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Suitability for live standards for betelvine cultivation under northern dry zone of Karnataka

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Abstract : A field experiment was conducted to evaluate the growth performance of eight different live standards and to assess their suitability for the cultivation of betelvine under open system of cultivation during 2006-07. The experiment was laid out in a randomized block design replicated thrice. Live standards differed significantly for tree height, basal girth, dbh, crown size and leaf area index one year after planting. Live standards, viz., *Melia azadirach*, *Sesbania grandiflora*, *Moringa oleifera* and *Milingtonia hortensis* were promising with vigorous growth. *Melia azadirach* recorded the highest plant height of 5.13 m followed by *Ceiba pentandra* (4.83 m) *Sesbania grandiflora* (4.56 m) compared to the lowest in *Erythrina indica* (1.09 m) at 13 months after planting.

Key words : Live standards, Microclimate, *Sesbania grandiflora*, Betelvine cv. AMBADI

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Betelvine is a delicate plant and requires shade and support for the growth of vine in open system of cultivation. Commonly used live standard for betelvine cultivation are *Erythrina* spp., *Sesbania grandiflora*, *Melia azadirach*, *Ceiba pentandra*, etc. During recent years, the popular live standards *Erythrina indica* is attacked by gall midge and growers in Northern dry zone of Karnataka are in search of alternative standards. Live standards for the cultivation of betelvine should be quick growing with rough bark. The canopy of shade trees having smaller leaves allowing filtered light in the plantation is well suited (Chourasia and Singh, 2001). It should withstand periodical lopping of branches for shade regulation. Shade trees suitable for betelvine cultivation under deferent agro-climatic conditions are varied.

Betelvine is cultivated under partially shaded humid micro-climatic conditions. Intensity of light in the plantation is regulated by periodical lopping of branches. Under northern dry zone of Karnataka shade is regulated just before the commencement of monsoon (May-June) by lopping the branches of live standards for optimum growth of vine. Height of live standards is also restricted by cutting the trees at four

to five meter height. Suitability of live standards under a given agro-climatic condition depends on its growth habit, bark feature and pest and disease incidence.

RESEARCH METHODS

The study was conducted at Kittur Rani Channamma College of Horticulture, Arabhavi, Gokak (Tq.), Karnataka during 2006-07. Eight different live standards were collected from betelvine growing areas of northern dry zone of Karnataka. The experiment was laid out in a Randomized Block Design replicated thrice. The trees were planted in 1.5 m rows and plant to plant spacing within row was 0.5 m. After 45 days of planting of live standards, betelvine cv. AMBADI was planted at the base of the tree. The observations were recorded on five selected treatments per replication on growth parameters, viz., plant height, basal grith, dbh, crown size, LAI, etc. Observations were also recorded on performance of betelvine on different live standards and light intensity, temperature and relative humidity under the plantation microclimate of different live standards.

RESEARCH FINDINGS AND DISCUSSION

In the present investigation, the growth performance of different live standards during second year of growth was recorded just before first lopping (13 months after planting) is presented in Table 1. There was significant differences in plant height, basal girth, dbh, crown size and leaf area index (Table 1). The live standards *Melia azadirach* was vigorous in growth indicated by higher plant height of 5.13 m followed by *Ceiba pentandra* (4.83m) compared to the lowest in *Erythrina indica* (1.09m). Higher plant height in standard *Melia azadirach* may be attributed to its vigorous growth, indicating its suitability for cultivation under northern dry zone of Karnataka. Variation in the tree height among live standards was also reported by earlier worker (Bhagat *et al.*, 1992) in tree species like *Ceiba pentandra*, *Gliricidia sepium* and *Erythrina indica* under Dapoli (Maharashtra) conditions. Significantly higher diameter at breast height (dbh) was recorded by *Sesbania grandiflora* (155.53 mm) followed by *Moringa oleifera*

(124.77 mm) and *Gliricidia sepium* (111.83 mm) compared to the lowest in *Millingtonia hortensis* (97.30 mm). There was considerable variation among different species of live standards for the spread of canopy (both North-South and East-West) leading to variation in crown size. Higher crown size was observed in *Sesbania grandiflora* (4.50 m), *Moringa oleigera* (4.15 m) and *Ceiba pentandra* (3.83 m). The popular live standard *Erythrina indica* recorded minimum crown size due to severe and continuous incidence of gall midge (*Aleurodidus* spp.) insect. Variation in crown size among different species of live standards indicated genetic variation and its suitability for northern dry zone of Karnataka. Similar variation in crown size was reported by Thakur and Kaur (2001) in *Melia azadirach* under Solan conditions.

The highest leaf area index was obtained in the standard *Melia azadirach* (69.00) compared to the lowest in *Erythrina indica* (3.00). Similar variation in leaf area was also reported by Mukesh and Suraj (2001) in *Sesbania sesban* under Kanpur conditions.

Table 1 : Growth performance of different live standards before lopping

Sr. No.	Live standards	Plant height (m)	Basal girth (cm)	Dbh (mm)	Crown size (m)	Leaf area index
1.	<i>Ceiba pentandra</i>	4.83	25.05	112.32	3.83	23.50
2.	<i>Erythrina indica</i>	1.09	12.39	0.00	1.46	3.00
3.	<i>Gliricidia sepium</i>	4.46	18.08	111.83	3.48	24.00
4.	<i>Jatropha curcus</i>	3.03	22.78	99.14	2.18	13.75
5.	<i>Melia azadirach</i>	5.13	21.22	113.47	3.07	69.00
6.	<i>Millingtonia hortensis</i>	4.41	21.58	97.30	3.80	19.44
7.	<i>Moringa oleifera</i>	3.40	24.35	124.77	4.15	30.81
8.	<i>Sesbania grandiflora</i>	4.56	29.04	155.53	4.55	18.26
	Mean	3.86	21.81	101.80	3.28	25.25
	S.E.±	0.229	0.570	6.183	0.057	1.544
	C.D. (P=0.05)	0.69	1.73	18.75	0.17	4.68
	CV (%)	10.28	4.53	10.52	3.01	10.59

Table 2 : Microclimate (Light, temperature and relative humidity) under the shade of different live standards and infestation of major pests on live standards

Sr. No.	Live standards	Canopy gap	Diffuse light	Mean of Jan-07 to Apr-07 (Temp. ⁰ C)	Mean of Jan-07 to Apr-07 (R.H.%)	Pest name	Per cent of infestation
1.	<i>Ceiba pentandra</i>	21900 (66.83)	9.53 (2.89)	34.84	46.3	-	-
2.	<i>Erythrina indica</i>	25900 (78.16)	1411 (4.31)	34.93	46.1	Gall midge	100
3.	<i>Gliricidia sepium</i>	22512 (69.03)	1169 (3.55)	34.60	46.3	Aphids	40
4.	<i>Jatropha curcus</i>	22483 (68.94)	1398 (4.33)	34.20	47.0	-	-
5.	<i>Melia azadirach</i>	21600 (65.87)	1117 (3.39)	32.20	45.74	-	-
6.	<i>Millingtonia hortensis</i>	21675 (66.04)	1199 (3.65)	34.60	46.79	-	-
7.	<i>Moringa oleifera</i>	21016 (78.46)	1520 (4.59)	33.20	45.8	Shot hole borer	30
8.	<i>Sesbania grandiflora</i>	23029 (70.53)	1187 (3.61)	32.40	46.0	Shot hole borer	40
	Mean	32603		36.6	46.5		

The performance of betelvine cv. AMBADI on different live standards at three months after lowering also differed significantly (Table 3). Among the eight live standards, betelvine trailed on *Sesbania grandiflora* recorded maximum number of clinging nodes to the live standard (16.33) followed by vines trailed on *Moringa oleifera* (13.00) and *Melia azadirach* (12.67) compared to the lowest observed in the vines trailed on *Ceiba pentandra* (5.00). The highest number of clinging roots per node was noticed in betelvine cv. Ambadi trailed on *Melia azadirach* (13.33) followed by *Sesbania grandiflora* (10.33) and *Millingtonia hortensis* (9.00) compared to the lowest recorded by vines grown on *Ceiba pentandra* (5.00). The betelvine cv. AMBADI recorded maximum vine height on the stem of *Sesbania grandiflora* (2.50 m) followed by *Moringa oleifera* (2.25 m) and *Melia azadirach* (2.10 m) compared to minimum in *Erythrina indica* (0.85 m).

Leaf yield was maximum in vines trailed on *Sesbania grandiflora* (150 leaves/ vine) followed by *Moringa oleifera* (120 leaves/vine) which was significantly higher than vines trailed on other trees. The yield was lowest (35 leaves / vine) in vines trailed on *Erythrina indica*. Rough bark will help for better clinging of roots to the live standard and gradually increases number of nodes cling to the standard. Bark of stem was rough in shade trees, viz., *Sesbania grandiflora*, *Moringa oleifera* and *Millingtonia hortensis*. The increase in height of vine on *Sesbania grandiflora* and *Moringa oleifera* is attributed to congenial features of stem of these trees for climbing of vine as indicated by the production of nodes and adventitious roots. Similar variations were also observed by Korikanthimath and Gowda (1999), Kurian *et al.* (1985) and Mathew *et al.* (1996).

Microclimatic observations with regard to intensity

of light, temperature and relative humidity is presented in Table 2. The highest light intensity among the different live standards under canopy gap (sun fleck) was observed in *Erythria indica* (78.46%) followed by *Moringa oleifera* (78.16%) compared to the lowest in *Melia azadirach* (65.87%). However, higher intensity under different light was recorded under the canopy of *Moringa oleifera* (4.59%) and *Jatropha curcus* (4.33%) compared to the lowest recorded under *Ceiba pentandra* (2.89%). Higher intensity of light under the microclimate of *Erythrina indica* is attributed to its lower crown size due to severe infestation of gall midge (Table 2). The highest plantation mean temperature was recorded in the microclimate created due to *E. indica* (34.93°C) followed by *Ceiba pentandra* (34.84°C) compared to the lowest observed under *Sesbania grandiflora* (32.40°C). Higher mean temperature under the canopy of *E. indica* is attributed to its poor growth indicated by plant height, canopy spread and crown size (Table 3). Similar variations in temperature were reported by Nair and Balakrishnan (1976).

Relative humidity of the plantation microclimate at noon was highest under the shade of *Jatropha curcus* (47.00%) followed by *Millingtonia Hortensis* (46.79%) compared to the lowest recorded in *Melia azadirach* (45.74%). Similar variation in relative humidity was reported by Joseph (1962).

In the present investigation, there was several pests infested in different live standards, viz., aphids, gall midge and shot-hole borer, inhibiting the growth of live standards. However, the damage caused by aphid and shot-hole borer did not affect the growth performance of betelvine. Infestation of gall midge insect on *E. indica* was continuous and severe. In the present study also, all the *Erythrina indica* standards were infested with gall midge throughout the year restricting the growth. Remadevi and

Table 3 : Performance of betelvine cv. AMBADI on different live standards at three months after first lowering

Sr. No.	Live standards	Number of nodes clinging to the standard	Number of clinging roots per node	Vine length (m)	Leaves per vine
1.	<i>Ceiba pentandra</i>	5.00	5.33	1.50	45
2.	<i>Erythrina indica</i>	5.33	6.00	0.85	35
3.	<i>Gliricidia sepium</i>	12.00	6.33	1.95	60
4.	<i>Jatropha curcus</i>	6.33	7.00	1.25	50
5.	<i>Melia azadirach</i>	12.67	13.33	2.10	75
6.	<i>Millingtonia hortensis</i>	11.00	9.00	2.00	90
7.	<i>Moringa oleifera</i>	13.00	8.33	2.25	120
8.	<i>Sesbania grandiflora</i>	16.33	10.33	2.50	150
	Mean	10.21	8.21	1.80	
	S.E.±	0.825	0.827	0.165	
	C.D. (P=0.05)	2.50	2.51	0.50	
	CV *%	13.99	17.45	15.85	

Sundararaj (2005) also reported infestation of *Helopeltis antunii* on *Melia azadirach* under Chitradurga and Tumkur (Karnataka) conditions.

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