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COMPARISON OF *EUCALYPTUS CAMALDULENSIS* GROWTH AT VARIOUS SPACINGS IN CONJUNCTION WITH AGRICULTURAL CROPS

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Growth of *Eucalyptus camaldulensis* has been studied at various spacings in conjunction with agricultural crops up to the age of 6 years. The spacing of 6.4 x 3.8 m was found to be the best for block plantation on farmlands. First thinning is recommended after three years in Eucalyptus plantations initially planted at closer spacings, and after six years, if initially planted on wider spacings on farmlands under irrigated conditions.

Key words: *Eucalyptus camaldulensis*, growth at various spacings

INTRODUCTION

Eucalyptus camaldulensis, native of Australia, was tried a century ago in areas that now make a part of Pakistan. It has gained much popularity in various plantation programmes during last two decades because of its high growth rate, multifarious uses and adaptability to different ecological and edaphic conditions.

In irrigated plamations conventional spacing for *Eucalyptus* is 1.5 x 1.5 m or 3 x 2 m. In the past the same spacings have been recommended to the farmers without considering the returns from *Eucalyptus* at these spacings. It has been observed that such closer spacings are suitable for pole, post, fuel wood and maximum biomass production on shorter rotations, whereas the main objective of the farmers remained production of quality wood with high economic returns to supplement their income. Such closer spacings did not serve the purpose of farmers for quality wood production. Therefore we considered it desirable to switch over to wider spacings. For this purpose the Punjab Forestry Research Institute, Faisalabad started experimentation on various spacings suitable for growing *Eucalyptus camaldulensis* on farmlands with agricultural crops. Chaudhry and Ghauri (1995) reported significant effect of 1.9 x 1.9 m, 3.2 x 1.9 m and 3.8 x 1.9 spacings on diameter growth while it was non-significant in case of height. They also found that spacings had a significant effect on wood production (volume per hectare) with agricultural crops at the age of three years.

In this paper the results of comparison of *Eucalyptus ramaldulensis* growth at various spacings in conjunction with agricultural crops up to the age of six years have been presented.

MATERIAL AND METHODS

In order to find out the effect of spacings on the growth of *Eucalyptus camaldulensis* in combination with agricultural crops, a study was laid out in the research garden, Punjab Forestry Research Institute, Faisalabad during April/May, 1990. Six months old *Eucalyptus* seedlings raised in polythene bags were planted at three spacings i.e. 1.9 x 1.9 m, 3.2 x 1.9 m and 3.8 x 1.9 m, using randomized complete block design. with three replications. A variety of agricultural crops, one after the other were raised in between the lines by the farmers. These included mashbeans, berseem , wheat and maize fodder. The data for height and diameter growth of trees were recorded during December, 1992 at the age of about three years and compared for various spacings. After recording the growth data, thinning was done as the tree crop became congested and farmers were reluctant to put the area under agricultural crops. To widen the spacings , alternate rows and alternate rows plus alternate plants were removed keeping into consideration that more space is made available for smooth cultivation of agricultural crops in between tree rows. New spacings created were 3.8 x 1.9 m, 6.4 x 1.9 m, 7.6 x 1.9 m, 3.8 x 3.8 m, 6.4 x 3.8 m and 7.6 x 3.8 m. The original spacings of 1.9 x 1.9m, 3.2 x 1.9m and 3.8 x 1.9m were also maintained as control without growing agricultural crops. Wheat and maize fodder were raised in thinned plots in between the lines each year. Irrigation with canal water was given according to the requirements of the agricultural crops.

RESULTS AND DISCUSSION

The data for height and diameter growth were recorded during May, 1996 at the age of six years and are presented in Table I for the comparison of the effect of various spacings.

Statistical analysis of the above data indicated that the spacings had a significant effect on diameter growth, while it was non-significant in case of height growth at 95% confidence level. LSD test showed 6.4 x 3.8 m spacing to be the best, while the results of 7. 6 x 3.8 m spacing did not differ significantly from that of 6.4 x 3.8 m spacing. Maximum diameter growth was shown by trees at a spacing of 6.4 x 3.8 m followed by 7.6 x 3.8 m spacing (18.30 cm). Minimum diameter growth was exhibited by trees at a spacing of 3.8 x 1.9m i.e. 15.33 cm: Various spacing means for diameter growth have been

OWI' a period of time. The percentage of trees declined from 7 10 0 in case of smaller diameter class up to 10 cm and increased from 9 to 37 in case of higher diameter classes as the spacings increased.

Growth mcasuremenrs in the plots which were not subjected to thinning and no agricultural crops were sown there, were taken :u rhe age of 6 years at original spacings of 1.9 x 1.9 m, 3.2 x 1.9m and 1.X x 1.9 m and the percentage of trees in various diameter c1asscs was determined for various spacings (Table -4) Their height and diameter under different spacings have been given in Table 1.

From Tables 2 and 4 it is clear that in plots where thinning was carried out at the age of 3 years and growing of agricultural crops continued, 50 to Y1 'X, trees in various spacings fell in bigger diameter classes at the age of 6 years. while, in original spacings of 1.t) x 1.9 m. 3.2 x 1.9 m and 3.8 x I.Y m, where thinning was not carried out at the age of 3 years and growing of agricultural crops was stopped because of crown closures. majority of the trees still fell in smaller diameter classes even after availing 6 years growth. Thus it may be stated that in *Eucalyptus* plantations under agroforestry systems, first thinning should be carried out after 3 years. Hussain and Chccma (1987) recommended that first thinning i.e. removal of 10 'X of basal area may be done at the age of 3 years. second thinning at the age of 7 years and final felling may be carried out after 10 yeas in *Eucalyptus camaldulensis* irrigated plantations. raised initially at a spacing of 1.5 x 1.5 m. Sheikh *cI al.. (!Y85)* reponed that tirst thinning becomes necessary after 6 years even if the plants were initially planted at a comparatively wider spacing of 4 x 4 m under agroforestry systems. Sheikh *(It).T!.)* found that planting of *Eucalyptus* at 12 x 12 feet spacing and growing agricultural crops in between plants helped in gaining more height and diameter growth as compared to conventional trench method of planting *Eucalyptus* in pure form in irrigated plantations.

Conclusions: Wider spacing between trees and tree rows has a positive and significant effect on tree diameter growth. The spacing of 6.4 x 3.X m is more useful for *Eucalyptu»* block plantations on farmlands which in addition to quality wood also gives increased number of agricultural crop rotations per unit area. Moreover, wider spacing provides better opportunity to the farmer for soil preparation and increased utility of his land resources through production of crops for longer period. First thinning in *Eucalyptus* plantations becomes necessary after 3 years at closer spacings. and after 6 years, if the plants were initially planted at a comparatively wider spacing on farmlands under irrigated conditions.

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