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RESEARCH ARTICLE

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Evaluation of Subabul *(Leucaena leucocephala)* genotypes for shallow vertisols of northern dry zone of Karnataka

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ABSTRACT

The field experiment was carriedout at Regional Agricultural Research Station, Bijapur (Karnataka) during 1999 to 2009 to evaluate the subabul *(Leucaena leucocephala)* genotypes for shallow vertisols of northern dry zone of Karnataka. Results of study indicated that, among eight subabul genotypes, S-10 recorded higher tree height (10.09 m) and diameter at breast height (10.15 cm) which were at par with K-636 and S-24. The lower values were produce by genotype K-29. The data on total woody biomass production of three years revealed that genotype S-10 produced highest total woody biomass in all the three year (8, 9 and 10th year of plantation) as compared to all other genotypes followed by K-636 and S-24. Hence, considering all these parameters, it may be inferred that Leucaena genotype, S-10, was the most promising to grow in shallow black soils of northern dry zone of Karnataka for minor timber purpose.

KEY WORDS : Quotient, Subabul genotypes, Vertisols, Wood volume

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INTRODUCTION

Subabul [*Leucaena leucocephala* (L.) dewit] is a miracle tree with a wide assortment of cultivars for different uses like forage, timber, wind break, nitrogen fixing multipurpose tree recommended for shallow marginal Vertisols. Subabul has been introduced in India during seventies mainly as an agroforestry crop to meet the increasing demand for fuel, fodder and timber for poles and posts. Subabul is known for its fast growing rate. It can be grown in variety of soils and climatic conditions due to its tolerance to high temperature and extended drought and remarkable regenerative capacity. The northern dry zone of Karnataka is characterized by hostile environment conditions like low and erotic rainfall, intense solar radiation and poor fertility status of the soil. Therefore, cultivation of field crops in the shallow black soil is uneconomical and it has become necessary to adopt alternative land use systems in such soils. Now it is an established fact that the cultivation of arboreal crops in place of aerial crops is appropriate, particularly nitrogen fixing tree species like subabul are preferred. Considering all these factors, an experiment was conducted to identify the fast growing and high wood yielding subabul genotypes.

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MATERIALS AND METHODS

The field experiment was carried out at Regional Agricultural Research Station, Bijapur (Karnataka) during 1999 to 2009. The soils of the experimental site were analyzed for various physico-chemical properties *viz.,* Sand 25%, Silt 23%, Clay 52%, bulk density 1.43 g/cc, pH- 8.5, EC- 0.34 dSm^{-1}, $CaCO_3$ 18.5% and soil depth 30-35 cm. The average rainfall of the site is 585 mm with 39 rainy days.

The experiment was laid out in Randomized Block Design with three replications during July 1999, having eight genotypes *viz.,* K-8, K-28, K-29, K-67, K-409, K-636, S-10 and S-24 planted in pit (1 cu. ft). In each replication the treatment was represented by 25 plants of same species. Plantation was done with spacing of 2 x 2 m in five rows, of which only the middle 9 plants were used for recording various observations, *viz.,* tree height (m), clear bole height (m), diameter at breast height (DBH)(cm) and crown spread (m) which were recorded in the last three years by using standard techniques and the at the end of 10th year (2009) for interpreting results. The total height of the tree was measured from the base of the tree upto the top of the main stem by using marked pole and expressed in meters. The collar diameter measured by marking plant at 0.5 m from ground level with white paint and measurements were made by using tree calipers and expressed in centimeter *i.e.,* known as diameter at breast height (DBH). The collar diameter at base was avoided because of swelling caused by wind pressure on plants in field condition. The clear bole height was measured from ground level upto the point where stem is free from branches by using marked pole and expressed in meters. The crown spread of seedlings in North-South and East-West directions was measured and expressed in meter. The data recorded on various characters during the course of investigation were subjected to Fisher's method of analysis of variance and interpretation of data was made as per the procedure given by Gomez and Gomez (1984).

These parameter were further used to calculate wood volume by using Huber's formula (Avery and Burkhart, 1983) and average annual increment $V = \pi r^2 h \times 0.8$.

where, V = Wood volume

$\pi = 22/7$

r = radius recorded at 1.3 m height

h = height of the tree,

0.8 = for of Quotient

Wood Volume (m^3 ha^{-1}) = $\pi r^2 h \times 0.8 \times 2500$

2500 number of plants per ha, by 2 x 2 m spacing

Number of plants/ha. = 10000/2x2 = 2500

RESULTS AND DISCUSSION

The data on tree height (m), diameter at breast height (cm), clear bole height (m) and crown spread of ten year old trees are presented in Table 1. The genotype S-10 recorded the highest tree height (10.09 m), diameter at breast height (10.15 cm), clear bole height (3.85 m) and crown spread (E-W: 3.02 m, N-S: 3.01m) followed K-636 (9.96 m, 10.04 cm, 3.34 m and E-W: 2.87 m, N-S: 2.92 m, respectively) and S-24 (9.91 m, 10.02 cm, 3.30 m and E-W: 2.91 m, N-S: 2.93 m, respectively). The lowest values were observed in genotype K-29. Guled *et al.* (1996) reported that on marginal soils at Bijapur a plant height of 8.21 m with a rotation of six years was obtained for genotypes K-8. Similarly, Gupta (1993) reported that on marginal sites at Dehradun the plant height of 7.4m was obtained in K-8 genotypes with 66 month's rotation.

The data on total woody biomass production of three years (Table 2) revealed that genotype S-10 had produced

Table 1: Silvicultural parameters of subabul genotypes (Age:10 years)

Genotypes	Tree height (m)	Clear bole height (m)	DBH (cm)	Crown spread (m)	
				E-W	N-S
K-8	9.47	3.52	8.99	2.88	2.93
K-28	9.17	2.76	8.24	2.60	2.66
K-29	7.57	2.32	5.82	2.76	2.75
K-67	8.47	2.78	7.39	2.50	2.57
K-409	9.18	3.27	7.59	2.93	2.97
K-636	9.96	3.34	10.04	2.87	2.92
S-10	10.09	3.85	10.15	3.02	3.01
S-24	9.91	3.30	10.02	2.91	2.93
S.E.±	0.25	0.17	0.25	0.09	0.09
C.D. (P=0.05)	0.76	0.53	0.77	0.26	0.27

Table 2: Wood yielding ability of subabul genotypes for three years

Genotypes	Wood yield (m^3 ha^{-1})			Average wood yield (m^3 ha^{-1} $year^{-1}$)		
	08th Year	09th Year	10th Year	08th Year	09th Year	10th Year
K-8	73.00	105.32	120.16	9.13	11.70	12.02
K-28	51.69	85.30	97.75	6.46	9.48	9.78
K-29	24.42	33.60	40.26	3.05	3.73	4.03
K-67	36.89	62.84	72.62	4.61	6.98	7.26
K-409	53.82	72.79	83.03	6.73	8.09	8.30
K-636	73.27	118.80	157.63	9.16	13.20	15.76
S-10	91.11	123.67	163.20	11.39	13.74	16.32
S-24	67.71	117.60	156.21	8.46	13.07	15.62

91.11 m^3 ha^{-1}, 123.67 m^3 ha^{-1} and 163.20 m^3 ha^{-1} in all the three years *i.e.*, 8, 9 and 10^{th} year of planting, respectively, followed by K-636 and S-24. The average yield of wood was increased as the years of planting increased in all the eight genotypes but the genotype S-10 was obtained highest annual average wood yield of 11.39, 13.74 and 16.32 m^3 ha^{-1} $year^{-1}$ in all three years *i.e.*, 8, 9 and 10^{th} year of planting followed by K-636 and S-24. According to Gupta (1993), 18.75-23.75 m^3 of average annual wood can be harvest from *Leucaena* on marginal site with 6-8 year rotation. At Bijapur on marginal soils 102.50 m^3 wood was harvested with 6 year rotation (Guled *et al.,* 1996).

Considering the all these parameters, it may be inferred that the subabul genotypes, S-10, is the most promising to grow on shallow vertisols of northern dry zone of Karnataka for minor timber purpose.

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