

## GROWTH CHARACTERISTICS OF DIFFERENT VARIETIES OF IPIL IPIL (*LEUCAENA LEUCOCEPHALA*) UNDER IRRIGATED CONDITIONS IN PAKISTAN

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### Abstract

Three test plantations were established at Peshawar and Hyderabad to find out the growth performance of different varieties of *Leucaena leucocephala* under dry tropical conditions with artificial irrigation. Preliminary results show the suitability of two different varieties at these two sites. Overall growth performance of this species appears to be better than most of the eucalypt species currently being planted in Pakistan.

### Introduction

*Leucaena leucocephala* is a tropical leguminous tree which is native to Southern Mexico and Central America (Brewbaker and Hutton, 1979). From earliest times, its young seed were eaten or cooked for food in Mexico. It was also used as hore feed and bedding during Spanish galleon trade with Philippines which resulted in its spread from its native habitat to the Pacific and Southeast Asia. In nineteenth century leucaena was further spread and used as a shade or nitrogen — nurse tree for coffee, cacao, quinine and pepper crops in Indonesia and Africa. Presently, it is naturalized throughout tropics between 30° N and 30° S latitude on less arid soils upto 1500 m elevation.

It is a multipurpose tree with varied uses e.g. fuel wood, charcoal manufacture, fence posts, animal forage, green manure etc. etc. It has caught world wide attention, especially in countries deficient in fuel wood, after 1977 publication of a report entitled "Leucaena: Promising Forage and tree crop for the Tropics" by the National Academy of Sciences of USA. Very high growth of upto 239 m<sup>3</sup>/ha/yr has been reported for this species in the Philippines by Bawagan and Samana (1976). The calorific value of 3800 to 4700/kg was found in Indonesia (Dijuan, 1950). Its wood burns well and cleanly with little smoke and ash production. The paper made of this species has also fairly high tearing strength but low folding endurance and tensile strength (Vietmeyer, 1977).

In Pakistan about 50% of total domestic energy requirements are met from fuelwood (Siddiqui, 1982). Fuelwood is generally in short supply in the country and large areas have been denuded of tree growth for fuel wood purpose. There is an urgent need to rehabilitate denuded and eroded areas for fuelwood production. However climatic conditions over major part of the country are extremely arid and tree growth is a possibility only with artificial irrigations. *Loucaena* was first introduced in Pakistan in early sixties. Considerable interest has been shown in this species in recent years for afforestation. This paper gives results of investigations carried out at Pakistan Forest Institute, Peshawar, for growing different varieties of *Leucaena leucocephala* at Peshawar and Hyderabad.

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## Material and Methods.

First consignment of Ipil Ipil seed was received from Philippine in 1977. It was sown in polythene tubes of 7.5 x 17.5 m size containing a medium of soil, sand and formyard manure in 2:1:1 proportion. Seed was treated before sowing by soaking it in hot water at 60°C and allowing it to cool. Germination was completed in about 10 days. Six month old seedling were planted in April 1978 over an area of 0.05 ha. at a spacing of 2 x 2 m in the experimental area of the Pakistan Forest Institute, Peshawar. The test site lies at 34° 01' latitude and 71° 34' longitude at an elevation of about 400 meters. The mean minimum and maximum temperatures at Peshawar are 10.9°C in the month of January and 32.9°C in June/July respectively. Average annual precipitation is 350 mm, most of it is received during the months of January to April. The soil of the test site is calcareous clayey loam with fair drainage. Its PH varies from 8.5 to 9.1.

The second trial of Ipil Ipil was started at Hyderabad in Sind province in April 1979 wherein four varieties (K-8, Cunningham Peru and local) were planted at 2.75 x 2 m spacing in a randomised complete block experiment with four replications and 30 plants of each variety in each replication. The test site is situated at a latitude of 25° 23' and longitude of 68° 25'. Its altitude is 32 meters. The mean minimum and maximum temperatures are 17.3°C and 34.0°C in the months of February and June respectively. The soil is fine alluvial loam with good drainage. Annual precipitation is about 160 mm. Another test plantation was laid out in the experimental area of the Institute in June, 1980 with 6 varieties of this species obtained from Hawaii. These were K-8, K-28, K-29, K-67, K-132 and Philippines. The last mentioned variety consisted of seed collected from the test plantation raised in 1978 at the Institute. The planting was done at 2 x 2 m spacing. All test plantations were regularly irrigated for a period upto 10 months every year.

Data were collected at regular intervals regarding survival and growth of plants in the above mentioned test plantations.

## Results and Discussion.

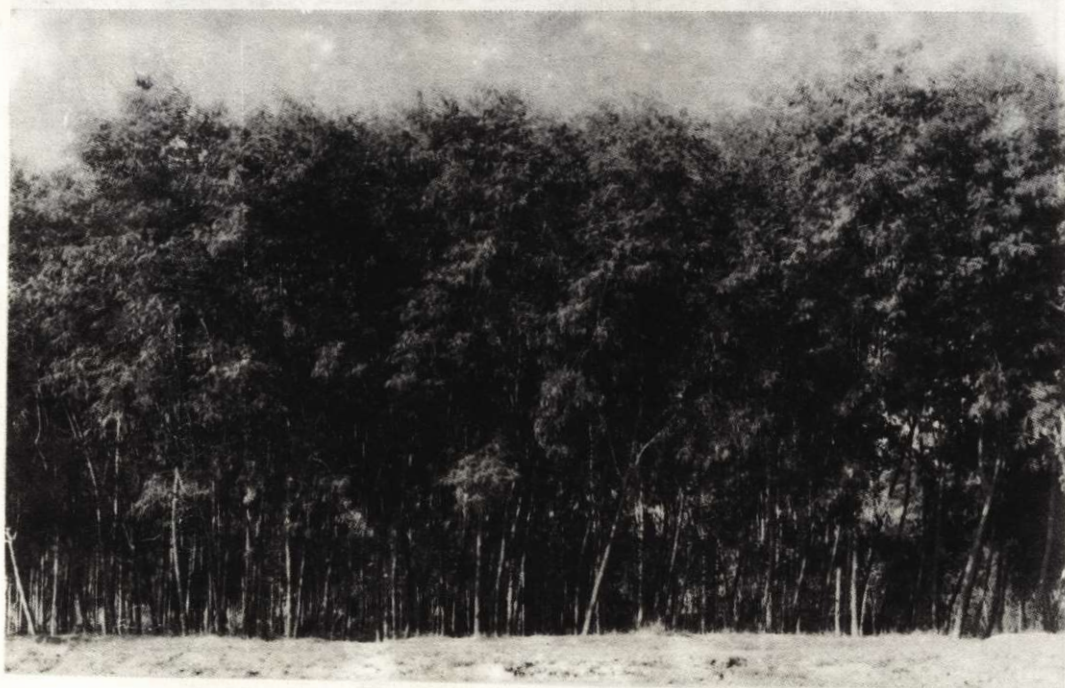
The results of three trials are briefly discussed below:

### 1. *Peshawar Trial of 1978 with Philippines Seed.*

The plants showed good growth in the initial stages. Average height growth of trees in the plot was 5.4 and 6.7 m at the end of growing season in 1978 and 1980 respectively. The diameter growth during the same period was found to be 5.6 cm and 6.7 cm. Most of the plants developed multi shoots and started producing seed during first year of growth. At this time the crop attained a closed canopy as well. Although frost is quite common and night temperature often comes down to 0°C in Peshawar in winter, still, no frost damage was observed and buds remained fairly active throughout the year. Cleaning was done in 1980 by cutting multiple shoots and leaving only one stem for each plant. Regular thinning was carried out and total plant growth in the plot was determined in July 1982. An average growth rate of 25.9 m<sup>3</sup>/ha/annum was found out. This is much higher than that of 12 m<sup>3</sup> reported for commonly planted

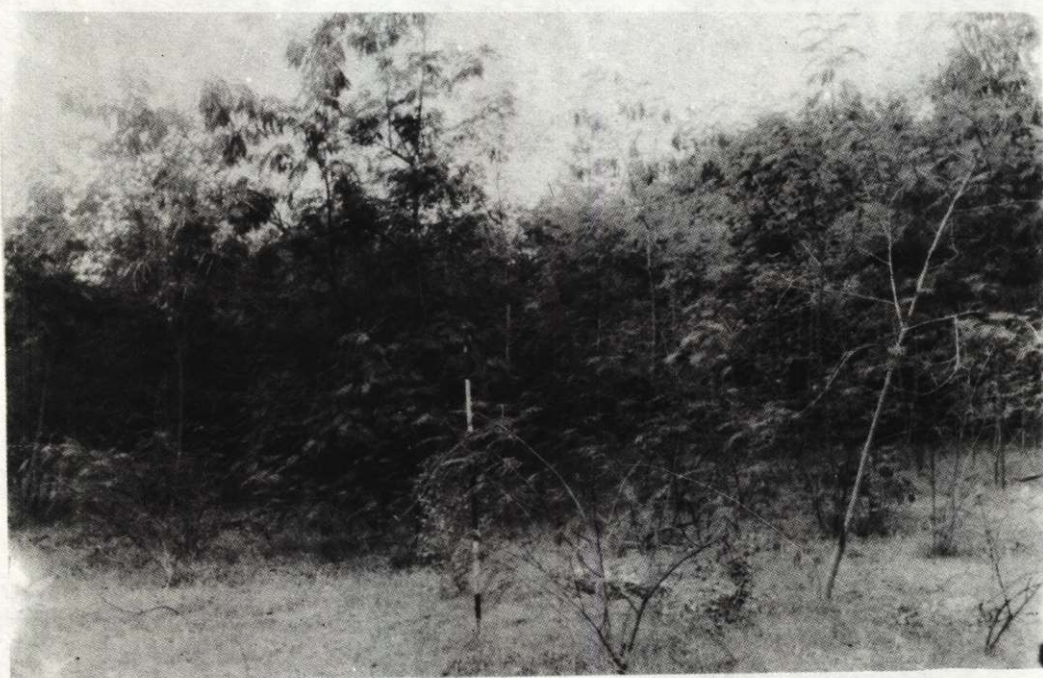


*Fig. 1. One-year growth of Ipil Ipil at Peshawar. Profuse seeding occurred during first year of growth.*



*Fig. 2. Five-year growth of Ipil Ipil at Peshawar.*





*Fig. 3. Three-year growth of Ipil Ipil varieties at Peshawar. Variety K-132 is shown in the foreground.*

*Eucalyptus camaldulensia* (Siddiqui, *et al.*, 1979) Only two species, *Eucalyptus grandis* (27.5 m<sup>3</sup>) and *E. tereticornis* (30.3 m<sup>3</sup>) were found to grow faster than Ipil Ipil in the same area over the same period. All indigenous species of shisham (*Dalbergia sissoo*), kikar (*Acacia arabica*) and bahan (*Populus euphratica*) showed a low rate of growth under similar conditions.

## 2. Hyderabad Trial of 1979 with 4 Varieties

Four varieties, namely, K-8, Cunningham, Peru and Hyderabad local were planted in this experiment. Two year growth of these varieties measured in December, 1982 is given below.

Variety	Diameter cm	Height m
K-8 (Mexico)	5.6	5.7
Peru (Peru)	3.9	2.7
Cunningham (Australia)	4.0	3.0
Local (Philippines)	0.9	2.0

Only K-8 variety has shown promising growth in this experiment. Its growth is also better than Philippines variety at Peshawar which was planted in April, 1978.

## 3. Peshawar Trial of 1980 with 6 Varieties of Hawaii and Philippines

The average height and diameter measurements of 6 varieties of Ipil Ipil from Hawaii and Philippines for the years 1980 and 1981 are presented below:

Variety	Survival %	Diameter		Height	
		1980	1981	1980	1981
K-8 (Mexico)	99	1.6	3.3	2.5	4.4
K-28 (Salvador)	100	2.1	3.0	2.8	4.1
K-29 (Honduras)	100	3.0	4.0	3.6	5.0
K-67 (Mexico)	89	2.7	4.0	3.3	5.5
K-132 (Mexico)	59	0.8	1.0	1.6	1.9
Local (Philippines)	97	2.1	3.5	3.0	4.7



Export for K-132 variety of Mexican origin, all varieties showed good survival of plants. K-67 variety of the same origin had the highest rate of diameter and height growth among all varieties during two years of planting of the experiment. K-132 variety showed poorest of survival and growth. This variety never developed into trees and exhibited bushy and spreading growth.

### Conclusion

The above data show that *Leucaena* does not give a high rate of growth under irrigated conditions in Pakistan. However it is quite comparable in growth with commonly planted eucalypt species in the country. On the other hand, planting of *Leucaena* is more advantageous than planting of other hardwoods especially on poor and eroded soils. It grows not only at fair rate for use as fuel wood but also improves soil through fixation of atmospheric nitrogen. Considerable accumulation of leaves under the trees was observed in all test plantation with resultant improvement in soil texture. Further, this species has forage value, both leaves and pods are copiously produced by it which can be fed to the cattle at regular interval.

### Acknowledgements

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