Int.J.Curr.Microbiol.App.Sci (2017) *6*(10): 527-530

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 10 (2017) pp. 527-530**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.610.064

Study of Suitability of Containers and Rooting Media for Growth and Rooting of Coffee Seedlings (*Coffea arabica* cv. Chandragiri)

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Keywords

Coffee, Containers, Media.

Article Info

Accepted:
07 September 2017
Available Online:
10 October 2017

A B S T R A C T

Study of suitability of containers and rooting media for growth and vigour of coffee seedlings (*Coffea arabica* cv. Chandragiri) was conducted with an objective to evaluate the suitability of different containers for raising the seedlings and to find out most suitable media for better rooting and growth of coffee seedlings. Coffee seedlings were grown in different containers and media for a period of 6 months in nursery. It was revealed from the study that, the growth and vigour of coffee seedling is greatly influenced by different containers and media used for filling of containers. Coffee seedlings grown in root trainer containing red soil + sand + FYM + *Pseudomonas fluorescens*, PSB – *Bacillus megaterium* and *Azospirillum* recorded maximum leaf area (60.695 cm^2), collar girth (4.01 mm), number of primary (238.6) and secondary roots (557.8) and dry weight (1.098 g) of roots at 180 days(at the time of transplanting to the main field).

Introduction

Coffee (*Coffea* sp.*)* belongs to family Rubiaceae. Coffee is the second important commodity in international trade, next to petroleum products in trade volume and value. Area under coffee plantation is 397.147 thousand hectares in India of which Karnataka accounts for 54.95 percent (2,35,438 ha.). India is producing 3,48,000 MT of coffee (2015-16 data) of which Robusta variety account for 2,44,500 MT of production (70.3%), while Arabica accounted for 1,03,500 MT (29.7%). The Karnataka leads in production (2,51,520 MT) next top producer states are Kerala and Tamilnadu.

India exports 70-80 per cent of its produce. Commercially coffee is propagated through seeds. There are various factors that influence the initial development of coffee growing in the field, such as the seedlings production process and, specially, the container and substrate used (Vallone *et al.*, 2009).

Amongst the containers used in conventional coffee seedling production, one can first list black polyethylene bags. This container presents a disadvantage, such as the contamination of the environment by the plastic bags when they are not properly

discarded and coiling of roots. Regarding the substrate, conventionally Forest soil: FYM: Sand (6:2:1). But the availability of forest soil is difficult because of dwindling of forest area.

Materials and Methods

An experiment was conducted during 2016-17 at the College of Horticulture, Mudigere to know the suitable container and rooting media to grow quality coffee seedlings for large scale plantation programme. The required seeds were collected from Central Coffee Research Institute, Balehonnur.

An experiment was laid out in a two factorial randomized block design. Coffee cultivar Chandragiri was used. Seeds were sown in portrays and raised bed of 15 cm height and 1 m wide size at a distance of 2 cm between seeds and 10 cm between rows in primary nursery. Coffee seedlings of 45 days (topee stage) old were transplanted to secondary nursery into different containers and media as per the treatment.

Results and Discussion

Leaf area (cm^2)

The effect of containers and rooting media was found to be significant at 180 days after sowing (Table 1). The maximum leaf area (60.95 cm^2) was recorded in the seedlings raised in root trainer using the media red soil + sand + FYM + *P. fluorescens* + PSB – *Bacillus megaterium* + Nitrifying Bacteria – *Azospirillum* (C_4M_7) and the least (18.29 cm^2) was recorded in C_3M_1 which was on par with C_3M_4 (21.95 cm^2). This superiority could be attributed better nutrition, moisture, aeration facilitates better enlargement and elongation of cell result in better growth of leaf. This was also related to organic-rich potting medium (red soil + sand + FYM + *P. fluorescens* + PSB + *Azospirillum*) used in the study would have exhibited favourable physical and chemical properties in root trainers. In polybags with inadequate drainage, however, the same medium may have hindered root growth and consequently shoot growth of seedlings (Annapurna *et al.*, 2004).

Treatment detail

Factor I: Container		**Factor II: Media**	
Treatment	Container	Treatment	Media
C_1	Black polythene bag (6" × 9") [Control]	M_1	Red soil + sand + FYM in 3:1:1 ratio (Control)
C_2	Transparent polythene bag (6"× 9")	M_2	Red soil + cocopeat + FYM in 3:1:1 ratio
C_3	Protray raised seedlings in black polythene bag (6"× 9")	M_3	Red soil + sand + vermicompost in 3:1:1
C_4	Root trainers	M_4	Red soil + sand + pressmud in 3:1:1
C_5	Raising in beds	M_5	M_1+ *Pseudomonas fluorescens* (5g/ kg)
		M_6	M_5+ VAM – *Gigaspora gigantean* (10g/kg FYM)
		M_7	M_5+ PSB – *Bacillus megaterium* (10g/kg FYM) + Nitrifying Bacteria – *Azospirillum* (10g/kg FYM)

Table.1 Effect of containers, rooting media and their interaction on leaf area (cm^2) of coffee seedlings at 180 days after sowing

	M_1	M_2	M_3	M_4	M_5	M_6	M_7	Mean
C_1	48.23	49.59	51.97	49.78	55.57	56.26	56.45	**52.55**
C_2	34.80	38.30	40.98	49.41	41.36	51.35	56.66	**44.69**
C_3	18.29	22.36	24.07	21.95	34.29	34.98	35.84	**27.39**
C_4	49.83	57.73	44.94	52.49	52.77	54.89	60.95	**53.37**
C_5	31.17	33.97	34.54	33.31	35.43	45.75	54.44	**38.37**
Mean	**36.46**	**40.39**	**39.30**	**41.38**	**43.88**	**48.64**	**52.87**	
CV (%) = 10.38	**S.Em±**				**CD at 5%**			
Container (C)	1.08				3.10			
Media (M)	1.27				3.67			
Interaction (C×M)	2.85				8.21			

C: Container M: Media DAS: Days after sowing NS: Non-significant

Table.2 Effect of containers, rooting media and their interaction on dry weight (g) of coffee seedlings roots at 180 days after sowing

180 DAS								
	M_1	M_2	M_3	M_4	M_5	M_6	M_7	Mean
C_1	0.400	0.430	0.478	0.425	0.493	0.515	0.524	**0.466**
C_2	0.400	0.414	0.427	0.478	0.506	0.525	0.591	**0.477**
C_3	0.403	0.419	0.489	0.404	0.502	0.525	0.541	**0.469**
C_4	0.490	0.496	0.449	0.524	0.850	0.959	1.098	**0.695**
C_5	0.485	0.486	0.475	0.512	0.615	0.785	0.800	**0.594**
Mean	**0.435**	**0.449**	**0.463**	**0.468**	**0.593**	**0.661**	**0.710**	
CV (%) = 12.88	**S.Em±**				**CD at 5%**			
Container (C)	0.022				0.070			
Media (M)	0.026				0.080			
Interaction (C×M)	0.060				0.173			

C: Container M: Media DAS: Days after sowing NS: Non significant

Dry weight of roots

The dry weight of roots recorded maximum (1.098 g) in root trainer filled with red soil + sand + FYM + *P. fluorescens* + PSB + *Azospirillum* (C_4M_7) and the least (0.400 g) was recorded in C_1M_1 at 180 days after sowing respectively (Table 2). Similar result was obtained by Biradar *et al.*, (2006) when endophytic fungi VAM (*Glomus fasciculatum*) were inoculated with other microbial cultures especially the *Azospirillum*, P–Solubilizer and N-PGPR in coffee seedlings compared to individual inoculations. This container have open bottom and vertical ribs which avoid root coiling and allow for free flow of air resulting in proliferation of lateral roots (Saravanan *et al.*, 2013) and there by higher dry weight of roots.

Coffee seedlings can be successfully grown in root trainer of 160 cc using red soil + FYM + Sand + *Pseudomonas fluorescens* (5g/ kg FYM) + PSB – *Bacillus megaterium* (10g/kg FYM) + Nitrifying Bacteria - *Azospirillum* (10g/kg FYM) as media.

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How to cite this article:

Srigandha, D.D., J. Venkatesha, G. Raviraja Shetty, I.B. Biradar, G. Manjunath and Sudeesh Kulkarni. 2017. Study of Suitability of Containers and Rooting Media for Growth and Rooting of Coffee Seedlings (*Coffea arabica* cv. Chandragiri). *Int.J.Curr.Microbiol.App.Sci.* 6(10): 527-530. doi: https://doi.org/10.20546/ijcmas.2017.610.064