GROWING SPACE REQUIREMENTS OF HYBRID POPLAR

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Summary

To compare the rate of growth of *Populus euramericana* CV–I–214 under seven different spacings viz 1.8 x 1.8, 2.4 x 2.4, 3.0 x 3.0, 3.7 x 3.7, 4.3 x 4.3, 4.9 x 4.9 and 5.5 x 5.5 meter, a study was planted in Changa Manga irrigated plantation. Assessment of the study after six years has indicated that growing space provided to the trees has a highly significant effect on diameter, and height growth. Spacings had also highly significant effect on volume production; highest volume under 1.8 x 1.8 m spacing and the least under 5.5 x 5.5 m.

Introduction

Hybrid poplar was introduced in Pakistan in late fities. Through the years methods of growing this tree on a large scale have been perfected and particular clones which would successfully grow under different climatic conditions have been identified. However, the optimum growing space requirements of poplars still remained to be standardised. Such a study had a special significance in Pakistan in view of the tremendous shortage of raw material for various end uses and a final decision was required to be taken as to the spacing and the rotation on which poplar should be grown for maximum volume production for different end uses.

Although studies on spacing of poplars have been conducted in many countries, yet the results could not entirely be applicable to Pakistan owing to different climatic conditions obtaining in this part of the world. It was observed that due to comparatively long growing season, here, the rate of growth was faster. Simultaneously low rainfall, high temperature and poor edaphic conditions affected the plants adversely. Some studies on spacing were laid out in the country in 1969, but the treatments were not properly replicated and distributed. To find a possible answer to these questions this PL–480 study was started in Changa Manga irrigated plantation in February, 1976.

Design of the experiment

The experiment was laid out over 19 hectares (47 acres) in a randomized complete block design with 1.8 x 1.8 (6 x 6′), 2.4 x 2.4 (8 x 8′), 3.0 x 3.0 (10 x 10′), 3.7 x 3.7 (12 x 12′), 4.3 x 4.3 (14 x 14′), 4.9 x 4.9 (16 x 16′), 5.5 x 5.5 (18 x 18′) meter spacing and seven replica-

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tions of each treatment, plot size 0.33 ha. Detail is as under:

	Spacing (metres)	No. of measurement trees	No. of border rows	Total number of plants in a plot including surround
A	1.8 x 1.8	350 (14 x 25)	6	962 (26 x 37)
B	2.4 x 2.4	180 (10 x 18)	5	560 (20 x 28)
C	3.0 x 3.0	112 (8 x 14)	4	352 (16 x 22)
D	3.7 x 3.7	84 (7 x 12)	3	234 (13 x 18)
E	4.3 x 4.3	50 (5 x 10)	3	176 (11 x 16)
F	4.9 x 4.9	32 (4 x 8)	3	140 (10 x 14)
G	5.4 x 5.4	32 (4 x 8)	2	96 (8 x 12)

17,640 well grown one year old poplar plants of uniform size and of the same clone (CV–I–214) were planted in February, 1976. Failures were restocked in February, 1977. Manual hoeing in closer spacings (1.8 x 1.8, 2.4 x 2.4 and 3.0 x 3.0 m) and soil cultivation with tractor in the remaining 4 spacings was completed in March, 1977.

Diameter and height measurements were recorded in December, 1981 with the following results:

Diamenter: Spacings

Treatments/ Replication	1.8x1.8 (m)	2.4x2.4 (m)	3.0x3.0 (m)	3.7x3.7 (m)	4.3x4.3 (m)	4.9x4.9 (m)	5.5x5.5 (m)	Replication Total
I	11.4	13.2	16.8	17.0	16.3	16.5	12.7	103.9
II	10.7	14.5	13.7	17.5	12.4	11.9	16.5	97.3
III	13.2	13.7	15.8	15.5	19.1	18.0	17.0	112.3
IV	12.2	14.2	17.0	19.8	19.6	18.3	15.5	116.6
V	12.4	15.0	15.7	16.8	16.5	19.3	18.8	114.6
VI	12.7	15.5	17.0	19.1	20.8	22.4	17.8	125.2
	72.6	86.1	96.0	105.7	104.7	106.4	98.3	669.9
Means	12.2	14.2	16.0	17.5	17.5	17.8	16.4	

Analysis of variance carried out for diameter increment is as under:

Source	DF	SS	MS	F
Treatment	6	23.9	4.0	5.714 **
Replications	5	10.8	2.2	
Error	30	22.0	0.7	
	41	56.7		

'F' test showed that treatments (spacings) had a highly significant effect on diameter growth. The 'T' test was applied to test the significance of mean diameter differences under different spacing treatments. The result of 'T' test are given in Fig. 1.

Fig. 1:– Results of 'T' test on diameter growth under various spacings.

Spacing

4.9x4.9, 4.3x4.3, 3.7x3.7, 5.5x5.5, 3.0x3.0, 2.4x2.4, 1.8 x 1.8

Treatments under lined with the same line are not significantly different from each other at .05 level.

Thus 4.9 x 4.9 m. spacing gave highest diameter growth followed by 4.3 x 4.3, 3.7 x 3.7, 5.5 x 5.5 and then 3.0 x 3.0 m. 5.5 x 5.5, 3.0 x 3.0 and 2.4 x 2.4 m spacings did not differ in diameter growth from each other.

2.4 x 2.4 and 1.8 x 1.8 m spacing had lowest diameter growth.

Height: Spacings (metres)

Treatment/ replication	1.8x1.8	2.4x2.4	3.0x3.0	3.7x3.7	4.3x4.3	4.9x4.9	5.5x5.5	Rep. Total
I	15.8	14.6	17.1	16.2	15.8	14.0	8.8	102.4
II	15.5	16.2	16.2	16.2	13.7	11.9	14.6	104.2
III	17.1	18.6	15.5	15.5	16.2	16.2	15.6	114.6
IV	13.4	15.8	17.7	19.2	16.4	16.2	14.3	113.1
V	16.8	16.8	16.1	16.2	16.2	15.5	15.6	113.1
VI	16.5	17.4	17.1	17.0	17.4	18.0	15.6	118.9
	95.1	99.4	99.7	100.3	95.7	91.8	84.5	666.3
Mean	15.8	16.6	16.6	16.7	15.9	15.3	14.1	

Analysis of variance for height increment was conducted as follows:

Source	DF	SS	MS	F
Replication	5	312	62.4	
Treatments	6	343	57.17	2.475*
Error	30	693	23.1	
Total:	41	1348		

'F' test showed that treatments (spacings) had a significant effect on height growth.

The results of 'T' test to separate the means of different spacing treatments are reproduced in Fig. 2.

Fig. 2: Results of 'T' test on height growth under various spacings.

3.7x3.7, 3.0x3.0, 2.4x2.4, 4.3x4.3, 1.8x1.8, 4.9x4.9, 5.5x5.5

Highest height growth was attained by 3.7 x 3.7 spacing following very closely by 3.0 x 3.0 and 2.4 x 2.4 m. spacings.

'T' test revealed that average height obtained under first six treatments 1.8 x 1.8 to 4.9 x 4.9 spacings) were not significantly different from each other.

Lowest height was obtained under 5.5 x 5.5 m. spacings.

Volume: Volume data were computed as under:

Cubic metre per hectare.

Treatment/ Replication	1.8x1.8	2.4x2.4	3.0x3.0	3.7x3.7	4.3x4.3	4.9x4.9	5.5x5.5	Rep. Total
I	122.102	107.058	135.257	96.842	84.667	57.307	23.511	626.744
II	91.594	141.065	78.019	105.378	43.173	25.190	55.558	539.978
III	156.318	119.723	113.845	80.468	116.014	68.923	51.989	707 282
IV	130.569	112.236	142.324	157.788	110.626	73.891	48.421	775.855
V	151.980	150.231	128.889	95.582	75.080	83.267	58.637	743.668
VI	163.246	174.371	137.286	155.059	131.408	113.075	63.815	938.261
Treatment Average:	815.809 135.968	804.684 134.114	735.620 122.603	691.117 115.186	560.968 93.495	421.653 70.275	301.931 50.322	331.788

Analysis of variance for volume growth was conducted as follows:

Source	DF	SS	MS	F
Replications	5	2698141	539628.2	
Treatment	6	7994684	1332447.3	15.494**
Total	41	13272801		

Spacings

1.8x1.8	2.4x2.4,	3.0x3.0,	3.7x3.7,	4.3x4.3,	4.9x4.9,	5.5x5.5
136	134	123	115	93	70	50

1. Spacing treatments have a highly significant effect on volume production.

2. Highest volume was obtained under 1.8x1.8 m spacing and the least under 5.5x5.5 m spacing.

3. 2.4x2.4 m spacing closely follows 1.8x1.8 m spacing

4. The treatments underlined do not differ significantly.

Conclusions:-

Since maximum volume is available from the closest spacing, it is recommended that for pulp and paper and chip board manufacture poplar plantations may be raised at closer spacings and worked on a short rotation of 5-6 years.