

COMPARISON OF SIX POPLAR CLONES FOR GROWTH AND SURVIVAL

by

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Summary. In a study conducted to compare the rate of growth of six different poplar clones over a period of 4 years, *P. deltoides* I-63/51 gave the best performance. The rest of the clones in order of merit were:

<i>P. euramericana</i>	I-214
<i>P. deltoides</i>	I-90/60, I-72/51 I-69/55, I-18/62

Introduction. Poplars were introduced in Pakistan as far back as twenty years. For a considerably long period only *P. euramericana* cv. I-214 remained the centre of interest and was planted all over the country irrespective of climatic and edaphic conditions of the tract. It becomes apparent quite soon that I-214 was not suitable for the hotter parts of the country. In such areas it showed poor rate of growth and an alarming degree of susceptibility to a number of insects and diseases. High temperature in summer caused severe desiccation resulting in vertical lesions on the stem. Appearance of *Ichthyura anastomosis*—common hairy defoliator—in epidemic form necessitated the introduction of some other hybrids as well as *deltoides* clones. Although *deltoides* clones are quite notorious for poor rooting, a host of calamities which befell I-214 prompted the lay out a number of field experiments with a view to comparing their rate of growth and survival with the extensively planted I-214.

Literature reviewed. Avanzo (1975) reported the results of 495 clones planted in *populetum mediterraneum* near the Tivoli Baths represented by average of 6 plants grown under irrigation. Out of the clones planted in 1962, *P. deltoides* UAS 235 (Italy), *P. nigra* 'Blanc de garrone' (France), *P. nigra* 56/73 (Turkey), *P. euramericana* Campeador (Spain), *P. alba* 'P.E.—104', 'P.E.—105' gave the best performance as regards height and diameter. *P. euramericana* Campeador (Spain) was the most outstanding so far as height (30.2 m) was concerned and *P. nigra* 'Blanc de Garrone' out-performed the rest in girth (149 cm.), P.E. Campeador being the second best in girth (144 cm.)

Crist and Dawson (1975) compared to selected poplar clones for yield and anatomy under intensive culture. The clones included *Populus* 'tristis' and *Populus* 'northwest'. The differences in yield between 2 clones grown at 3 planting densities (23×23, 30.5×30.5

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and 61 × 61 cm) illustrated that the selection of genetic material and culture regime under which a species was grown were significant factors that must be determined in maximum yield system specifically for all the species used. Nearly all good quality characteristics varied significantly between the clones but most characteristics were well within the ranges reported for *Populus* pulpwood.

Khan (1976) reported the survival and growth of Poplar clones tested by him in Miani Research Station. The clones under test included Y-509, A-65/27, A-65/31, A-61/183, A-61/186 and A-Y-48. The last named clone although low in survival (50%) as compared to almost 100% in the case of the rest of the clones was far better in height (10 m) and diameter (12 cm) after two years of growth. An important observation regarding this clone was that it was a slow starter but over-took the rest in the second year. The second best was Y-509 with 100% survival, 8.5 m height and 9.6 cm diameter.

Maisenhelder (1970) compared native selections of *P. deltoides* with hybrids on southern sites and reported that the native selection of *Populus deltoides* grew faster, had better stem form, and were more resistance to pests. Euramericana hybrids included cv. I-214, cv. Robusta, cv. Eugenii, cv. Mussolinii etc. and *Populus deltoides* clones were Rosedale selected 6, 7 and 8. Average survival diameter and height were 63 percent, 8.1 cm and 8.2 m in the 5th year for all hybrids and 100 percent, 14 cm and 13.4 m for the average Rosedale clones respectively.

Maisenhelder Lois C. (1961) based on his evaluation, tentatively selected the hybrids *P. eugenii*, *P. robusta* and I-214 and the deltoides such as Catfish 2 and 5, Texas select, Alton and Rosedale for additional work on poplars. He regarded the hybrids slower in growth to the deltoides clones.

Mohn, Randal and McKnight (1970) described the performance of 14 *Populus deltoides* clones chosen primarily on the basis of rapid early growth. They found the indications that quite a few of these had high potential for commercial planting. The clones included Stoneville 63, 67, 70, 71, 72, 75, 81, 91, 92, 107, 109 and 124.

Randal (1973) compared the Stoneville clones with some other random clones and reported that after 7 years, Stoneville clones grew 20 percent larger in diameter and 11 percent taller than average poplars. Clone number Stoneville 66 gave the highest diameter, height and cubical contents not only on a good silt loam soils but also in clay soils. This was followed by 67, 74, 92 and 109. Mean diameter and height for selected clones was 23.9 cm and 21.2 m where as mean for random clones was 7.1 cm and 8.9 m.

Sheikh, M.I. (1972) compared the growth and survival of different poplar clones planted at Jallo. After 2 years, out of the 14 clones put to test, the first 4 clones in order of height attainment, and diameter growth turned out to be I-72/51 (12.6 m), I-63/51

(12.0 m), I-69/55 (11.6 m) and I-90/60 (11.2 m). Diameter growth showed almost the same pattern and ranged between 15-16 cms at breast height. The survival percentage was I-72/51 (80 %), I-63/51 (79 %), I-69/55 (100) and I-90/60 (100).

Sheikh and Hussain (1972) while reporting the interim results of poplar clonal trial in Pakistan pointed out that P.E. Sacrau cv. 79/234 showed the best rate of growth; others like *P. deltoides* I-63/51 and I-18/62 also proved to be quite good. However, they recommended large scale planting of P×E cv. I-214 in the North and the *deltoides* clones in the southern parts of the country.

Sheikh (1974) described the results of clonal trials of poplar laid out in Changa Manga irrigated plantation in March, 1970 using 3 clones viz. *P. deltoides* cv. I-63/51, *P. euramericana* cv. I-214 and *P. euramericana* cv. I-021. Statistical analysis of the data indicated that *P. deltoides* cv. I-63/51 was the best both in diameter and height followed by *P. euramericana* cv. I-214 and *P. euramericana* cv. I-021. Difference in height as well as in diameter were statistically significant. However, there was one serious snag in I-63/51; only 75% plants survived in the first year against 99% of hybrid and had to be replanted next year.

Sekawin (1971) reported the results of tests conducted on some new poplar clones selected in Italy. He tested cuttings for rooting ability and was of the view that it was based on many endogenous and exogenous factors. He concluded that so far as survival of planting in field was concerned, it depended strongly on the amount of rainfall received in spring. Out of the *deltoides* clones tested viz. *Populus deltoides* I-63/51, I-72/51, I-77/51 and I-68/55, the clone I-72/51 gave the highest survival (93%) when planted in the field in the spring. Out of the hybrids (I-72/58, I-BL, CB-2, I-37/61, I-214) clone I-BL gave the highest survival (97%). So far as growth was concerned I-63/51 gave the maximum diameter (33.7 cm) over a period of 9 years followed by 33.4 cm, 33.3 cm, and 31.8 cm for I-77/51, I-214 and I-69/55 respectively. Also all the four clones of *Populus deltoides* were found to be resistant to *Marsonina brunnea* the dreaded fungus causing total defoliation. I-63/51 showed the best results when put to test for plywood, whereas clone I-69/55 showed better grain quality.

Materials and Methods. This study was laid out on a roadside plot falling within a radius of about 14 kilometres from Peshawar (34°—2' N). The area having clayey loam soil, 7.5 pH and an average annual rainfall of 300 mm was being used as a forest nursery. To make it fit for planting with poplars all roots and stumps were dug out. The soil was thoroughly worked by ploughing upto 0.3 m depth with a mould board plough. *Trifolium alexandrinum*, a leguminous fodder crop was grown to improve the soil structure. Pits, 0.5 m in depth and 0.7 m in radius were dug at 6×6 m spacing. 1-year old plants of the following clones raised at the Pakistan Forest Institute nursery were planted on February 12, 1973, making sure that the plants were planted the same day they were uprooted from the nursery:

<i>Populus deltoides</i>	.. I-72/51
—do—	.. I-63/51
—do—	.. I-90/60
—do—	.. I-18/62
—do—	.. I-69/55
<i>P. euramericana</i>	.. I-214

Planting was followed by flow irrigation. In all, sixteen irrigations were given during one growing season. Survivals were recorded on 8-8-1973 as under:

Table 1

Percentage of survival of different Poplar clones planted on Feb. 12, 1973

Sl. No.	Name/number of the clones (Treatments)	Number planted	Number surviving	Percentage of survival	Remarks
1.	<i>P. deltoides</i> I-72/51	50	48	96	Salts appeared in cer-
2.	„ I-63/51	50	48	96	tain patches after irri-
3.	„ I-90/60	50	49	98	gation which caused
4.	„ I-18/62	50	46	92	subsequent death of
5.	„ I-69/55	50	50	100	some plants although
6.	<i>P. euramericana</i> I-214	50	49	98	initial sprouting was 100%.

No casualties were recorded during subsequent inspections. Restocking was not done as due to preponderance of salts even the agricultural crop grown for intercultivation did not survive in these particular patches.

Collection of Data. Height and diameter measurements were taken upto the end of December, 1976, the time when the crop was finally harvested after completing four growing seasons. These are given as under:

Table 2

Comparative statement of diameter and height growth (Means)

Clone No. (Treatments)	Date of measurement 26-4-1973		Date of measurement 14-1-1974		Date of measurement 13-12-1974		Date of measurement 9-12-1976	
	Diameter (cm)	Height (m)	Diameter (cm)	Height (m)	Diameter (cm)	Height (m)	Diameter (cm)	Height (m)
<i>P. deltooides</i> I-72/51 (T ₁)	—	3.4	4.3	4.4	8.6	9.6	18.8	16.37
<i>P. deltooides</i> I-63/51 (T ₂)	—	3.8	5.3	5.2	10.4	11.9	22.2	17.77
<i>P. deltooides</i> I-90/60 (T ₃)	—	3.0	3.8	4.3	9.1	8.2	19.0	16.19
<i>P. deltooides</i> I-18/62 (T ₄)	—	2.9	3.8	4.1	10.2	8.8	19.1	13.43
<i>P. deltooides</i> I-69/55 (T ₅)	—	3.8	4.3	4.5	10.9	11.3	18.2	16.18
<i>P. euramericana</i> I-214 (T ₆)	—	4.1	5.1	5.0	11.4	9.2	21.5	16.85

At the time of felling, volume of different clones was recorded. There were four replications and 6 treatments (clones) in all. Four trees were selected at random from each of the 24 plots for calculating the volume.

Table 3

Average volume per tree (m^3)

Replications	Treatments					
	T ₁ (72/51)	T ₂ (63/51)	T ₃ (90/60)	T ₄ (18/62)	T ₅ (69/55)	T ₆ (I-214)
I	0.1676	0.2667	0.2492	0.1582	0.0974	0.3591
II	0.2902	0.4579	0.3112	0.2158	0.2265	0.2886
III	0.1960	0.2993	0.2659	0.1826	0.2146	0.2478
IV	0.2764	0.3296	0.1325	0.2056	0.2546	0.2475
Clones Total	0.9302	1.3535	0.9588	0.7622	0.7931	1.1430
Mean of clones	0.2326	0.3384	0.2397	0.1906	0.1983	0.2858

Statistical analysis of data: *Height growth:* Analysis showed that all the clones were highly significant (1 % level) from I-18/62 which was found to be the poorest performer. however, rest of the five clones did not differ amongst themselves. Ranking in order of merit is given below:

Clone	Average height (metres)
I-63/51	17.7
I-214	16.85
I-72/51	16.37
I-90/60	16.19
I-69/55	16.18
I-18/62	13.43

Diameter growth: Analysis did not show superiority of any clone over the other. Average diameter attained by different clones are given below in order of merit:

Clone	Average dia (cms)
I-63/51	22.2
I-214	21.5
I-18/62	19.1
I-90/60	19.0
I-72/51	18.8
I-69/55	18.2

Volume growth: Statistical analysis showed that I-63/51 was highly significant (1% level) from I-18/62 and I-69/55 and significant 5% level from I-72/51 and I-90/60. It, however, was not significant from I-214, the latter being significantly different from I-18/62 and I-69/55. Clone I-63/51 is the best followed by I-214 in volume growth. Ranking in order of merit is given below:

Clone	Average volume (m^3)
I-63/51	0.3384
I-214	0.2858
I-90/60	0.2397
I-72/51	0.2326
I-69/55	0.1983
I-18/62	0.1906

Conclusion. Analysis of data clearly indicates that *P. deltoides* I-63/51 out-performed the rest of the clones. This clone too, therefore, should be planted in Peshawar valley where the main emphasis so far has been on *P. euramericana* I-214. Almost cent percent survival after planting should alleviate the fear of low rootability of the deltoides clones. This standard of success can be easily maintained provided all planting operations are completed by the middle of February.

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