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Growth and productivity of different *Eucalyptus* species on degraded land

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Abstract : The present investigation was carried out to assess the growth and productivity of Eucalyptus species on degraded land from 2003 to 2010 at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad under rainfed conditions. The experiment consisted of five eucalyptus species *viz., Eucalyptus tereticornis, E. hybrid, E. grandis, E. pelleta and E. Dandeli* clones planted at 2 x 2 m spacing in randomized block design with four replications. At the end of study, growth parameters *viz.,* height, current annual increment (CAI) in height, diameter at breast height and CAI in DBH and MAI in height and dbh were significantly higher in *E. hybrid* and *E. tereticornis* as compared to *E. pelleta*. The volume was higher in *E. hybrid* and *E. tereticornis* as compared to *E. pelleta.*

Key words: Current annual increment, Commercial Plantation, Degraded land, Mean annual increment, Productivity

Introduction

The demand of wood from forest or commercial plantation for timber, fuel wood, pulp and paper production is increasing each year at an alarming rate. Therefore, there is an urgent need for improvement in production of forest resources to meet the needs of fuelwood, timber and wood production on a sustainable basis and increase biomass yield from farm forestry plantations. *Eucalyptus* is widely planted in farm forestry system throughout the world more particularly in India to provide wood products in region of scarcity. In India alone more than one million hectare area is under *Eucalyptus* plantation which are bound to increase in the next few decades in view of the demand of the wood (Turnbull, 1999). *Eucalyptus*, one of few trees which due to its astonishing growth characteristics are capable of reducing wide gap between demand and production of wood in shortest possible time (Chandra and Yadava, 1986). The species provide ample scope for genetic improvement due to wide geographic distribution and natural occurrence of variation. In view of the present study was carried out with an objective to assess the growth and productivity of different species of *Eucalyptus* on poor and degraded soils.

Material and methods

The present experiment was conducted to assess the productivity of *Eucalyptus* species on degraded soil at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad from 2002. The area lies between 15^0 27" N latitude and 76^0 46" E longitude and at an altitude of 678 m above mean sea level. Average mean monthly maximum and minimum temperatures during the study period were 30.8 ^{0}C and 16.98 ^{0}C respectively. Average rainfall of 780 mm was received in 56.4 rainy days during the months of June, July, August, Sept and October. The experiment consisted of five species. *viz E. teriticornis,. E. hybrid grandis, E. grandis, E. pelleta, and E. Dandeli* clones.

Eucalyptus seedlings used for planting were raised from the vegetative means in the Forestry Nursery in the University. The seedlings were planted at 2 x 2 m. The each treatment consisted of 16 trees and was laid out in randomized block design with four replecations. The soil is red with 40 cm depth and limits for cultivation of field crops. The soil is having 6.2 pH and EC 3.41 m.moles/cc NPK content was 172, 18.2, 164 kg/ha respectively. The current annual increment (CAI) and mean annual increment (MAI) and Mean annual increment (MAI) of each species were calculated using all the growth parameter at the end of 6 years. A fertilizer doze of 40: 40: 40 N: $P_2 0_5$: K_2O kg/ha was applied at onset of monsoon for initial 3 years of planting. The soil working and cutting of bushes and shrubs was done regularly before the onset of monsoon.

Results and discussion

Height of eucalyptus differed significantly among different *Eucalyptus* species. *E. hybrid* recorded significantly higher height (11.25 m) followed by *E. grandis* (10.90m) and *Eucalyptus tereticornis* (10.35 m) (Table 1) Lowest height was recorded in *E. pelleta* (9.10 m). Height increment was significantly higher in *E. hybrid* followed by *E. tereticornis* and *E. grandis* throughout the growing season (Table 3). The maximum height increments of 2.36 and 2.18 m were observed during 2005 in *E. teriticornis*

Table 1. Height (m) of different *Eucalyptus* species from 2003 to 2010

	Height (m)							
	Year							
Species	2003	2004	2005	2006	2007	2008	2009	2010
Eucalyptus tereticornis	1.02	2.02	4.38	5.64	7.44	8.75	9.80	10.35
Eucalyptus hybrid	1.08	2.60	4.64	5.34	7.52	8.85	9.70	11.25
Eucalyptus grandis	1.33	1.85	3.85	5.86	6.20	7.35	8.80	10.90
Eucalyptus pelleta	1.13	1.75	3.86	5.20	6.80	7.10	8.40	9.10
Eucalyptus Dandeli clone	0.87	2.38	4.69	6.10	8.70	7.85	8.35	9.20
C.D. @ 5 %	0.21	0.64	0.73	0.67	1.43	0.93	1.16	1.27

Table 2. Diameter at breast height (DBH) of different *Eucalyptus* species as influenced by different species

	DBH (cm)							
	Year							
Species	2003	2004	2005	2006	2007	2008	2009	2010
Eucalyptus tereticornis	0.93	2.77	6.07	10.82	13.60	15.20	16.80	18.60
Eucalyptus hybrid	0.94	2.78	7.60	12.64	15.80	16.10	18.70	20.18
Eucalyptus grandis	1.13	2.00	5.20	8.40	11.23	12.80	14.10	15.28
Eucalyptus pelleta	0.90	2.22	3.70	5.28	7.80	9.40	10.20	12.14
Eucalyptus Dandeli clone	0.74	2.64	3.26	5.30	6.68	8.10	9.20	10.86
C.D. @ 5%	0.23	0.28	0.86	1.95	2.75	2.84	2.76	2.92

Table 3. Increment in height and diameter at breast height of different *Eucalyptus* species during 2003 to 2010

Eucalyptus species	Current Annual Increment of height (m)								MAI	Current Annual Increment of DBH (cm)								MAI
	2003	2004	2005	2006	2007	2008	2009	2010		2003	2004	2005	2006	2007	2008	2009	2010	
E. tereticornis	1.02	1.00	2.36	1.26	1.80	1.31	1.05	0.55	1.29	0.93	1.84	3.30	4.75	2.78	1.60	1.60	1.80	2.33
E. hybrid	1.08	1.52	2.04	0.70	2.18	1.33	0.85	1.55	1.41	0.94	1.84	4.82	5.04	3.16	0.30	2.60	1.48	2.52
E. grandis	1.33	0.52	2.00	2.01	0.34	1.15	1.45	2.10	1.36	1.13	0.87	3.20	3.20	2.83	1.57	1.30	1.18	1.91
E. pelleta	1.13	0.62	2.11	1.34	1.60	0.30	1.30	0.70	1.14	0.90	1.32	1.48	1.58	2.52	1.60	0.80	1.94	1.52
E.Dandeli clone	0.87	1.51	2.31	1.41	2.60	0.85	0.50	0.85	1.15	0.74	1.90	0.62	2.04	1.38	1.42	1.10	1.66	1.36
C.D. @ 5%	0.22	0.67	0.24	0.58	0.68	0.27	0.28	0.67	0.07	NS	0.42	1.61	1.84	1.52	0.63	1.08	0.54	0.21

and *E. hybrid* respectively. Lowest height increment was observed in *E. pelleta* and *E. Dandeli* clones. Mean annual increment was significantly higher in *E. hybrid* and *E. grandis* as compared to other tree species. *E. hybrid* recorded significantly higher DBH (20.18 cm) followed by *E. tereticornis* (18.60 cm) and lowest diameter was observed in *E. pelleta* (12.14 cm) and *E. Dandeli* clone (10.86 cm) (Table 2). Current annual increment in dbh was significantly higher in *E. tereticornis* and *E. hybrid* and lowest was observed in *E. pelleta*. Mean annual increment in DBH was significantly higher in *E. tereticornis* (2.33 cm) and *E. hybrid* (2.52 cm) as compared to *E. Dandeli* clone (1.36 cm). (Table 3)

Similarly significant differences in different *Eucalyptus* species have been reported by various workers. Lal (2005) conducted a study to assess the comparative growth performance of various *Eucalyptus* species. Kumar and Bangawa (2006) observed significant differences for growth attributes among seven species of *Eucalyptus* species. Maximum MAI for diameter at breast height was recorded in *E. tereticornis* and *E. hybrid*. (Different morphological parameters *viz.*, total height, diameter at breast height and clear bole height were assigned the scares to work out the average index score to serve as performance indicators of different species).

Among the *Eucalyptus* species maximum variation was observed in *Eucalyptus* tereticornis for all the characters under this study. Significantly higher values were observed in current annual increment of total height, clear bole height and diameter increment in *E. tereticornis* and *E. hybrid*. These results are in confirmation with results of R. Kumar *et al.* (2010), Gomes and Correia (1995) and Kumar and Bangarwa (2006).

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