Asian Jr. of Microbiol. Biotech. Env. Sc. Vol. 25, No. (3) : 2023 : 414-417

ISSN-0972-3005

DOI No.: http://doi.org/10.53550/AJMBES.2023.v25i03.004

CPTS SELECTION AND PROGENY TESTING IN *MELIA COMPOSITA*

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(Received 10 January, 2023; Accepted 9 March, 2023)

Key words: *Melia composita, Plus trees, Progeny testing and Variability.*

Abstract– Twenty five superior candidate plus trees (CPTs) of *Melia composita* were selected through an intensive survey from Haryana, Punjab and Uttrakhand. The trees were selected on the basis of the different characters of economic importance viz. straightness, clear bole height, self-pruning ability, acute branch angle etc. Among all the plus trees the maximum tree height was reported in MC21 (17.9 m) whereas the minimum was reported in MC3 (6.5 m). Highly significant and positive correlation (r = 0.941) was obtained between the tree height and other morphological characters viz. clear bole height, girth at breast height, crown spread etc. with optimum amount of variability among different progenies for various characters. Further, the progeny performance also provided a huge amount of variability which may be helpful in identifying superior plus trees for further scientific improvements of this versatile tree species.

INTRODUCTION

As the global warming is progressing the distribution and composition of various forest tree species are expecting a great change. According to the Indian scenario, it has been predicted that the distribution range and diversity will decrease drastically over the sun-continent region (NIFS, 2014 and Park *et al.,* 2016). The assisted migration and adoption of alternative tree species is specifically suggested as an important counter measure against the conquering effects of global warming (Williams and Dumroese (2013). Moreover, the extraction of important materials may be from leaves, barks, branches, flowers etc. has also opened a great vistas for the new species. Currently tree improvement programs are the most required need of hour to meet the growing domestic as well as global demands of wood and wood based products which is estimated to reach to 13.2 million tonnes till 2022 in India (Palsaniya *et al.,* 2009).

Breeding programs of the timber based species relies over the identification of the best quality of parents. This will help to create a diverse genetic base for the improvement of the commercially more desirable varieties. Therefore, for any such activity desirable trees are found in natural forest conditions and the tree may exhibit superior traits relative to the neighboring trees of the same species (Clark and Wilson, 2005). These selected trees are referred to as the superior phenotypes of plus trees. Therefore, the plus tree selection is the first step for any tree improvement programme (Hooda *et al.,* 2009; Kaushik *et al.*, 2011 and Kumar, 2012).

Melia composita commonly known as 'Burma Dek' is a deciduous tree species which is native to Indian sub-continent but now it has been witnessed growing in many different regions throughout the globe (Murugesan *et al.*, 2013 and Johar *et al.*, 2016). The species bears a wide range of adaptability and can be easily propagated in areas with an average rainfall of 350-2000 mm upto an altitude 1800 msl with an average temperature range of 23-27 ^{o}C. *Melia composita* can be easily cultivated on a variety of soils, however, deep fertile sandy loam soils supports the best growth for the versatile species (Orwa *et al.,* 2009). *M. composita* is basically desired for its high quality fungus and termite resistant timber (Swaminathan *et al.,* 2012) as *Eucalyptus, Populus* and *Casuarina spp.* are more susceptible to the attack of pest and diseases (Anand *et al.,* 2012). Being such an important versatile species with high values, required efforts have not been made for its genetic improvement. Therefore, in present study an attempt has been made to carry out the progeny testing of superior plus trees to boost the breeding activities of *Melia composita.*

MATERIALS AND METHODS

An intensive survey was carried out in to select the desirable plus trees of *Melia composita* in the different agro-climatic regions of Haryana, Punjab and Uttrakhand during January-March, 2022. The selection of the superior plus trees was made on the basis of the phenotypic assessment of desirable characters of economic interest such as tree height, clear bole height, girth at breast height etc. The total of twenty-five morphological superior trees was selected and sufficient amount of good quality ripened fruits was collected. The collected fruits were depulped and seeds were properly washed with tap water and were further air dried at room temperature for 2-3 days. After washing and drying, the seeds were kept in cotton cloth bags and were stored at room temperature.

For each progeny (25), polythene bags of size 22 x 10 cm were filled properly with an equal proportions of FYM: dune sand: clay (1:2:1) and were arranged randomly in four different blocks in nursery at Lovely Professional University, Phagwara (Punjab). Two seeds per bag were sown during the 2nd week of March and immediately after filling bags were irrigated properly with help of hand garden sprinkler to maintain a proper moisture levels. Regular weedings were also carried out to overcome the incidence of unwanted weeds in the nursery seed bags. The data pertaining to germination percentage, shoot length, root length, collar diameter and plant biomass were recorded at regular intervals of plant growth.

RESULTS AND DISCUSSION

The height of the selected trees varied from 6.5 m (MC3) to 17.9 m (MC21) with an average height of 11.1 m. Similarly, the clear bole height also varied from 3.0 m (MC3) to 8.6 m (MC21) with an average value of 5.0 m. Therefore, it can be clearly marked that the trees selected in present study had a fairly good straightness and were also reported to have a desirable clear bole length which is required for the

Table 1. Morphological characters of selected plus trees of *Melia composita*

Accession No.	Latitude & Longitude	Tree height (m)	Clear bole height (m)	GBH (cm)	Clear bole height: Total height ratio	Height : GBH ratio	Crown Spread (m)	
							N-S	E-W
MC1	29.5050° N & 75.3070° E	8.2	3.9	60.9	0.48	0.13	4.8	4.7
MC2	29.5050° N & 75.3070° E	8.6	4.2	68.4	0.49	0.13	5.2	4.8
MC3	29.5460° N & 75.9318° E	6.5	3.0	65.3	0.46	0.10	4.5	4.4
MC4	29.5460° N & 75.9318° E	6.7	3.2	70.4	0.48	0.10	4.8	4.8
MC5	30.0343° N & 76.8079° E	8.8	4.6	90.4	0.52	0.10	5.3	4.9
MC6	30.5271° N & 75.5684° E	8.5	3.7	75.7	0.44	0.11	5.1	4.7
MC7	30.3819° N & 75.5468° E	11.2	4.5	88.4	0.40	0.13	5.4	4.9
MC8	30.7614° N & 75.6499° E	9.9	4.5	85.6	0.45	0.12	5.4	5.2
MC9	30.8028° N & 75.6310° E	12.5	4.7	90.1	0.38	0.14	5.9	5.7
MC10	30.9010° N & 75.8071° E	10.9	4.9	85.4	0.45	0.13	4.8	4.6
MC11	30.9010° N & 75.8071° E	8.6	4.2	71.5	0.49	0.12	5.2	5.1
MC12	30.9010° N & 75.8071° E	9.5	4.4	76.8	0.46	0.12	4.7	4.9
MC13	30.3518° N & 78.0095° E	17.2	8.4	175.7	0.49	0.10	8.2	7.1
MC14	30.71769 °N& 77.8674 °E	10.5	4.5	126.1	0.43	0.08	4.9	4.8
MC15	30.3340° N & 77.9602° E	10.7	5.0	137.6	0.47	0.08	4.8	4.6
MC16	30.3450° N & 78.0894° E	13.5	6.5	144.7	0.48	0.09	7.4	7.2
MC17	30.2497° N & 77.9810° E	14.7	6.9	145.8	0.47	0.10	7.5	7.1
MC18	30.2662° N & 78.1062° E	10.6	4.2	110.5	0.40	0.10	5.2	5.0
MC19	30.2662° N & 78.1062° E	11.5	5.1	99.8	0.44	0.12	6.3	6.0
MC20	30.3898° N & 78.1058° E	10.6	4.8	92.8	0.45	0.11	4.8	4.6
MC21	30.3579° N & 78.1066° E	17.9	8.6	180.8	0.48	0.10	8.3	7.4
MC22	30.3579° N & 78.1066° E	11.9	5.4	165.2	0.45	0.07	6.7	6.4
MC23	30.3579° N & 78.1066° E	15.6	7.4	160.7	0.47	0.10	7.9	7.5
MC24	30.3220° N & 78.0866° E	11.8	3.7	99.9	0.31	0.12	6.4	6.1
MC25	30.3220° N & 78.0866° E	12.9	5.8	132.5	0.45	0.10	6.8	6.7
Range		6.5-17.9	3.0-8.6	60.9-180.8	0.31-0.52	0.07-0.14	4.5-8.3	4.4-7.5
Mean		11.1	5.0	108.0	0.45	0.11	5.8	5.5

good marketability of timber. Concomitantly, Chauhan *et al.* (2012); Meena *et al.* (2014; 2016) and Johar *et al.* (2016) also reported that the straightness, total height and the clear bole height coupled with the lower values of crown spread are desirable for an ideal agroforestry tree species. Similarly, the data presented in Table 1 shows that the girth at breast height for the superior plus trees varied from 60.9 to 180.8 cm, respectively which is again a good character for the selection of plus trees from the commercial point of view. From the correlation analysis (Table 2), it was reported that the clear bole height had positive and highly significant association with the tree height (r = 0.941) closely followed by crown spread (N-S direction) (r = 0.910). Similar, Johar *et al.* (2016) also reported a highly significant and positive correlation (r = 0.522) among the different progenies of *Melia composita* for different morphological characters viz. height, clear bole height, GBH etc.

Table 2. Correlation coefficient among different traits of plus tees of *Melia composita*

	Tree height	Clear bole height	GBH	Clear bole height: Total height ratio	Height : GBH ratio	Crown Spread (N-S)	Crown Spread (E-W)
Tree height		0.941**	0.876**	-0.037^{NS}	-0.212^{NS}	0.910**	0.876**
Clear bole height			0.875**	0.300^{NS}	-0.302^{NS}	0.890**	0.849**
GBH				0.107^{NS}	-0.643**	0.835**	0.815**
Clear bole height: Total height ratio					-0.267^{NS}	0.068^{NS}	0.045^{NS}
Height : GBH ratio						-0.268^{NS}	-0.287^{NS}
Crown Spread(N-S)							0.982**
Crown Spread(E-W)							

** Significant at 5 per cent

Table 3. Mean performance of the progenies of *Melia composita* for emergence and seedling characters

Accession code	Germination (%)	Shoot length (cm)	Root length (cm)	Root : Shoot ratio	Collar diameter	Plant biomass
MC1	6.00	32.77	12.07	0.37	5.34	1.96
MC2	6.67	31.89	10.90	0.34	5.58	1.97
MC3	25.33	48.49	16.78	0.35	7.10	2.06
MC4	6.33	28.33	12.20	0.43	5.22	1.99
MC5	7.00	30.04	11.68	0.39	4.89	2.04
MC6	19.33	44.97	18.43	0.41	7.90	2.06
MC7	26.00	47.39	19.28	0.41	6.85	2.22
MC8	24.00	49.35	19.10	0.39	7.41	2.37
MC9	7.00	27.35	12.00	0.44	6.17	1.96
MC10	16.33	73.69	16.47	0.22	7.33	3.00
MC11	21.33	64.07	17.64	0.28	8.52	2.48
MC12	29.33	64.73	20.84	0.32	7.03	2.69
MC13	26.33	60.33	20.06	0.33	7.81	2.48
MC14	30.67	70.63	17.98	0.25	9.74	2.65
MC15	31.67	82.46	20.39	0.25	11.65	3.25
MC16	22.00	87.60	17.52	0.20	9.85	3.35
MC17	19.00	85.87	18.22	0.21	13.73	3.24
MC18	23.00	98.39	16.87	0.17	11.75	3.46
MC19	17.67	70.84	18.32	0.26	11.82	2.88
MC20	28.00	67.01	17.63	0.26	10.97	2.53
MC21	26.00	76.86	19.77	0.26	11.65	3.08
MC22	27.33	84.12	20.46	0.24	9.60	3.27
MC23	28.67	79.33	18.45	0.23	9.02	3.07
MC24	30.33	69.87	18.93	0.27	10.84	2.79
MC25	29.67	82.43	19.82	0.24	10.90	3.15
Mean	21.4	62.35	17.27	0.30	8.75	2.64
CD (p=0.5)	2.94	6.93	1.66	0.02	1.37	0.39

The performance of the *Melia composita* progenies for emergence and seedling characters also varied significantly for their mean performance (Table 3). The data revealed that the highest germination percentage was reported in the progenies from plus tree MC15 (31.67 per cent) followed by the progenies from MC14 (30.67 per cent) and MC24 (30.33 per cent), respectively. However, the progenies from plus tree MC1 displayed the poor germination percentage i.e. 6.00 per cent which may be due to inferior genotype or may be due to non-acclimatization of the progeny in new environment. Similarly, the progenies from MC18 portrait the maximum shoot length, i.e. 98.59 cm followed by the progenies from MC16 and MC 17 plus trees, respectively. However, the maximum root length was observed in the progenies from MC12 (20.84 cm) closely followed by the progenies from MC22 (20.46 cm) and MC13 (20.06 cm). Whereas, the minimum root length was observed for the progenies from MC2, i.e. 10.30 cm. Similar, results were also reported for the collar diameter and plant biomass at the age of six months which clearly shows a huge diversity among the different progenies from the selected plus trees. Therefore, the findings from the present study would be highly helpful in selecting the desirable superior plus trees for the further development of new varieties and genotypes which would help the growers to higher profits and in upliftment of their socio-economic status.

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