forage production. The potential forage yield of recommended *Leucaena* genotypes (K 8, K 28, K 67) was 80-100 t ha^{-1} $year^{-1}$ (Anonymous, 1992).

The psyllid bug had devastating effects on forage yielding ability of all the recommended *Leucaena* genotypes. The genotype K 740 is resistant to psyllid bug (Table 2), exhibiting no DGI at 0-5 scale during 1994 and 1995. The forage yield in K 740 was the highest, which might be due to its resistance to psyllid bug. Though *L. collensii* and *L. pallida* are slow growing species, in the present experimentation they recorded higher forage yield due to their resistance/tolerance to psyllid bug, which was found to be severe on other genotypes. Therefore, genotype K 740 can be grown in shallow black soils of northern dry zone of Karnataka for forage production. Further, K 740 genotype (*Leucaena collensi*) can be used in breeding programme for

developing psyllid-resistant and high yielding *Leucaena* forage.

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