

PROSPECTS OF *ACACIA MANGIUM* FOR AFFORESTATION IN BANGLADESH

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Abstract

Acacia mangium is a fast-growing tree species of the family Leguminosae. In the Forest Research Institute campus, Chittagong, 80 seedlings were planted in 1979. At the age of 4½ years the trees attained an average height of 10.3 m with 10.4 cm diameter at breast height. The growth rate is comparable to that of *Eucalyptus camaldulensis* and better than that of *Pinus caribaea* and *Swietenia macrophylla* which were planted simultaneously. The species, therefore, shows great promise for afforestation in Bangladesh and further trial plantations may be raised to study its growth and performance in this country and elsewhere and for raising seed-stands and ultimately Seed-Orchards as a source of seed supply for further plantation programmes.

Introduction

Mangium (*Acacia mangium* Wild.) is a fast growing tree species of the family Leguminosae, sub-family Mimosodeae. The species is indigenous to northern Australia, New Guinea and Eastern Indonesia. It grows as tall as 30 m with a straight bole and stem diameter upto 0.90 m at its natural habitat. Mangium is a multipurpose species suitable for timber, molding, furniture, veneer, firewood, charcoal, pulp and particle board. This species is reported to be doing well in sungrass infested and nutrient deficit areas in several countries (1, 2). An attempt was, therefore, made to investigate the adaptability and response of the species to Bangladesh site conditions.

Materials and Methods

A batch of mangium seed was received from Australia in 1978 and seedlings were raised in 1979 at Forest Research Institute, Chittagong. Fifty six seedlings were planted in a block by the side of Silvicultural Research nursery and 24 seedlings were planted along with *Eucalyptus camaldulensis*, *Pinus caribaea* var. *hondurensis* and *Swietenia macrophylla* on the approach road of Forest Research Institute. Seedling were again raised in 1980 from the seed lot of 1978 and also from a new batch of seeds in 1983, as also from locally collected seeds from 1979 plantation at Forest Research Institute campus. Small scale block plantations of *Acacia mangium*, covering 1.33-6.03 hectares of area were raised (Table-1). The experiment was replicated at 7 (seven) different sites including four major Research Stations, 2 sub-stations

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and Forest Research Institute. For comparison, growth data were collected from block plantations of *Eucalyptus camaldulensis*, *E. tereticornis*, *Pinus caribaea*, *Swietenia macrophylla*, *Gmelina arborea*, *Gassia siamea*, *Acacia auriculiformis* as given in table-3. The area of block plantations were 2-4 hectares for each species. The spacing used was 2.44m x 2.44m i.e. 1700 seedlings per hectare for each species and similar treatments were given to all the plantations.

Table 1.

Acacia mangium plantation at different Silvicultural Research Station and sub-stations.

Location	Area of plantation in hectare	Remarks
	1980-84	
Charkai	2.02	Sungrass infested area with prolonged draught period.
Charaljani	3.22	Sungrass infested and comparatively moist area.
Keochia	6.03	poor site with top-soil removed.
Lawachara	4.02	Comparatively good soil with existing cover crop.
Hazarikhil	3.03	Good and fertile soil with sungrass and other competing weeds.
Hathazari	0.81 0.52(Local seed)	Baren soil with low capability.
Total	19.65	

This work is an attempt to evaluate the response of mangium at various sites and also to compare the growth rates with a few other species. The important features of soils and climatic data of the Stations are given in Table-2.

Table 2.

Shows the configuration, Soil type, Annual rainfall and range of temperature of field Stations (3, 4, 5, 6).

Stations	Configuration	Soil type	Annual rainfall (mm)	Temperature °C (Mean extremes).
Keochia	Strongly dissected	Sandy loam to clay loam	2590	19.7 – 28.1
Lawachara	Isolated low hills	Sandy loam to clay loam	2462	17.5 – 28.5
Charaljani	Broadly dissected level terrace	Sandy clay to clay	2500	17.5 – 29.3
Charkai	Gently undulating terrace	Ditto	1800	17.5 – 30.0

All the trees of this species were measured at Forest Research Institute campus individually. Twenty five trees for each of *E. camaldulensis*, *Swietenia macrophylla* and *Pinus caribaea* were measured at random. The 1980 plantation of mangium at Hathazari was burnt due to accidental fire, leaving only a portion. Fifty trees of the unburnt portion were measured. For comparison, 2–5 random samples of 25 trees were taken for *Gmelina arborea*, *Acacia auriculiformis*, *Cassia siamea*, *Shorea robusta*, *E. camaldulensis*, *E. tereticornis*, *Pinus caribaea* and *Swietenia macrophylla* from each site. From each sample, diameters at breast height (dbh), total height and survival were recorded.

Results and Discussion

Data were summarised to calculate the mean height, mean dbh and survival percentage (Table 3). The ages of the different species were variable and hence to compare all the species together, mean annual increment (MAI) was calculated.

Table 3.

Mean height, mean dbh and survival percentage of some species planted at different Silvicultural Research Stations and sub-stations.

Location	Species	Age* Years	Height (m)		dbh (cm)		Survival Percentage
			Mean	MAI	Mean	MAI	
FRI, CTC.	<i>A. mangium</i>	4.0	10.3	2.6	10.4	2.6	94
	<i>E. camaldulensis</i>	4.0	10.9	2.7	10.8	2.7	—
	<i>P. caribaea</i>	4.0	5.3	1.3	8.6	2.2	—
	<i>S. macrophylla</i>	4.0	3.7	0.9	3.5	0.9	—
Charkai	<i>A. mangium</i>	1.0	1.7	1.7	—	—	92
	<i>E. camaldulensis</i>	1.0	1.9	1.9	—	—	82
	<i>E. tereticornis</i>	1.0	1.8	1.8	—	—	84
	<i>G. arborea</i>	5.0	6.1	1.2	8.3	1.7	54
	<i>C. siamea</i>	5.0	5.0	1.0	3.0	0.6	50
Keochia	<i>A. mangium</i>	1.0	1.7	1.7	—	—	92
	<i>A. auriculiformis</i>	4.0	6.6	1.7	6.7	1.7	47
	<i>S. robusta</i>	15.0	9.4	0.6	12.3	0.8	44
	<i>G. arborea</i>	15.0	4.5	0.3	7.4	0.5	40
Hathazari	<i>A. mangium</i>	4.0	7.8	2.0	9.2	2.3	—
	<i>A. mangium</i> (Local)	1.0	1.3	1.3	—	—	98
	<i>E. camaldulensis</i>	3.0	5.3	1.7	4.3	1.4	78
	<i>P. caribaea</i>	2.0	1.9	1.0	—	—	—
Charaljani	<i>A. mangium</i>	1.0	1.8	1.8	—	—	92
	<i>A. auriculiformis</i>	5.0	6.5	1.3	6.4	1.3	—
	<i>E. camaldulensis</i>	2.0	4.3	2.2	2.8	1.4	73
Lawachara	<i>A. mangium</i>	1.0	1.9	1.9	—	—	96
Hazarikhil	<i>A. mangium</i>	1.0	1.9	1.9	—	—	98

The diameter and height increment of mangium, *E. camaldulensis* and *E. tereticornis* are comparable while faster than those of *P. caribaea*, *A. auriculiformis*, *S. macrophylla*, *C. siamea* and *S. robusta*. But on the basis of survival percentage, mangium is at the top of the list. The survival percentage of mangium varies from 92–98 while the same for *E. camaldulensis* is 73–82 and for other species 24–84. Mangium planted even in sungrass infested areas at

Charkai, Hazarikhill and Charaljani are doing well. Some trees of 1979 plantation started flowering and producing viable seeds since 1982. The growth rate of samplings raised from these local seeds and planted at Hathazari are comparable with those of seedlings raised from imported seeds.

The increment per hectare per year was calculated for the older plantations of *E. camaldulensis*, *A. mangium* and *A. auriculiformis* (Table 4). For estimation of volume, diameter at one meter interval was taken to the top-end diameter of five centimeter. Smallian formula was used for computation of volume. The number of seedlings planted per hectare were not the same. From the table-4, it is apparent that the increment of *mangium* per hectare per year is higher than that of *A. auriculiformis* and *E. camaldulensis*. Though in the strict sense, these are not comparable since the sites were different.

Table 4.

Mean Annual Increments of at different ages for mangium and other species.

Station	Species	Age in Years	MAI $\text{m}^3 \text{ha. year}^{-1}$	Initial stocking per hectare
Keochia	<i>A. auriculiformis</i>	3.83	4.22	1700
	<i>E. camaldulensis</i>	4.83	4.27	1700
Charkai	<i>E. camaldulensis</i>	5.0	16.66	10500
FRI	<i>A. mangium</i>	4.5	27.3	6723

This species, therefore, has great potentialities for afforestation in Bangladesh, specially at the poorer sites, sungrass infested areas of Un-classed State Forests and non-forest areas of northern districts. The species can also be planted as ornamental, avenue or shade trees, screening boundaries, roadsides, wind-breaks, agroforestry, social and community forestry, fuel wood and energy plantations.

Further trial plantations are being raised at different sites within the country and systematic study conducted for recording data on the growth and performance of this fast-growing exotic species to arrive at a conclusion regarding the suitability of mangium for large scale afforestation in the similar sites of South-east Asia.

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Station	Species	Age in Years	MAI in m ³ per ha year	Initial stocking per hectare
Kochia	<i>A. auriculata</i>	4.83	4.52	1700
	<i>E. camaldulensis</i>	4.83	4.54	1700
Chakra	<i>E. camaldulensis</i>	2.0	18.66	10200
FRI	<i>A. mangium</i>	4.5	37.3	6723

This species therefore has great potentialities for silviculture in Bangladesh, especially at the present stage, suggests mixed areas of *E. camaldulensis* forest and non-forest areas in northern districts. The species can also be planted as ornamental, avenue or shade trees, for wood and energy plantations.

Further that plantations are being raised at different sites within the country and state mainly conducted for recording data on the growth and performance of this fast-growing exotic species to arrive at a conclusion regarding the suitability of mangrove for large scale plantation in the coastal area of Bangladesh.

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