POSSIBILITY OF APPLICATION OF THINNING GRADES IN TERMS OF BASAL AREA IN *EUC. CAMALDULENSIS* PLANTATIONS

Raja Walayat Hussain and M. Afzal Cheema(1)

Introduction

Eucalyptus camaldulensis was introduced in the country specially in the irrigated plantations of the Punjab and Sind quite sometime back. The species adopted well to the prevalent climatic and edaphic conditions.

Normal practice of planting the species is 1.5 x 1.5 m or 3.0 x 3.0 m according to the objectives of management. To get better growth different grades of thinning are applied to the crop.

In order to know which grades of thinning induces optimum growth conditions some experiments were laidout covering different ecological zones of the country. These experiments were based on the removal of certain percentage of basal area when the stand is fairly young.

Layout of experiment

The present study was laidout in compartment 2 of Bahawalpur irrigated plantation in April 1978. Three years old unthinned crop of *Eucalyptus camaldulensis* planted at a spacing of 1.5 x 1.5 m was selected for the study. 20 plots each of 0.05 hectare were demarcated. Basal area of each plot was determined and four plots with almost equal basal area were grouped into one block (replication). Following four treatments (A, B, C and D) were allotted to the four plots in each replication:

A No thinning control

B removal of 15% basal area of the control plot

C removal of 30% basal area of the control plot

D removal of 45% basal area of the control plot

The four treatments in each replication were randomly allotted to the plots. 20 plots gave 5 replications.

Method and procedure

Measurements were recorded annually. If the basal area of a plot in a group exceeded that of its control plot it was removed bringing it back to the assigned percentage of basal area

* The authors are respectively Director, Forestry Research Division and Forest Mensuration Officer at Pakistan Forest Institute, Peshawar.

for each treatment. The retained basal area for three grades of thinning were kept as 85%, 70% and 55% of the control plots in each block. From the annual data mean diameter, mean height, number of trees, basal area and volume were calculated on hectare basis both for the main crop and thinned crop. Cumulative number of trees, basal area, volume were also worked out to get figures for final yield. Latest measurements included in the study were recorded in the fall of 1985.

Results and Discussions.

(i) *Effect on diameter and height.*

Average diameter and height at the time of layout of the study (1978) and at the end of 1985 are given below in table 1.

Table 1. Diameter (cm) and height (m) growth.

Treatment	1978		1985		Increment in 8 years	
	Dia	Ht.	Dia	Ht	Dia	Ht
A	7.1	11.0	14.2	15.0	7.1	4.0
B	9.4	12.5	16.6	19.8	7.2	7.3
C	9.9	13.1	19.3	21.0	9.4	7.9
D	10.9	13.1	22.6	22.9	11.7	9.8

Diameter and height increment shows that the more the basal area removed the better the response of the left over crop to these attributes. Number of standing trees in 1985 in each treatment on hectare basis are given below with spacing.

Table 2. Number of standing trees on one hectare with spacing in 1985.

Treatment	No. of tree	Spacing (m)
A	2026	2.2 x 2.2
B	1221	2.9 x 2.9
C	788	3.6 x 3.6
D	450	4.7 x 4.7

Removal of higher percentage of basal area providing wider spacing resulted in trees of better size and form though less in number. However, visual look gives the impression that the crop has been opened too much in treatment D. Recommendation of this spacing initially may be advantageous and profitable if agroforestry practices are applied. However planting of 1 year old plants of the species initially at such a wider spacing may not induce much growth in them and weeds and other undesirable vegetation may suppress the plants. Planting dense initially and opening up the crop with almost alternate removal of plants at the age of 3—4 years will invigorate the residual plants, these will put up better diameter and height growth and will suppress the weeds and other unwanted undergrowth.

(ii) *Effect on increase in basal area and volume.*

Basal area and volume growth including basal area and volume removed in thinning, during last 8 years of study are given below in the table on hectare basis:

Table 3. Basal area (m^2) volume (m^3)

Treatment	1978 (after 1st thinning)		1985 (including thinnings)		Increment in 8 years	
	B.A.	Vol.	B.A.	Vol.	B.A.	Vol.
A	17.55	120.49	35.82	238.95	18.27	118.46
B	14.05	94.46	33.96	233.04	21.91	138.58
C	11.88	80.33	34.37	236.27	22.49	155.94
D	9.96	66.96	30.64	230.01	20.68	163.05

These parameters favour treatment C for basal area increment and treatment D for volume increment during the 8 years of study period. The most imporant point which goes in favour of treatment is that this treatment fulfills the silvicultural requirements of the species. Only those trees were removed during the study period which should be removed according to the rules of thinning i.e. malformed, leaning, whips etc. Moreover this treatment induced better from growth of the leftovers and suppressed weed growth. On the other hand, in treatment D undergrowth was quite profuse and a number of good well formed trees and to be removed to conform to the requirements of the applied treatment.

Conclusion

The study revealed that:

(i) Removal of 30% of basal area (C treatment) conforms with silvicultural requirements of the species. It induces normal growth for the leftover crop. The trees left after thinning are almost of uniform size, well formed, uniformly spaced and do not allow weed growth under them.

(ii) Removal of 15% basal area i.e. B treatment leaves behind malformed, whips, leaning and weak plants. The spatial distribution of leftovers is not uniform and congestion still exists. Though weed growth in this treatment gets suppressed yet the main crop does not put up normal growth as the release is less than it should be.

(iii) Removal of 45% basal area did not hinder the increment of leftovers but in this treatment several wellformed and healthy trees and to be sacrificed to make up the basal area requirement resulting in erratic spatial distribution of leftover crop and profuse weedgrowth. The diamter distribution of the main crop had a large variation and the tree of wind and strom. Several trees leaned under this force and had their tops broken.

As for interval of thinnings it was found that thinnings became due in alternate years in all the treatment because of that time basal areas exceeded the limits prescribed vis-a-vis basal area of control plots. It is recommended that first thinning of C grade i.e. removal of 30% of basal area may be done at the age of 3 years, second thinning at the age of 7 years and final fellings may be carried out after 10 years.

The above recommendations are given keeping in view practical considerations and to reduce the expenditure involved on frequent thinning. The average dbh of trees at 7 years will be 13.8 cm. Such trees if thinned will fetch some revenue and may compensate for the expenses incurred on thinning. In addition the released crop will put up better growth in last 2—3 years before final felling.

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