



## **Growth Performance of Different Clones of Poplar (*Populus deltoides* Marsh.) in Nursery**

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### **ABSTRACT**

To assess early growth performance of poplar in nursery nineteen clones viz. *S7C1*, *S7C15*, *S7C20*, *BR-510*, *L-90*, *L-89*, *FS-155*, *FS-18*, *AM-48*, *L-90*, *AM-41*, *AM-49*, *L-200-84*, *L-87* and *FS-190* were collected from Silviculture division of Forest Research Institute, (FRI) Dehradun and three clones procured from Wimco seedlings ltd. viz. *Bahar*, *Udai*, *Kranti*. *G-48* was taken as control. This paper, analyzed first six months and one year growth of poplar clones. The performance of nineteen clones were tested on the basis of height, collar diameter, intermodal length and no. of branches. The results of nursery performance indicated that Wimco seedlings ltd. gave superior results for growth indicators as compared to others clone tested.

**Keywords:** *poplar, performance, nursery, clones, superior, Wimco*

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### **INTRODUCTION**

*Populus* is widely planted above 28° N latitude in India in Jammu and Kashmir, Punjab, Haryana, Uttarakhand, Uttar Pradesh, North Bengal, Himachal Pradesh, Sikkim and Arunachal Pradesh, along roads, canals, in agriculture fields, towns, parks, orchards and home gardens. *P. deltoides* grows better on well-drained fertile soils with a neutral soil pH. Since poplars prefer longer hours of day light, the natural zone of poplars lies only from 31° N latitude and upwards. Therefore exotic poplars were initially introduced in India in areas between 28° N to 31° N. To produce true to type plants they are propagated vegetatively. The most important use of poplar wood is pulp and paper. Poplar wood substitutes well for aspen for pulp and paper products, and is being grown for pulpwood extensively in all parts of the world [1]. Currently poplar is used for a broad range of the solid wood products including pallets, crates, boxes and furniture components. The advent of modern dry kilns with improved drying capabilities has opened up more poplar lumber opportunities including molding, paneling, flooring, fine furniture, picture frames, and decorative boxes [2]. The foliage from poplars is rich in nitrogen and protein and can provide a valuable source of animal feed. Poplar leaves are used for fodder in many parts of the world especially for sheep and goats [3].

Poplar research is facing problems regarding mixing of clones. Forestry unlike agriculture is a long term proposition and mistakes committed once are reflected after several years or even recognized due to non-identification of the different clones. Identification of different clones of poplar on the basis of morphological characters is nearly impossible due to lack of visible and contrasting traits among the different clones. But identification of different clones is very necessary for the maintenance of purity at nursery and plantation stages. Poplar is a deciduous species, therefore leaf related characters are available in the winter months while vegetative buds remain in stable state during that whole period. Poplar plantations in different states have a narrow genetic base consisting of only a few superior clones. Therefore present study was carried out to understand growth performance of different clones of Poplar (*Populus deltoides* Marsh.) in nursery for future tree improvement program.

**MATERIAL AND METHODS**

The trial was carried out in the experimental field of Forest Research Centre research nursery situated at latitude 25°07' to 25°10'N and longitude 81°54' to 81°58' E and at 98 m elevation. Cuttings were derived from nursery grown from one year old plants. Cuttings from one year shoots were prepared using sharp cutters like secateurs in the month of January 2018. Clones S<sub>7C1</sub>, S<sub>7C15</sub>, S<sub>7C20</sub>, BR -510, L-90, L-89, FS-155, FS-18, AM- 48, L-90, AM-41, AM -49, L-200-84, L-87 and FS-190 were collected from Silviculture division of Forest Research Institute, (FRI) Dehradun and three clones procured from Wimco seedlings ltd. viz. Bahar, Udai, Kranti. G48 was taken as control and collected from local nursery. Cuttings of size 22 cm length and 2 to 3.5 cm diameter were planted in pits. Both ends of the cuttings were sealed by wax, as protection against moisture loss. The cuttings were then submerged in fresh water immediately after preparation and kept for 28 hours prior to planting. Cuttings were pre-treated with fungicide & insecticide. The cuttings are then inserted vertically in well prepared nursery beds. The spacing between cuttings was kept at 50 cm or 60 cm and between rows 60 to 80 cm. The entire length of cuttings was inserted into the soil keeping one bud above ground level. The soil around each cutting was compacted gently but firmly without injuring the bark. Irrigation was provided as soon as the planting of cuttings was completed because undue delay in irrigating the beds can cause dehydration of the planted cuttings and result in poor sprouting. The first irrigation was medium thereafter subsequent irrigation was light and the interval vary between 7 to 10 days. Thereafter irrigation was given at 10 to 15 days interval till onset of monsoons. Proper and effective drainage of excess water during rainy season was taken into account to prevent lodging and collar rot. After the rainy season one to two irrigations per month were given in the trial. The data regarding tree collar diameter (cm), tree height (m), no of branches and internodal length (cm) were recorded after six months and one year.

**RESULTS AND DISCUSSION****Table 1: Growth performance of six months old *Populus deltoides* clones**

	poplar clones	height(m)	collar diameter(cm)	no. of branches	internodal length(cm)
1	S <sub>7C1</sub>	3.43	1.98	7.3	2.94
2	S <sub>7C15</sub>	3.57	2.09	8.6	3.37
3	S <sub>7C20</sub>	3.0	1.95	9.03	3.03
4	Udai	3.82	2.20	10.6	3.84
5	BR 510	3.06	1.90	9.9	3.11
6	Kranti	3.67	2.11	7.85	2.86
7	G48	3.16	2.07	7.35	3.96
8	L90	2.81	1.80	6.36	4.01
9	L89	3.46	1.99	6.45	3.9
10	FS155	2.24	1.74	9.56	2.96
11	FS 18	2.13	1.86	7.95	3.31
12	Bahar	3.33	1.99	7.14	3.28
13	AM 48	1.99	1.65	7.81	3.12
14	L90	2.9	1.88	9.8	3.65
15	AM - 41	2.22	1.92	7.08	3.01
16	AM 49	2.0	1.59	8.30	3.35
17	L-200-84	3.33	2.0	7.90	3.8
18	L 87	2.49	1.84	8.50	3.78
19	FS 190	2.95	1.93	7.70	3.13
	Range	1.99-3.82	1.59-2.20	6.36-10.60	2.86-4.01
	CD(p=0.05)	0.21	0.07	0.85	0.14

**Table 2: Growth performance of one year old *Populus deltoides* clones**

	poplar clones	height(m)	collar diameter(cm)	no. of branches	internodal length(cm)
1	S <sub>7</sub> C <sub>1</sub>	4.13	2.34	<b>10.43</b>	4.54
2	S <sub>7</sub> C <sub>15</sub>	4.76	2.55	9.83	4.95
3	S <sub>7</sub> C <sub>20</sub>	4.43	2.4	10.1	4.53
4	Udai	5.17	3.32	13.6	5.3
5	BR 510	4.12	2.4	9.59	4.7
6	Kranti	4.88	2.71	10.54	5.62
7	G48	4.3	2.62	12.6	4.64
8	L90	3.93	2.38	9.3	5.8
9	L89	3.01	2.2	11.08	5
10	FS155	3.36	2.19	10.46	4.4
11	FS 18	3.28	2.46	10.96	4.9
12	Bahar	4.31	2.51	9.2	4.88
13	AM 48	2.88	2.05	12.01	4.75
14	L90	4.41	2.45	8.49	5.2
15	AM - 41	3.4	2.32	8.03	4.6
16	AM 49	3.22	2.08	9.45	5.26
17	L-200-84	3.86	2.38	9.78	5.1
18	L 87	4.44	2.5	11.98	5.33
19	FS 190	3.97	2.4	10.96	4.8
	range	2.88-5.17	2.05-2.71	8.03-13.60	4.40-5.80
	CD(p=0.05)	0.39	0.06	1.1	0.35

In this study, a lot of variation was observed in growth parameters of different *Populus deltoides* clones, viz., Total height (1.99-3.82 m), collar diameter (1.59-2.20 cm), inter-nodal length (2.86-4.01cm), number of branches (6.36-10.60) after six months. After one year total height (2.88-5.17 m), collar diameter (2.05-2.71cm), number of branches (8.03-13.60) and internodal length (4.40-5.80 cm)

In this study, it was observed that clones Udai, Kranti, S<sub>7</sub>C<sub>15</sub>, overtook all other clones and showed maximum height growth and collar diameter (Table 1 & 2). After one year clones L- 90, Kranti and Udai had maximum inter-nodal length, clones Udai and L-87 had maximum no. of branches than other clones tested. The survival of plants was in range of 96-100%. Survival in general is influenced by several factors, which include site management, especially the weeding frequency and the protection of the seedlings from pests and diseases, drought and handling during planting period [4]. The clones had different ranks of dbh and height increments as compared to G48. The results of early growth performance in nursery condition indicated that out of nineteen clones Udai, Kranti and S<sub>7</sub>C<sub>15</sub> gave superior results for growth indicators as compared to others clone tested. Clones FRI-AM- 48 and FRI-AM- 49 had poor performance as compared to other clones at data recorded after six months and after one year. The poor performance in all the clones has been due to non-application of any fertilizer to the soil or due to their genetic make-up. It was observed from the Table 1 and 2 that all Wimco seedlings ltd. clones showed significantly better growth performance in the nursery over other clones. Various workers had also studied the performance of *Populus deltoides* clones under nursery conditions and reported similar results. G-48 performance is also good and is the most popular clones over the last two decades in agroforestry plantations in India [5]. Dhiman and Chander [6] survey confirms that G-48 and Udai were the leading clones in agroforestry. Kumar *et al.*, 2017 also reported same results in different clones through nursery performance. They observed that clone Udai overtook all other clones and showed maximum height growth, collar diameter and number of branches after six months and after one year. Other clones viz., S<sub>7</sub>C<sub>1</sub>, Bahar, S<sub>7</sub>C<sub>20</sub> were considered significantly promising clones. Kumar *et al.*, [7] also observed that all three Wimco seedlings ltd. clones showed significantly better growth performance in the nursery over other clones. Various workers had also studied the performance of *Populus deltoides* clones under nursery conditions and

reported similar results. Verma and Bangarwa [8] suggested that Wimco seedlings ltd. clones had better growth characters than Lal Kuan clones of Uttarakhand. Toky *et. al.*, [9] also studied the performance of various clones and observed a lot of variation in the growth parameters of different *Populus deltoides* clones. Rawat *et al.*, [10] earmarked eleven clones as best and twelve as potential clones on the basis of nursery screening. Similar results was also reported by Karnatka and Chandra [11] that growth performance of five clones, viz., Udai, Kranti, Bahar, 72/58 and ST-74 had come close to clone G-48 and clone Udai and Kranti performed better than Bahar.

## CONCLUSIONS

The results of study confirm that three clones of Poplar, out of which two belongs to Wimco seedlings ltd. (Udai and Kranti) were better suited to growth at early stage of nursery trial. These clones were released during the year 1992 [12]. However, these were early growth results, with expected low juvenile mature correlations and growth monitoring will continue in this trial series for confirm assessment of promising clones for the region. The identification of promising clones for the region will open a new path for farmers to adopt this species more widely in agro forestry as suitable planting material of Poplar will be a boon for local farmers for strengthening their economic level through agro forestry. Assessment of performance of poplar clones in future years will be helpful for identification of promising clones for the specific region, thus, planting stock of desired clones may be raised for their further cultivation in field. The expansion of plantations of poplar in agro forestry will be helpful in reducing pressure of forests and increasing trees outside forests.

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## CONFLICT OF INTEREST

Authors declared no conflict of interest.

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