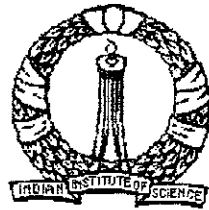


Comparison of field performance of two exotic species:
Acacia auriculiformis and *Cassia siamea* in hilly and high
rain fall zone of Uttara Kannada district, Western Ghats,
southern India.

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REFERENCE

ABSTRACT

A comparison of field performance of *Acacia auriculiformis* and *Cassia siamea* was made in Uttara Kannada district of Karnataka State in the Western Ghats region. Biomass accumulation, height, seedling survival, coppicing ability and herb layer productivity was compared in the monoculture plantations of *A. auriculiformis* and *C. siamea*. There was no statistical difference in biomass, height, basal area and herb layer productivity between these two species plantations. However, there was significant difference with respect to coppicing ability between these two species. *Cassia siamea* exhibited coppicing ability much better than *Acacia*. Thus it was suggested that *Cassia* could be planted along with *Acacia* or *Cassia* monoculture plantations could be taken up to reduce the cost of replanting after first harvest. Further, the growth of herb layers in monoculture plantations of *Cassia* may also enhance soil carbon thereby increasing soil productivity.

Keywords: *A. auriculiformis*, *C. siamea*, field performance, growth rates, coppicing, biomass, seedling survival, Western Ghats.

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Introduction

Afforestation of denuded and barren tracts planting different species has been in place for a few decades. Species were selected based on the purpose the species serves, suitability to particular agro-climatic and eco-edaphic conditions, and its immunity to fire, grazing and ability to coppice. In recent years a lot of information are available on survival (Prasad and Hegde 1986), growth (Sunder and Reddy 1990), yield (Nadaf *et. al.*, 1996, Reddy and Sugur 1992) and economic returns (Kulkarni et al 1996) pertaining to *Acacia auriculiformis*. On account of better performance of *A. auriculiformis* on the above said parameters, it is dominating in the afforestation programme which serves largely the fuel wood and small timber requirements and to some extent pulp wood needs of industries. Vast stretches of *Acacia auriculiformis* have been raised as monoculture in the Western Ghats region in southern India, which has limited use to the local community.

Recent experience of pink disease of Eucalyptus plantations in Uttara Kannada district, infestation of psyllid insects on Subabul rightly warned the danger of monoculture plantations succumbing to diseases and pests. This necessitated a search for alternatives such as mixed species plantation with various utilities and planting in different proportions. Search is also be on species that can grow along with the dominant plantation species. So far no serious efforts have been made to identify suitable species having multiple uses that can replace the dominant species or that can be grown along with it. Survival and field performance of another exotic species *Cassia siamea* (Pal and Raturi 1989) indicates its potential alternative to *A. auriculiformis*. An attempt has been made here to compare the field performance of *A. auriculiformis* and *C. siamia* and examining the possibility of introducing this species in the high rain fall zone of hilly region in the Western Ghats is discussed.

Materials and methods.

Study Area

The study was conducted in Sirsi block of Uttara Kannada district (latitude 30° 55 'to 15 ° 31 N and longitude 74° 9 to 75° 10 E). The district is hilly terrain with varying depth of soil. Soils are lateritic with gneiss and schist type of rocks underneath with a pH around 5. Annual average rainfall in the district is 250 cm. June to mid-October is monsoon season, November to January is winter season and February to May is summer season.

Methods

Nursery raised poly-pot seedlings of 6 months old were planted in the pit (size: 30x30x30 cm) soon after the on set of the monsoon in June 1990. Seedlings were planted at 1.5x1.5 m apart. The plot size was 25x25 m and the trials were conducted in triplicates. Survival and growth, measured as diameter and height, were monitored every year and other intercultural operations such as weeding and soil-work were done regularly. After 5 years of growth, plants were harvested leaving behind stumps of 10 cm above the ground. To avoid border effect, 5 meter on all the side was avoided and all individuals in the central 15 x 15 m area were harvested. Fresh weight of leaves and stem of all the individuals were recorded in the field. Samples were oven dried to extrapolate biomass in t/ha in dry weight. Herb layer was harvested in all the plots, fresh weight was recorded in the field and samples were oven dried to express herb layer production in t/ha on dry weight basis. These plots were visited again after 6 months to record the coppicing ability of species. Total biomass and rate of accumulation of biomass was statistically analyzed.

Results and discussion

The features of both the species are given in Table 1. Both species belong to Leguminosae family but only *Acacia* fixes nitrogen. Thus planting of *Acacia* may make soil of the plantation area richer in nitrogen once the plantation is felled. But the experiences of farmers of *Acacia* is that of the lack of herb

layer growth under this plantation. On the other hand leaves of *Cassia* provide leaf manure and fodder, thus it can meet the needs of local people. But *Acacia auriculiformis* produces modified stem as leaves that take more time for decomposition and mineralisation thus not preferred by local people.

Comparison of field performance is given in Table 2. Though there is difference in biomass production among these two species, but the difference is statistically not significant. It indicates that *Cassia siamea* is equally good in biomass production. Both the species have shown better survival i.e. 93 % and 91% respectively for *Acacia auriculiformis* and *Cassia siamea*. But the later showed 100% coppice after the individuals were harvested while the former had only 10% coppice. As the coppice shoot grow faster and attain harvestable girth and height at shorter intervals, *Cassia siamea* can be introduced in the hilly region of high rainfall zone. The other advantage of planting *Cassia siamea* is that there was slight increase in the herb layer production under this species plantation. Productivity of herbs and grasses depend upon the availability of light, introducing *Cassia siamea* on the hilly region facilitates flora of the ground layer that is grazed by livestock. Further, soils may get better with respect to physical properties and richer in nutrients because of easy degradability of leaves. In case of *Acacia auriculiformis*, the underground is covered with scanty herbs and grasses because of canopy closure and thick mulch. Both these factors play a key role in controlling the growth of herbs, which is essential to maintain diversity and fodder (grass).

Conclusions: Considering their performances in the field it can be suggested that *Cassia siamea* has the potential to replace or it can grow along with *Acacia auriculiformis*. Mixed plantation would enrich soil better as *A. auriculiformis* fix nitrogen and *Cassia* facilitating better biodegradation of leaves keeping higher microbial activity in soil. *Cassia* is a tropical tree and hence can adapt better under hilly and monsoon climate of the region

than *Acacia* would. Further, in all other aspects *Cassia* is comparable to *Acacia*.

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Table 1: Some important characteristics of *Acacia auriculiformis* and *Cassia siamea*

Botanical Name	<i>Acacia auriculiformis</i>	<i>Cassia siamea</i>
Common name	Bengali babul, Australian Acasia, Wattle,	Bombay black wood, Ironwood tree
Place of origin	Northern Australia and Queens land, Papua, New Guinea	South-East Asia
Taxonomy		
Family	Leguminosae	Leguminosae
Sub-family	Mimosae	Caesalipineae
Phenology		
Physiognomic character	Evergreen	Deciduous
Flowering period	September-November	May-June
Fruiting season	February-March	March-April
Other Characters		
Nitrogen fixing	Yes	No
No. of seeds / Kg	34000-49000	20000
Calorific value K. cal / Kg	4800-4900	3600
Specific gravity of wood	0.60-0.78	0.60-0.80
Coppicing ability	Poor	Profuse
Seed treatment Required	Hot water soaking/ immersing Sulfuric acid treatment	Hot water soaking/ immersing Sulfuric acid treatment
NTFP value	Fuel wood, Small timber, Pulpwood	Leaf as fodder and manure, Fuel wood, Pulpwood, Small Timber

Table No 2: Comparison of field performance of *Acacia auriculiformis* and *Cassia siamea* at 5 years.

	Plot No.	Survival %	Above Ground Biomass (t/ha/year)	Accumulation of biomass (t/ha/year)	Growth rate of height (cm/year)	Average DBH cm	% stems coppiced	Above ground herbs (t/ha/year)
<i>Acacia auriculi Formis</i>	1	92.50	12.732	2.546	123.72	3.31	9.0	0.4373
	2	89.08	11.591	2.318	112.50	2.98	13.20	0.3968
	3	97.50	13.589	2.718	115.79	3.27	8.54	0.5184
	Mean ± SD	93.04±4.24	12.64±1.00	2.53±0.20	117.34±5.77	3.19±0.18	10.17	0.45±0.06
<i>Cassia siamea</i>	1	96.67	11.344	2.268	101.93	2.86	100	0.6613
	2	86.44	09.604	1.920	094.61	2.88	100	0.4533
	3	89.58	04.028	0.806	070.70	1.76	100	0.4107
	Mean + SD	91.02±5.24	8.33±3.82	1.66±0.76	89.08±16.33	2.5±0.64	100	0.51±0.13
	t-statistic	0.54	1.89	1.89	2.83	1.79	60.53	0.675
	P value	0.6143	0.1838	0.1834	0.0824	0.1985	0.0002	0.5507