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Interaction Effects of Growth Media, Container Size and Types on the nursery performance of *Melia azedarach* Linn.

JA Mugloo, SH Veerapur, R Banyal, PA Khan and Amir Farooq

Faculty of Forestry, Sher-e-Kashmir University of Agricultural Sciences & Technology, Benhama, Ganderbal E-Mail:drbanyal08@gmail.com

Key words:

Container size, dickson's quality index, growth media, Melia azederach,

ABSTRACT

Quality planting stock is considered the key element for success of any afforestation program. To achieve the said goal, the present investigation was carried out at the nursery site of Faculty of Forestry, SKUAST-K, Shalimar for sorting the container type, size and growing medium to produce the quality planting stock. The interaction effect of container type and growing medium significantly influenced all the parameters of M. azedarach seedlings. The root trainer with the combination of M4 (Soil: Sand: FYM: Dalweed :: 2:1:2:1) was recorded maximum in collar diameter (2.73 mm), fresh root weight (1.41 g), dry root weight (0.35 g), total seedling dry weight (.082 g), Dickson's quality index (0.070), whereas polythene bag with the combinations of M4 (Soil: Sand: FYM: Dalweed :: 2:1:2:1) was recorded maximum in height (30.11), fresh shoot weight (2.32 g), total seedling fresh weight (3.18 g) and dry shoot weight (0.62 g). The combination of root trainer (300 cc) and growing medium (Soil: Sand: FYM: Dalweed) in the ratio of 2:1:2:1 by volume proved best among all the tested combination to have the quality nursery stock of Melia azedarach.

INTRODUCTION

Melia azedarach Linn. being one of the broad leaved species is commonly known as Persian Lilac and is the best known representative of family Meliaceae after *Azadirachta indica* (Neem). The specific name is from Persian, 'Azad darakht' (Turnbull 1986). Often got confused with Neem, Persian Lilac is thought to be indigenous to Kashmir (Seth et al. 1962). In Kashmir it is locally called as Dranka Kul, Zahar Kul etc. Persian Lilac is a tree of subtropical climate but has been cultivated in the low temperature also. In Kashmir, it has been successfully planted to afforest bare-southern and south western slopes of the Shankaracharya hill in Srinagar (Luna 1995).

Raising quality seedling requires technical skills including careful planning for all the major components such as quality seed, appropriate growing media, containers, nursery hygiene and protection. Potting mixture is the most important ingredient for raising seedlings in containers in nursery. Apart from the selection of proper ingredients, it is necessary to maintain the porosity of potting mixture so that the proper developments of roots take place (Shrivastava et al. 1998). As a result site and species specific work is required to

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be done for developing a proper potting mixture. Therefore, an attempt has been made to find out the appropriate media, container size and type to raise the quality planting material of *M. azedarach* Linn.

MATERIAL AND METHODS

The study was conducted in Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar under nursery conditions. The experimental site is located between 34.08°N latitude and 74.83°E longitude at an elevation of 1587m amsl. The soil of the nursery is well drained and has good irrigation facility. Five growing media viz., M_0 : Soil (control), M_1 : Soil:Sand:FYM (1:1:1), M_2 : Soil: Sand: FYM (2:1:1), M₂: Soil: Sand: FYM:Dalweed (2:1:1:1), M₄ : Soil: Sand: FYM: Dalweed (2:1:2:1) was tested along with two container size and types viz., root trainers (three size) : 150cc, 250cc and 300cc and polythene bags made up of three equal volume as that of root trainers (150cc, 250cc and 300cc). The experiment was laid out in CRD (factorial) (Completely Randomized Design). The experiment was replicated 3 times. The detail of treatment combination is given in the table 1.

After completion of experiment, observations related to growth (height and collar diameter) were recorded. For biomass attributes (fresh shoot, fresh root, total seedling fresh weight, dry shoot, dry root and total seedling dry weight) five seedlings per replication were taken and cut at collar region to record the observations. The other parameters such as root: shoot ratio, Sturdiness quotient was calculated by dividing the seedling height (cm) by collar diameter (mm) as described by Roller (1977). Dickson's quality index assessment was made by using the formula given by Dickson et al. (1960).

Quality Index (Q.I.) =	Seedling dry weight (g)
	[Height of seedling (cm)/
	Diameter of seedling (mm)]
	+ [top dry weight (g) + root
	dry weight (g)]

The results obtained from above experiment were subjected to analysis of variance and tested for significant differences.

RESULTS AND DISCUSSION

The interaction effect of container size and growing medium was found significant in respect of seedling height, collar diameter, fresh shoot weight, fresh root weight, total seedling fresh weight, dry shoot weight, dry root weight and total seedling dry weight (Table 2). The parameters namely seedling height, fresh shoot weight, fresh root weight, total seedling fresh weight, dry shoot weight, dry root weight and total seeding dry weight gained maximum values in the treatment combination of S₂M₄ (container size 300cc- Soil: Sand : FYM : Dal weed :: 2:1:2:1), whereas, collar diameter was found highest in S₃M₃ (container size 300 cc- Soil: Sand : FYM : Dal weed :: 2:1:1:1). PM₄ (Polythene bag-Soil: Sand: FYM: Dal weed :: 2:1:2:1) recorded maximum values for total seedling weight, fresh shoot and dry shoot weight, whereas RM₄ (Root trainer – Soil : Sand : FYM : Dalweed :: 2:1:2:1) recorded maximum values for total seedling dry weight, dry shoot and root weight (Table 3). The interaction effect of container type and size was found statistical significant in respect of seedling

Root train	ner		Polythene bag			
Volumes (03) x Media (05) = 15			Volumes (03) x Media (05) = 15			
V ₁ M ₀	$V_2 M_0$	$V_3 M_0$	V ₁ M ₀	$V_2 M_0$	V ₃ M ₀	
$V_1 M_1$	$V_2 M_1$	$V_3 M_1$	$V_1 M_1$	$V_2 M_1$	$V_3 M_1$	
$V_1 M_2$	$\mathrm{V}_2~\mathrm{M}_2$	$V_3 M_2$	$V_1 M_2$	$V_2 M_2$	$V_3 M_2$	
$V_1 M_3$	$V_2 M_3$	$V_3 M_3$	$V_1 M_3$	$V_2 M_3$	$V_3 M_3$	
$V_1 M_4$	$V_2 \; M_4$	$V_3 \; M_4$	$V_1 M_4$	$V_2 \; M_4$	$V_3 M_4$	

Table. 1 Treatment Combination

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Table 2: Interaction effect of container size and growing medium on growth and biomass of Persian Lilac (Melia azedarach Linn.) seedling under Kashmir conditions in one growing season

Container size X Growing medium	Height (cm)	Collar dia meter (mm)	Fresh shoot weight(g)	Fresh root weight(g)	Total seedling fresh weight(g)	Dry shoot weight(g	Dry root g) weight(g)	Total seedling dry weight(g)
S M	15.18	1.55	0.74	0.47	1.13	0.17	0.10	0.25
	22.82	1.89	1.34	0.81	2.13	0.32	0.17	0.48
$S_1 M_2$	19.93	1.99	0.89	0.59	1.62	0.22	0.14	0.39
$S_1 M_3$	21.03	2.32	1.12	0.74	1.77	0.26	0.16	0.42
S ₁ M ₄	24.97	2.21	1.83	1.00	2.80	0.46	0.23	0.68
S ₂ M ₀	18.50	1.76	0.84	0.58	1.24	0.21	0.12	0.28
$S_{2}M_{1}$	26.25	2.16	1.64	0.97	2.23	0.40	0.20	0.51
$S_{2} M_{2}$	22.72	2.29	1.19	0.75	1.85	0.29	0.16	0.43
$S_{2}M_{3}$	24.42	2.75	1.17	0.83	2.09	0.29	0.16	0.47
$S_{2}M_{4}$	29.65	2.46	2.30	1.18	3.18	0.57	0.26	0.73
S ₃ M ₀	21.37	2.01	0.93	0.68	1.50	0.28	0.20	0.43
$S_{3}M_{1}$	31.48	2.62	1.88	1.08	2.35	0.57	0.32	0.68
$S_{3}M_{2}$	25.57	2.61	1.26	0.87	2.02	0.37	0.26	0.57
S ₃ M ₃	28.45	3.28	1.43	0.95	2.17	0.39	0.27	0.60
$S_{3}M_{4}$	34.45	3.07	2.62	1.39	3.50	0.77	0.39	1.00
SED	0.447	0.057	0.030	0.024	0.037	0.002	0.020	0.003
CD at 0.05	0.876	0.112	0.058	0.048	0.073	0.005	0.038	0.005

 $S_1 = 150 \ cc$ $S_2 = 250 \ cc$ $S_3 = 300 \ cc$

 $M_o = \text{Soil} \ M_1 = \text{Soil: Sand: FYM} (1:1:1)$

 M_2 = Soil: Sand : FYM (2:1:1)

 M_3 = Soil: Sand: FYM: Dal weed (2:1:1:1)

 M_4 = Soil: Sand: FYM:Dalweed (2:1:2:1)

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Table 3:

Interaction effect of container size and growing medium on growth and biomass of Persian Lilac (*Melia azedarach* Linn.) seedling under Kashmir conditions in one growing season

Container size X Growing medium	Height (cm)	Collar dia meter (mm)	Fresh shoot weight (g)	Fresh root weight (g)	Total seedling fresh weight (g)	Dry shoot weight (g)	Dry root weight (g)	Total seedling dry weight (g)
S ₁ M ₀	15.18	1.55	0.74	0.47	1.13	0.17	0.10	0.25
S ₁ M ₁	22.82	1.89	1.34	0.81	2.13	0.32	0.17	0.48
S ₁ M ₂	19.93	1.99	0.89	0.59	1.62	0.22	0.14	0.39
S ₁ M ₃	21.03	2.32	1.12	0.74	1.77	0.26	0.16	0.42
S ₁ M ₄	24.97	2.21	1.83	1.00	2.80	0.46	0.23	0.68
$S_{2}M_{0}$	18.50	1.76	0.84	0.58	1.24	0.21	0.12	0.28
S ₂ M ₁	26.25	2.16	1.64	0.97	2.23	0.40	0.20	0.51
S ₂ M ₂	22.72	2.29	1.19	0.75	1.85	0.29	0.16	0.43
S ₂ M ₃	24.42	2.75	1.17	0.83	2.09	0.29	0.16	0.47
S ₂ M ₄	29.65	2.46	2.30	1.18	3.18	0.57	0.26	0.73
S ₃ M ₀	21.37	2.01	0.93	0.68	1.50	0.28	0.20	0.43
S ₃ M ₁	31.48	2.62	1.88	1.08	2.35	0.57	0.32	0.68
S ₃ M ₂	25.57	2.61	1.26	0.87	2.02	0.37	0.26	0.57
S ₃ M ₃	28.45	3.28	1.43	0.95	2.17	0.39	0.27	0.60
S ₃ M ₄	34.45	3.07	2.62	1.39	3.50	0.77	0.39	1.00
SED	0.447	0.057	0.030	0.024	0.037	0.002	0.020	0.003
CD at 0.05	0.876	0.112	0.058	0.048	0.073	0.005	0.038	0.005

 $S_1 = 150 cc$ $S_2 = 250 cc$ $S_3 = 300 cc$

 $M_o = Soil M_1 = Soil: Sand: FYM (1:1:1)$

 M_2 = Soil: Sand : FYM (2:1:1)

 M_3 = Soil: Sand: FYM: Dal weed (2:1:1:1)

 M_4 = Soil:Sand: FYM: Dal weed (2:1:2:1)

height, collar diameter, fresh root weight, total seedling fresh weight, dry shoot weight, dry root weight and total seedling dry weight. But observed non significant with respect to fresh shoot weight. PS_3 (Polythene bag – 300cc) seedling height, collar diameter, total seedling fresh weight and dry shoot weight and total seedling dry weight, whereas, RS_3 (Root trainer – 300 cc) recorded maximum values

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Container type X Growing medium	Height (cm)	Collar diameter (mm)	Fresh shoot weight (g)	Fresh root weight (g)	Total seedling fresh weight (g)	Dry shoot weight (g)	Dry root weight (g)	Total seedling dry weigh (g)
R M ₀	17.49	1.70	0.79	0.59	1.23	0.20	0.15	0.31
R M ₁	25.83	2.22	1.59	1.08	2.17	0.41	0.27	0.54
R M ₂	21.13	2.28	1.07	0.81	1.79	0.27	0.21	0.46
R M ₃	23.10	2.73	1.23	0.94	1.96	0.30	0.23	0.51
R M4	29.27	2.49	2.18	1.41	3.14	0.58	0.35	0.82
P M _o	19.21	1.85	0.88	0.56	1.35	0.23	0.13	0.33
P M	27.89	2.23	1.65	0.82	2.31	0.44	0.20	0.56
$PM_{_2}$	24.34	2.31	1.16	0.66	1.87	0.31	0.16	0.45
PM ₃	26.17	2.84	1.25	0.78	2.05	0.33	0.17	0.49
PM_{4}	30.11	2.67	2.32	0.97	3.18	0.62	0.23	0.77
SED	0.365	0.047	0.024	0.020	0.031	0.002	0.016	0.002
CD at 0.05	0.715	NS	0.048	0.039	NS	0.004	0.031	0.004

Table 4 • Interaction effect of container type and growing medium on growth and biomass of Persianlilac (*Melia*

R = Root trainer*P* =*Polythene* bag $M_o = \text{Soil}$ $M_1 = \text{Soil: Sand: FYM (1:1:1)}$ M_2 = Soil:Sand : FYM (2:1:1) M_3 = Soil:Sand:FYM:Dalweed (2:1:1:1) M_4 =Soil:Sand:FYM:Dalweed(2:1:2:1)

for fresh root weight and dry root weight, respectively (Table 4).

Maximum root: shoot ratio was found in seedlings raised on S_3M_0 , whereas, minimum ratio was found in seedlings raised on S_2M_4 growing medium. Similarly, minimum sturdiness was found in seedlings of S_2M_1 and maximum was found in seedlings of S₃M₃. Maximum Dickson's index was found in S_3M_4 and minimum was found in S_1M_0 (Table 5).

Maximum root: shoot ratio was found in seedlings raised on RM₂, whereas, minimum soot: shoot ratio was found in seedlings raised on PM₄

growing medium. Similarly, Minimum sturdiness was found in seedlings of RM₃ and maximum was found in seedlings of PM₁. Maximum Dickson's index was found in RM_4 and minimum was found in RM_0 (Table 6). Maximum root: shoot ratio was found in seedlings raised on RS_3 , whereas, minimum soot: shoot ratio was found in seedlings raised on PS₁ growing medium. Similarly, Minimum sturdiness was found in seedlings of RS and maximum was found in seedlings of PS₁. Maximum Dickson's index was found in RS₃ and minimum was found in RS_1 (Table 7).

The container size with growing medium

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Table 5: Interaction effect of container size and growing medium on quality parameters of Persian Lilac (Melia azedarach Linn.) seedling under Kashmir conditions in one growing season

Container size X Growing medium	Root / shoot ratio (dry weight basis)	Sturdiness	Dickson's quality index
S ₁ M ₀	0.590	9.811	0.025
S ₁ M ₁	0.557	12.127	0.040
$S_1 M_2$	0.642	10.058	0.040
$S_1 M_3$	0.618	9.140	0.048
$S_1 M_4$	0.458	11.366	0.061
$S_2 M_0$	0.598	10.529	0.027
$S_2 M_1$	0.511	12.169	0.042
$S_2 M_2$	0.556	9.935	0.043
S ₂ M ₃	0.568	8.878	0.054
$S_2 M_4$	0.449	12.049	0.061
S ₃ M ₀	0.721	10.633	0.040
$S_{3}M_{1}$	0.579	12.069	0.056
$S_{3}M_{2}$	0.717	9.825	0.058
$S_{3}M_{3}$	0.705	8.756	0.070
$S_{3}M_{4}$	0.522	11.337	0.087
+ SED	0.021	0.374	0.002
CD at 0.05	0.041	NS	0.003

- $S_1 = 150 \ cc$ $S_2 = 250 \ cc$ $S_3 = 300 \ cc$
- $M_o = \text{Soil} \ M_1 = \text{Soil: Sand: FYM} (1:1:1)$
- M_2 = Soil: Sand : FYM (2:1:1)
- M_3 = Soil: Sand: FYM: Dal weed (2:1:1:1)
- M_4 = Soil: Sand: FYM: Dal weed (2:1:2:1)

has a significant role in carrying capacity of potting mixture and availability of nutrients. The larger volume of container size and low growing density allows the seedling to grow vigorous and healthy compared to smaller size container. The variations in growing medium might be due to difference in texture and structure of mixtures which control the moisture retention capacity, aeration and nutrients availability (Misra and Jaiswal 1993). The results may be due to larger container size which supports

the seedling for longer periods by providing nutrients and moisture as these are the basic requirements for proper establishment and faster growth as described by Gupta et al. (1992). Similar results were observed for the significant influence of container size x growing media on seedling growth and biomass parameters in Casuarina equisetifolia (Rathore et al. 2004), Picea pungens (Mateja and Gorzelak 1983) and Fagus sylvatica (Zielinska 1988).

Table 6:

: Interaction effect of container type and growing medium on quality parameters of Persian Lilac (*Melia azedarach* Linn.) seedling under Kashmir conditions in one growing season

Container type X Growing medium	Root / shoot ratio (dry weight basis)	Sturdiness	Dickson's quality index
R M	0.713	10.286	0.030
R M ₁	0.659	11.649	0.047
R M	0.774	9.291	0.051
R M ₃	0.747	8.437	0.061
R M ₄	0.600	11.701	0.070
PM	0.560	10.363	0.031
PM	0.439	12.595	0.045
P M	0.503	10.588	0.043
P M _°	0.513	9.418	0.053
P M	0.371	11.467	0.069
SED	0.017	0.306	0.001
CD at 0.05	0.033	0.599	0.003

R = Root trainer P = Polythene bag

 $M_o =$ Soil $M_1 =$ Soil: Sand: FYM (1:1:1) $M_2 =$ Soil: Sand : FYM (2:1:1)

 M_3 = Soil: Sand: FYM: Dal weed (2:1:1:1) M_4 = Soil: Sand: FYM: Dal weed (2:1:2:1)

Table 7: Interaction effect of container type and size on quality parameters of Persian Lilac (Melia azedarach Linn.) under Kashmir conditions in one growing season

Container type X Container size	Root / shoot ratio (dry weight basis)	Sturdiness	Dickson's quality index
RS ₁	0.713	9.647	0.051
RS_2	0.629	10.307	0.052
RS ₃	0.754	10.865	0.054
PS ₁	0.444	11.354	0.034
PS_2	0.445	11.117	0.040
PS ₃	0.544	10.185	0.071
SED	0.013	0.237	0.001
CD at	0.026	0.464	0.000
0.05	0.020	0.404	0.002

 $R = Root \ trainer \ P = Polythene \ bag \qquad S_{_1} = 150 \ cc \qquad S_{_2} = 250 \ cc \ S_{_3} = 300 \ cc$

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