

## WATER REQUIREMENT FOR OPTIMUM GROWTH OF POPLARS

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## Summary

In this study conducted to find out as to how far different depths of water (D 1:0.90), (D 2:1.35) and (D 3:1.80) metres given in one growing season to four poplar clones, I-90/60, I-72/58, I-4/64 and I-69/55 affected their rate of growth, it has been found that the dose of water was insignificant. However, clones between themselves showed different rates of growth; significant at 1% level for dia and height and at 5% for volume; I-69/55 showing the overall best performance followed by I-4/64, I-90/60 showed the poorest growth.

## Introduction

Canal water is a precious commodity in Pakistan. But for the availability of flow irrigation arranged through a system of dams, reservoirs, canals and distributories which has made the Indus Basin as one of the most fertile regions of the world, the country very well would have remained a desert sustaining itself on the erratic rainfalls. Use of canal water for growing trees was started more than 100 years back when the first ever irrigated plantation in the world was raised in the year 1865 at Changamanga. These plantations now cover almost 0.23 million hectares, spread all over the country. In spite of such a long history of raising irrigated plantations very few studies have been made to find out the optimum dose of water for the best rate of growth of a particular tree. The only exception is *Dalbergia sissoo* raised in Pirawala plantation where a study was established to find out the optimum growth of the species under different deltas of water.

The poplar tree attracted the attention of the foresters in Pakistan about 20 years back due to its comparatively faster rate of growth and a variety of end uses to which the wood can be put. Since the tree is known to be a heavy water demander for its proper growth, it was considered imperative to find out the response of different clones to different quantities of water given to the crop in one growing season and its cumulative effect over a period of 5 years.

## Preparation of the area:

A piece of land which had remained under *Dalbergia sissoo* (shisham) for about 50 years and had recently been clear felled was selected for the layout of the study. Stumps were uprooted and the site levelled with tractor. Thorough ploughing was also done.

## Layout:

Fifteen plots of 30.5 x 30.5 m were laid out over an area 184 m in length and 100 m in width. 2 m apart trenches were dug and connected with water courses for supply of water.

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**Planting:**

22 cm long cuttings of the following clones were planted on 11-2-78 at 2 x 2 m, spacing, planting 256 cuttings in each plot:

I - 72/58

I - 4/64

I - 69/55

I - 90/60

Random line planting of all the four clones was done in every plot, allotting four lines to each clone.

**Irrigation:**

Since water requirement of the clones and their growth response to different quantities of water was to be determined, following three deltas<sup>1</sup> were prescribed:

Treatment	Depth of water given in the season	Depth of water given in one irrigation
D <sub>1</sub>	0.90 m	7.50 cm
D <sub>2</sub>	1.35 m	11.25 cm
D <sub>3</sub>	1.80 m	15.00 cm

\* Delta<sup>1</sup>: Depth of water delivered to one acre in one irrigation season.

The deltas were replicated 5 times. Masonry flumes were constructed at the mouth of each plot and a scale was painted on one side. The quantity of water to be delivered to each plot was calibrated with the level of water on the scale with the time for which water was allowed to flow to the plot through the flumes. In all the 3 treatments 12 irrigations were given in one season.

**Records of Data:**

Diameter and height data recorded in October, 1983 are given in the following tables. Volume of individual clones was also calculated.

**Overall assessment:**

Clone I-69/55 leads all others in dbh, ht. and volume growth. Clone I-4/64 is the second best in all the above attributes.

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Table 1  
 MEAN DIAMETERS AT BREAST HEIGHT (cm) FOR VARIOUS DELTAS AND CLONES

	D <sub>1</sub>			D <sub>2</sub>			D <sub>3</sub>					
Reps/clone	I-90/60	I-72/58	I-4/64	I-69/55	I-90/60	I-72/58	I-4/64	I-69/55	I-90/60	I-72/58	I-4/64	I-69/55
R <sub>1</sub>	11.2	13.2	13.0	14.5	12.4	13.0	16.5	15.5	13.7	10.7	13.5	14.5
R <sub>2</sub>	14.7	12.4	14.7	14.2	13.7	14.5	13.2	14.2	11.9	15.9	15.8	19.1
R <sub>3</sub>	13.2	13.5	15.5	14.5	13.2	17.3	13.2	15.0	13.0	14.2	16.0	14.5
R <sub>4</sub>	14.2	12.2	14.0	11.9	12.4	12.2	16.0	14.5	11.9	13.5	15.2	15.2
R <sub>5</sub>	11.4	15.0	14.7	15.5	11.7	11.4	15.0	16.3	14.2	14.5	15.8	15.8
Total	64.7	66.3	71.9	70.6	63.4	68.4	73.9	75.5	64.7	68.8	76.3	79.1
Average	12.9	13.3	14.4	14.1	12.7	13.7	14.8	15.1	12.9	13.8	15.3	15.8

Analysis divides the clones in two groups; clones I-4/64 and I-69/55 form the first group and clones I 90/60 and I 72/58 make the second group.

Table 2

MEAN HEIGHT (m) FOR VARIOUS DELTAS AND CLONES

Reps/clone	D <sub>1</sub>			D <sub>2</sub>			D <sub>3</sub>					
	1-90/60	1-72/58	1-4/64	1-69/55	1-90/60	1-72/58	1-4/64	1-69/55	1-90/60	1-72/58	1-4/64	1-69/55
R <sub>1</sub>	15.85	16.63	17.37	17.37	13.41	17.37	17.98	18.59	17.37	15.54	13.72	17.98
R <sub>2</sub>	16.46	16.46	16.46	17.98	16.76	15.85	15.54	18.59	16.46	18.59	19.20	19.81
R <sub>3</sub>	13.11	16.15	15.54	18.29	17.98	16.46	14.33	18.59	16.45	17.67	17.67	18.59
R <sub>4</sub>	16.76	15.54	15.85	15.85	17.37	15.54	15.84	17.68	15.85	16.15	17.07	17.98
R <sub>5</sub>	14.33	15.24	17.98	19.20	13.72	15.54	14.63	17.37	15.85	17.07	16.46	18.29
Total	76.51	80.02	83.20	88.69	79.24	80.76	78.32	90.72	81.99	85.02	84.12	92.65
Average	15.30	16.00	16.64	17.74	15.85	16.15	15.66	18.14	16.40	17.00	16.82	18.53

Analysis shows best performance by clone 1-69/55. The performance of other three clones is similar.

Table 3

VOLUME (m<sup>3</sup>) PER HECTARE FOR DIFFERENT DELTAS AND CLONES 1983,  
ROUND WOOD UPTO 5 CM TOP DIAMETER

Reps/clone	D <sub>1</sub>					D <sub>2</sub>					D <sub>3</sub>					
	1-90/60	1-72/58	1-4/64	1-69/55	1-90/60	1-72/58	1-4/64	1-69/55	1-90/60	1-72/58	1-4/64	1-69/55	1-90/60	1-72/58	1-4/64	1-69/55
R <sub>1</sub>	153.62	224.03	217.86	249.57	160.47	193.65	417.32	302.82	260.08	183.55	228.85	255.13	260.08	183.55	228.85	255.13
R <sub>2</sub>	367.58	173.68	248.92	239.94	237.13	255.93	211.58	237.21	146.17	341.12	340.36	555.04	146.17	341.12	340.36	555.04
R <sub>3</sub>	220.13	236.37	336.39	252.46	234.46	458.87	207.74	355.25	189.13	254.76	288.53	322.49	189.13	254.76	288.53	322.49
R <sub>4</sub>	263.51	153.51	231.79	155.62	204.02	100.40	357.68	233.57	196.07	239.46	389.72	303.02	196.07	239.46	389.72	303.02
R <sub>5</sub>	121.90	298.07	270.24	310.80	138.30	146.47	288.60	364.91	264.19	267.32	334.59	347.58	264.19	267.32	334.59	347.58
Total	1126.74	1085.66	1305.20	1208.39	974.38	1155.32	1482.92	1493.76	1055.64	1286.21	1582.05	1783.26	1055.64	1286.21	1582.05	1783.26
Average	255.35	217.13	261.04	241.68	194.88	231.06	296.58	298.75	211.13	257.24	316.41	356.65	211.13	257.24	316.41	356.65

Best performance is given by 1-69/55 and 1-4/64. Second group is of clones 1-72/58 and 1-90/60.