



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(1): 1040-1042
Received: 26-11-2018
Accepted: 29-12-2018

Shikha Thakur
Department of Vegetable
Science, Narendra Deva
University of Agriculture &
Technology, Kumarganj,
Faizabad, Uttar Pradesh, India

Sanjeev Thakur
Department of Tree
Improvement and Genetic
Resources, College of Forestry,
Dr. Y S Parmar UHF, Nauni,
Solan, Himachal Pradesh, India

SK Jha
Department of Forest Biology
and Tree Improvement, College
of Forestry, ACHF, Navsari
Agricultural University, Navsari,
Gujarat, India

Correspondence
Shikha Thakur
Department of Vegetable
Science, Narendra Deva
University of Agriculture &
Technology, Kumarganj,
Faizabad, Uttar Pradesh, India

First year growth variation in some selected clones of *Populus deltoides* in Himachal Pradesh

Shikha Thakur, Sanjeev Thakur and SK Jha

Abstract

The present study was conducted to evaluate early growth performance of 33 local clones of *Populus deltoides* under mid hills conditions of Himachal Pradesh. The clones were procured from clonal selections from various sources from India as well as many hybrids were prepared and planted under Randomized Block Design (RBD) in experimental farm of Dr. Y S Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh. One year growth was recorded and analyzed for height, diameter and genetic parameters. Significant variation was recorded for diameter and height growth among different clones. Both diameter and height growth traits showed moderate values for heritability and genetic advance indicating good scope of early selection for these traits in these clones. Clones OP-8, FS-74 and HYB-3 were found best in terms of evaluated traits.

Keywords: *Populus deltoides*, heritability, genetic advance, clones

1. Introduction

Globally, one can find various fast growing species (Bamboos, Eucalyptus, Quaking Aspens, Willows, Hybrid Poplar and so on) raised for industrial wood in plantations. Poplars occupy a small geographical area at national level but they make unique contribution to socio-economy and ecology of regions of their occurrence. Due to high growth rate of these trees their importance in people's livelihood far exceeds than their geographical extent. One of the most important fast growing Poplars is *Populus deltoides* (commonly known as Eastern Cottonwood). It is one of the fast growing species in the world. It ranges from Eastern, Southern and mid- Western USA and Southern Canada to the foothills of the Rocky Mountains (i.e. throughout warm temperate to cool temperate regions of the world). It extends latitudinally from 28° to 36° N and longitudinally from 70° to 100° W.

Poplar (*Populus deltoides*) is a fast-growing tree species has been extensively planted in many countries. In addition to growing in plantations for wood production, poplar is also planted in Agroforestry systems especially as a fast-growing windbreak and/or an extra income stream for farmers. A number of researches have documented the rise of poplar-based Agroforestry in India where research on the tree began back in the 1950s. Devender Chahal *et al.* (2012) [2] consider poplar a good choice for Agroforestry systems due to various reasons namely; its little shading effect on crops, it adds to soil fertility through its leaf litter, a wide variety of commonly planted crops e.g. wheat, oat, sorghum, maize, etc. can be grown as inter-crops and yield loss in the inter-crops may be compensated for by the sale of poplar wood at the end of the rotation.

The cultivation of poplar has generated huge employment in the rural sector in India and has overall improved the rural economy (Chandra, 2011) [1]. Raina *et al.* (2011) [7] echo the benefits of poplar cultivation which has also created a wood industry providing cheaper products to consumers, and reducing India's wood import. Along with clonal eucalypts, poplars are seen as the 'green gold' of the countryside (Raina *et al.*, 2011).

Due to increasing popularity of the clones of *Populus deltoides* because of their short rotation and attractive price of wood, a large number of farmers have planted commonly known clones on their farm. Variability studies in trees are very important for their survival, good growth as well as for adaptation (Sharma *et al.*, 2018) [8]. Keeping in view the uses of its poplar wood for famers and industries as well as the importance of this tree as an Agroforestry species, we carried out variability studies in growth parameters in nursery raised trial in Dr. Y S Parmar University of Horticulture and Forestry, Nauni, Solan (HP), India.

2. Material and Methods

Thirty three *P. deltoides* clones from the large germplasm bank of poplar at Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan, India have been evaluated for

variability in height and diameter growth in initial stage. Clones were grown in Randomized Complete Block design with three blocks. The descriptions of the clones are given in

table 1. The analysis of data for ANOVA and variance component partitioning were carried out in JMP 9.0 software (SAS Institute Inc., Cary, NC).

Table 1: Description of thirty three *P. deltoides* clones used in present study

Sr. No.	Clone	Description	Method of development
1	SOLAN-2	Univ. of Horticulture & Forestry, Solan (HP)	Hybrid
2	126/86	Lalkuan, Uttarakhand	Clonal selection
3	HYB-3	Univ. of Horticulture & Forestry, Solan (HP)	Hybrid
4	PD- 48	Rohru Clonal selection (HP)	Clonal selection
5	42-N	Nalagarh Clonal selection (HP)	Clonal selection
6	RANIKHET	Ranikhet (Uttarakhand)	Clonal selection
7	154/86	Lalkuan, Uttarakhand	Clonal selection
8	52/85	Lalkuan, Uttarakhand	Clonal selection
9	47-N	Nalagarh Clonal selection (HP)	Clonal selection
10	36-N	Nalagarh Clonal selection (HP)	Clonal selection
11	60-N	Nalagarh Clonal selection (HP)	Clonal selection
12	L-80	Lalkuan, Uttarakhand	Clonal selection
13	FS-65	L-34/82 X G-3	Hybrid
14	FS-71	L-34/82 X G-3	Hybrid
15	FS-35	110702 X S7C20	Hybrid
16	FS-74	L-49 X G-3	Hybrid
17	L-153	Lalkuan, Uttarakhand	Clonal selection
18	L-70	Lalkuan, Uttarakhand	Clonal selection
19	FS-24	110702 X 113324	Hybrid
20	22/86	Lalkuan, Uttarakhand	Clonal selection
21	200/85	Lalkuan, Uttarakhand	Clonal selection
22	PD-90	Rohru Clonal selection (HP)	Clonal selection
23	200/86	Lalkuan, Uttarakhand	Clonal selection
24	SOLAN-1	Univ. of Horticulture & Forestry, Solan (HP)	Hybrid
25	FRI-PD-OP-9	Open pollinated seed of L-34/84 (Uttarakhand)	Clonal selection
26	OP-30	Open pollinated seed of D-171 (Uttarakhand)	Clonal selection
27	OP-32	Open pollinated seed of L-200/84 (Uttarakhand)	Clonal selection
28	FRI-PD-OP-10	Open pollinated seed of L-34/84 (Uttarakhand)	Clonal selection
29	OP-34	Open pollinated seed of L-200/84 (Uttarakhand)	Clonal selection
30	OP-8	Open pollinated seed of L-34/84 (Uttarakhand)	Clonal selection
31	OP-33	Open pollinated seed of L-200/84 (Uttarakhand)	Clonal selection
32	40-N	Nalagarh Clonal selection (HP)	Clonal selection
33	H-16	Univ. of Horticulture & Forestry, Solan (HP)	Hybrid

3. Results and discussion

Both the trait under study showed significant variation due to clonal difference (Table-2). The clonal height ranged between 1.35 to 4.67 m with an average value of 3.49 m (Fig-2) and the basal diameter ranged between 15.05 to 44.61 mm with average values of 29.50 mm (Fig-2). The highest value (4.67 m) for initial height observed in clone 52/85 (Lalkuan selection) followed by OP-32, OP-8, 200/85, HYB-3, FS-71, FS-74, 154/86, FRI-PD-OP9 and L-70 whereas maximum

basal diameter (44.61 mm) showed by 40-9 followed by OP-8, FS-74, HYB-3, H-16 and 22/86.

Table 2: Analysis of variance table showing significance for the variation in height and diameter due to *P. deltoides* clones.

Characters	df	Mean Square	F Ratio	Prob > F
Height	32	1.374	2.380	0.002
Diameter	32	79.374	1.926	0.013

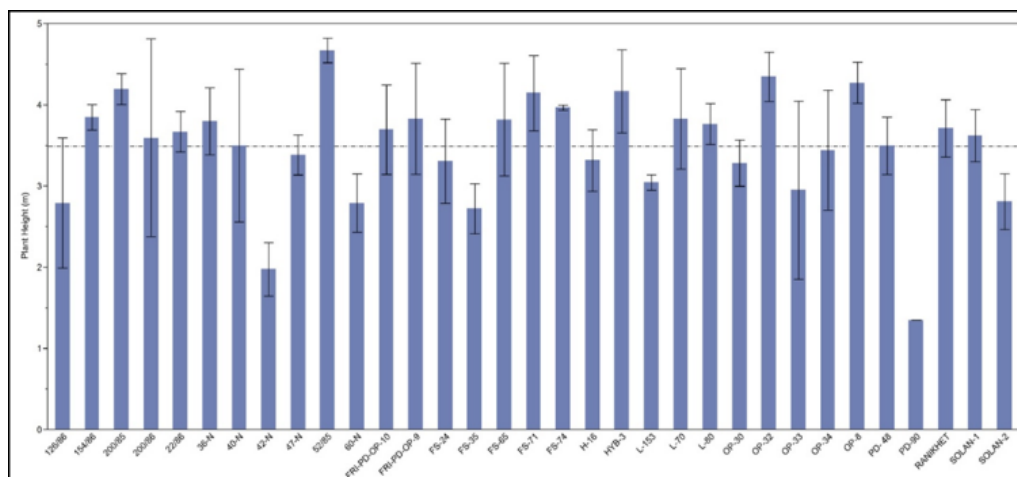


Fig 1: First year height variation in thirty three selected *P. deltoides* clones (dotted line shows overall mean of all thirty three clones).

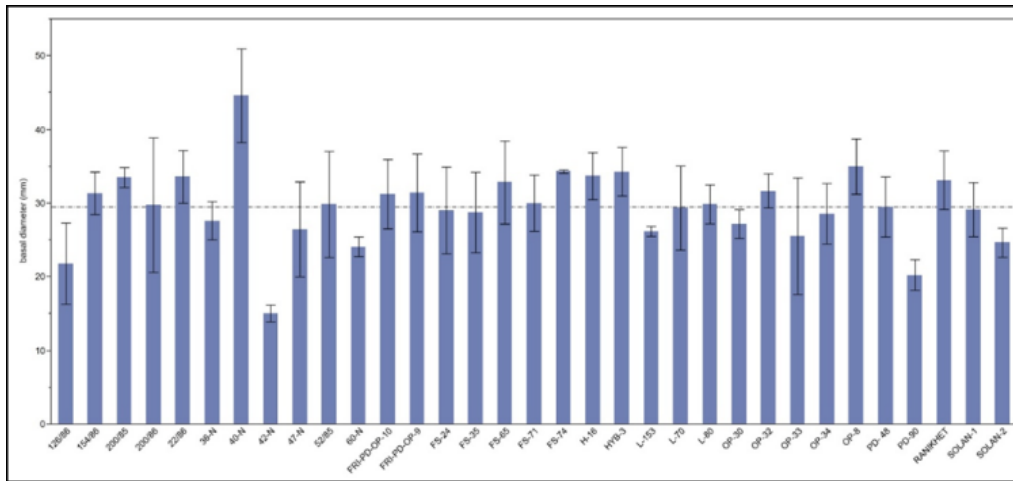


Fig 1: First year basal diameter variation in thirty three selected *P. deltoides* clones (dotted line shows overall mean of all thirty three clones)

Perusal to table-3 shows that in initial years, environment has much influence on height and diameter of selected clones. The environmental variance was higher as compared to genotypic variance for both the characters resulting in higher ECV as compared to GCV. The heritable value was observed lower in diameter as compare to height. Height is generally more influenced by environment however moderate genetic gain observed for both the characters.

The variation in growth parameters has also been reported in tree species by Kumar *et al.* (2010) [5] in *Eucalyptus tereticornis*, Prasad *et al.* (2011) [6] in *Leucaena leucocephala* and by Jayraman and Rajan (1991) [3] in *Eucalyptus auriculiformis*. Many scientists reported the existence of significant differences and superiority of few seed sources, open pollinated families and provenances in tree species like *Lagerstroemia* spp. (Jamaludheen *et al.*, 1995) [4] in different age gradations which lend support to the current findings in clones of *Populus deltoides*.

Table 3: Genetic parameters for height and diameter in *P. deltoides* clones

Genetic parameters	Height (m)	Diameter (mm)
V _g	0.27	12.72
V _e	0.58	41.22
V _p	0.84	53.94
GCV (%)	7.61	43.11
ECV (%)	16.54	139.73
PCV (%)	24.15	182.84
Heritability	0.32	0.24
Genetic Gain	0.60	3.57
Genetic Advance (%)	17.07	12.09

4. Conclusions

In conclusion, clones OP-8; a clonal selection from Uttarakhand, FS-74; a hybrid clone from Lalkuan and HYB-3; a hybrid from Solan (Himachal Pradesh) can be selected for short rotation end uses like wood based industries mainly plywood industry.

5. Acknowledgement

All the authors acknowledge the earlier efforts of Dr D.K. Khurana and Dr N.B. Singh for their earlier meticulous effort for polar improvement, collection of germplasm and establishing clonal bank at Dr Y S Parmar University of Horticulture and Forestry, Nauni, Solan, India.

6. References

- Chandra JP, Chauhan SK, Sharma R, Garg RK, Singh K, Saralch HS. Development of poplar based agroforestry system. *Indian Journal of Ecology*. 2011; 38:11-14.
- Devender Chahal, Afzal Ahmad, Bhatia JN. Assessment of agroforestry based two-tier-cropping system in Ambala district of Haryana. *Agriculture Update*. 2012; 7(3):210-213.
- Jairaman K, Rajan AR. Yield from *Acacia auriculiformis* plantation in Kerala. *KFRI Research Report*. 1991; 81:21-25.
- Jamaludheen V, Gopikumar K, Sudhakara K. Variability studies in *Lagerstroemia* (*Lagerstroemia speciosa*. Pers.), *Indian Forester*. 1995; 121(2):137-141.
- Kumar A, Luna RK, Kumar V. Variability in growth characteristics for different genotypes of *Eucalyptus tereticornis*(SM.) *J Forest Res*. 2010a; 21:487-91.
- Prasad JVNS, Korwar GR, Rao KV, Mandal U. Optimum stand density of *Leucaena lucocephala* for wood production in Andhra Pradesh, South India. 2001; 35(1):227-235.
- Ranjit Raina, Hara SS, Hara V, Irland LC. Twenty-first century forest plantations: development of agroforestry in Haryana. *Journal of Resources, Energy and Development*. 2011; 8(2):67-74.
- Sharma D, Kumar A, Thakur S, Sagar N. Initial growth performance of improved genotypes of *Melia dubia* in low hills of Himachal Pradesh. *International Journal of Chemical Studies*. 2018; 6(6):1847-1849.