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Hrishika Rajiv
M.Sc. Scholar, Department of
Fruit Science, Dr. Panjabrao
Deshmukh Krishi Vidyapeeth,
Akola, Maharashtra, India

Dr. DM Panchbhair
Professor & Dean, Faculty of
Horticulture, Department of
Fruit Science, Dr. Panjabrao
Deshmukh Krishi Vidyapeeth,
Akola, Maharashtra, India

Pranjali Laharia
P.G. Student, Department of
Fruit Science, Dr. Panjabrao
Deshmukh Krishi Vidyapeeth,
Akola, Maharashtra, India

Somendra Meena
Ph.D. Scholar, Department of
Fruit Science, Dr. Panjabrao
Deshmukh Krishi Vidyapeeth,
Akola, Maharashtra, India

Rutuja Deshmukh
Ph.D. Scholar, Department of
Fruit Science, Dr. Panjabrao
Deshmukh Krishi Vidyapeeth,
Akola, Maharashtra, India

Corresponding Author:
Hrishika Rajiv
M.Sc. Scholar, Department of
Fruit Science, Dr. Panjabrao
Deshmukh Krishi Vidyapeeth,
Akola, Maharashtra, India

Influence of different polybag size on budding success of Nagpur mandarin

Hrishika Rajiv, Dr. DM Panchbhair, Pranjali Laharia, Somendra Meena and Rutuja Deshmukh

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Abstract

An experiment entitled "Influence of different polybag size on budding success in Nagpur Mandarin" was carried out at Nursery Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during the year 2023-24. The study aimed to standardized the ideal polybag size for the commercial propagation of Nagpur mandarin. The experiment was laid out in Factorial Completely Randomized Design consisted of different budding techniques as Factor A viz., B₁ (Shield Budding), B₂ (Chip Budding) and B₃ (Softwood Grafting) and Polybag size as Factor B viz., P₁ (5"x12"), P₂ (6"x12"), P₃ (7"x12") and P₄ (8"x12") with twelve treatment combinations replicated three times. In respect of polybag size observations recorded before budding plant height (cm), number of leaves and leaf area (cm²), fresh weight of roots (g), dry weight of roots (g), fresh weight of shoots (g), dry weight of shoots (g), root to shoot ratio of fresh weight and root to shoot ratio of dry weight after 180 days to budding. Regarding the various polybag sizes, data collected 180 days after transplanting indicated that the 7"x12" polybag produced better results in terms of rootstock characteristics, plant height (cm), leaf count, and leaf area (cm²). Fresh weight of roots (g), dry weight of roots (g), fresh weight of shoots (g), dry weight of shoots (g), root to shoot ratio of fresh weight and root to shoot ratio of dry weight found in P₄ (7"x12" polybag) after 180 days to budding.

Keywords: Nagpur mandarin, budding, polybag size, transplanting

Introduction

Citrus is the collective generic term comprising a number of species and varieties of fruits, known for their characteristic flavour and attractive range of colours. (T.K. Chattopadhyay, 1998). Citrus fruits have a prominent place among popular and extensively grown tropical and subtropical fruits. The citrus fruit, or hesperidium, is a unique berry with an edible pulp called endocarp that surrounds the juicy segment with non-endospermic seeds. The outermost layer, flavedo (zest), contains essential oil used in culinary purposes. The mesocarp, also known as the albedo, is the inner, colourless part of the fruit. The vitamin C content varies from 30 mg in *C. aurantium* to 68 mg in *C. reticulata*. The genus includes 16 species, as mentioned by Swingle in 1948 and 144 species by Tanaka in 1954 (Bose *et al.*, 2001) ^[1].

Among citrus group major crops like oranges, mandarins, lemons, grapefruits, pummelos, and limes are grown commercially in all over India. Among all citrus fruits, mandarins are the most important one grown in India. Nagpur mandarin is leading fruit among citrus with production volume estimated at over 6 million metric tons according to reports of National Horticulture Board (NHB).

Nagpur mandarin being a demanding fruit for both local consumption and export, it is necessary to increase production of healthy, disease free and early planting material. For economic production there is need to standardized polybag size for commercial production of Nagpur mandarin. The success of propagation method, however, depends on different factors like environmental conditions, polybag size, propagation technique and nutrient application. Accordingly, in the light of this premise, the present research work was carried out to figure out the influence of different budding techniques on budding success of Nagpur mandarin.

Materials and Methods

The experiment entitled “Influence of different budding techniques on budding success of Nagpur mandarin” was carried out at Fruit Nursery, Department of Fruit Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra during the year 2023-24 with the objectives to study the effect of different polybag size on budding success of Nagpur mandarin. The experiment was laid out in Factorial Completely Randomized Design with Factor A as different budding method viz., B₁ (Shield budding), B₂ (Chip budding) and B₃ (Softwood grafting) and Factor B as different polybag size viz., P₁ (5"x12"), P₂ (6"x12"), P₃ (7"x12") and P₄ (8"x12") with twelve treatment combinations replicated three times.

Methodology

Four polybag size of 5x12, 6x12, 7x12, 8x12 were used for raising the Rangpur lime rootstock. Potting mixture used is soil, sand and FYM in ratio 2:1:1. These rootstocks are used for budding after 180 days of transplanting. After budding observations were recorded after 180 days.

Plant Height

Scion length was recorded after 180 days of success grafting for five plants from each replication of all treatments by measuring scale.

Number of leaves

Number of leaves on scion was recorded after 180 days of budding and after computing the mean it was recorded as number of leaves.

Fresh weight of roots (g)

Five plants from each replication in each treatment were collected and fresh weight of each root was recorded. The mean fresh weight of roots was calculated from the total number of fresh weights of all roots from each replication and expressed in grams (g).

Dry weight of roots (g)

Five plants from each replication in each treatment which were collected for fresh weight are used for dry weight. These roots of plant are kept under atmospheric temperature for three days then in hot air oven at 60-degree centigrade temperature. Mean of all five plants are taken and dry weight of roots was recorded.

Observations recorded: Data was collected after 180 days of transplanting to study the effect of polybag size on budding success of Nagpur mandarin. The observations are plant height (cm), leaf count, leaf area (cm²) recorded 180 days after transplanting and observations fresh weight of roots (g), dry weight of roots (g), fresh weight of shoots (g), dry weight of shoots (g), shoot to root ratio of fresh weight and shoot to root ratio of dry weight.

Design and statistical analysis: The experiment followed a Factorial Completely Randomized Design, with twelve treatment combinations, each replicated three times. A total of 30 plants were used per replication, following the methodology outlined by Panse and Sukhatme (1997) [6].

Results and Discussion

The polybag size 7x12 is significantly superior in plant height (cm), number of leaves and leaf area (cm²) after 180 days of transplanting.

Plant height (cm)

Height is one of the primary factor influence by container size. The data presented in Table 1 shows significant differences in plant height of rootstock Rangpur lime after 180 days of transplanting. Significantly maximum (55.44 cm) plant height of rootstock Rangpur lime was observed in P₃ (polybag 7"x12") which was followed by (51.89 cm) in P₄ (polybag 8x12). The results are in conformity with Nesmith & Duval, 1992.

Number of leaves

The data presented in Table 1 represents significant differences in number of leaves of rootstock Rangpur lime after 180 days of transplanting. Significantly maximum (57.40) leaves were observed in P₃ (polybag 7"x12") which was followed by (54.96) in P₄ (polybag 8"x12"). Number of leaves is influence by nutrition transfer to branches. 7"x12" polybag provide enough volume for nutrient retention and absorption.

Leaf area (cm²)

Significantly maximum (28.11cm²) leaf area was observed in P₃ (polybag 7"x12") which was followed by (27.26 cm²) in P₄ (polybag 8"x12"). Leaf area is of significance in terms of photosynthesis competence as well as relativity to plant yield. Comparing the yield of plants in 5"x12" and 6"x12" polybags, the reduction of the root area results in less nutrient and water absorption, giving small leaves and a small leaf area (Marler & Davies, 1987) [4].

Fresh weight of roots (g)

After 180 days of budding, the data in Table 2 shows notable variations in the fresh weight of roots of rootstock Rangpur lime. Significantly maximum (16.54 g) weight was observed in P₃ (polybag 7"x12") which was followed by (16.08 g) in P₄ (polybag 8"x12"). Growth and development of roots directly influence the fresh weight of roots. Medium polybag size gives optimum space for roots development which leads to increase in fresh weight of roots. This result is verified by Hartmann *et al.*, 1986 [3].

Dry weight of roots (g)

The data collected in Table 2 goes with the trend and maximum (6.80 g) weight was observed in P₃ (polybag 7"x12") which was at par with (6.68 g) in P₄ (polybag 8"x12"). The results obtained are similar with the findings of Riadh *et al.* (1995) [7] in *Acacia auriculiformis* and *Chickrassia tabularis*.

Fresh weight of shoots (g)

Table 2 shows the significant differences in fresh weight of shoots. Significantly maximum (35.41 g) weight was observed in P₃ (polybag 7"x12") which was followed by (31.20 g) in P₄ (polybag 8"x12").

Dry weight of shoots (g)

Significantly maximum (13.64 g) weight was observed in P₃ (polybag 7"x12") which was followed by (12.25 g) in P₄ (polybag 8"x12").

Shoot to root ratio of fresh weight

Significantly maximum (2.16 g) weight was observed in P₃ (polybag 7"x12") which was followed by (1.93 g) in P₄ (polybag 8"x12").

Shoot to root ratio of dry weight

Maximum (2.80) ratio was observed in P₃ (polybag 7"x12") which was followed by (1.92) in P₄ (polybag 8"x12").

Table 1: Influence of different polybag size on plant height (cm), number of leaves, leaf area (cm²).

Treatments	Plant height (180 DAT) (cm)				Treatment	Number of leaves (180 DAT)				Treatment	Leaf area (180 DAT)			
	Budding methods					Budding methods					Budding methods			
Polybag size	B1	B2	B3	Mean	B1	B2	B3	Mean	B1	B2	B3	Mean		
P 1 (5x12")	47.67	46.07	48.73	47.49	45.07	48.20	45.27	46.18	25.53	25.53	25.83	25.63		
P 2 (6x12")	47.20	47.87	50.13	48.40	49.27	49.27	47.73	48.76	26.27	26	26.27	26.18		
P 3 (7x12")	56.93	55.07	54.33	55.44	57.80	56.20	58.20	57.40	28.40	28.13	27.80	28.11		
P 4 (8x12")	52.47	51.07	52.13	51.89	54.87	53.80	56.20	54.96	26.53	27.57	27.67	27.26		
MEAN	51.07	50.02	51.33		51.75	51.87	51.85		26.68	26.81	26.89			
	B	P	B X P		B	P	B X P		B	P	B X P			
'F' Test	NS	Sig	NS		NS	Sig.	NS		NS	Sig.	NS			
SE (m±)	0.64	0.74	1.28		0.54	0.63	1.08		0.30	0.35	0.60			
CD at 5%	-	2.15	-		-	1.83	-		-	1.01	-			

Table 2: Influence of different budding method and polybag size on fresh weight of roots, dry weight of roots, fresh weight of shoots and dry weight of shoots.

Treatments	Fresh weight of roots (g) (180 DAB)				Treatment	Dry weight of roots				Treatment	Fresh weight of shoots				Treatment	Dry weight of shoots			
	Budding methods					Budding method					Budding method					Budding method			
Polybag size	B 1 (Shield Budding)	B 2 (Chip Budding)	B 3 (Softwood Grafting)	Mean	B1	B2	B3	Mean	B1	B2	B3	Mean	B1	B2	B3	Mean			
P1 (5"x12")	15.28	14.89	14.70	14.96	5.47	4.33	4.70	4.84	18.96	20.35	19.87	19.73	7.82	6.20	7.47	7.16			
P 2 (6"x12")	15.41	15.50	15.61	15.50	5.73	4.80	5.53	5.36	27.09	24.32	23.92	25.11	11.27	9.42	11.50	10.73			
P 3 (7"x12")	16.39	15.85	17.38	16.54	5.77	6.83	7.80	6.80	33.05	32.69	40.49	35.41	14.25	11.76	14.90	13.64			
P 4 (8"x12")	16.26	16.12	15.85	16.08	6.53	6.60	6.90	6.68	31.62	30.90	31.07	31.20	13.19	10.17	13.39	12.25			
MEAN	15.83	15.59	15.89		5.88	5.64	6.23		27.68	27.07	28.84		11.63	9.39	11.82				
	B	P	B X P		B	P	B X P		B	P	B X P		B	P	B X P				
‘F’ Test	Sig.	Sig.	Sig.		Sig.	Sig.	Sig.		Sig.	Sig.	Sig.		Sig.	Sig.	Sig.				
SE (m±)	0.06	0.06	0.11		0.13	0.15	0.25		0.27	0.31	0.54		0.09	0.11	0.19				
CD at 5%	0.16	0.19	0.32		0.37	0.43	0.74		0.78	0.91	1.57		0.28	0.32	0.55				

Conclusion

Production of good and healthy planting material depends on many factors but polybag size is one of the crucial factors which affect overall growth of rootstock which indirectly affect the development of scion.

On the basis of the study entitled "Influence of different budding techniques on budding success of Nagpur mandarin", 7"x12" polybag size show promising results with respect to the growth factors like plant height, number of leaves and leaf area of rootstock and fresh weight – dry weight of roots, fresh weight- dry weight of shoots, shoot to root ratio of fresh weight and dry weight of budded seedlings.

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