The Pharma Innovation Journal 2022; SP-11(2): 1897-1898

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(2): 1897-1898

www.thepharmajournal.com
Received: 16-12-2021
Accepted: 19-01-2022

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Study on benefit cost ratio of coffee (*Coffea arabica* cv. Chandragiri) for nursery raising

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Abstract
This study was conducted with an objective to find out the cheap and best container and media to grow coffee seedlings in nursey. It was revealed from the study that, the root trainer filled with red soil + pressmud + sand in 3:1:1 (C_4M_4) recorded maximum benefit cost ratio (2.85:1) and least benefit cost ratio (0.98:1) was obtained in raised bed grown seedlings using red soil+ cocopeat+FYM in 3:1:1 (C_5M_2).

Keywords: Coffee, root trainer, media.

Introduction
Coffee is the second important commodity in international trade, next to petroleum products in trade volume and value. Coffee (*Coffea* sp.*)* belongs to family Rubiaceae. As per 2019-20 data Karnataka leads in production (2,03,445 MT) next top producer states are Kerala and Tamilnadu (Anonymous, 2020) [1]. 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) [3]. Regarding the substrate, conventionally Forest soil: FYM: Sand (6:2:1) is used, but the availability of forest soil is difficult because of diminishing of forest area.

Material and Method
An experiment was conducted during 2016-17 at the College of Horticulture, Mudigere to know the benefit cost ratio of coffee seedlings grown in different container and media for large scale nursery 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, 2 seeds per well 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.

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	M_3	Red soil + sand + vermicompost in 3:1:1
C_4	Root trainees	M_4	Red soil + sand + pressmud in 3:1:1
C_5	Raising in bed	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 container and media on benefit-cost ratio of coffee cv. Chandragiri for nursery raising

Tr. No.	Treatment	Total cost (₹ /seedling)	Gross income (₹ /seedling)	Benefit: Cost ratio
C_1M_1	Black polythene bag + red soil+ sand+ FYM in 3:1:1	4.61	2.39	1.51:1
C_1M_2	Black polythene bag + red soil+ coco peat+ FYM in 3:1:1	5.61	1.39	1.24:1
C_1M_3	Black polythene bag + red soil + sand + vermicompost in 3:1:1	5.49	1.51	1.27:1
C_1M_4	Black polythene bag + red soil + sand + press mud in 3:1:1	4.41	2.59	1.58:1
C_1M_5	Black polythene bag + M_1+ *Pseudomonas fluorecens* (5g/ kg FYM)	4.79	2.21	1.46:1
C_1M_6	Black polythene bag + M_5 +VAM (10g/kg FYM)	5.04	1.96	1.38:1
C_1M_7	Black polythene bag + M_5+ PSB (10g/kg) + Nitrogen fixing bacteria (10g/kg FYM)	5.29	1.71	1.32:1
C_2M_1	Transparent polythene bag + red soil+ sand+ FYM in 3:1:1	4.10	2.90	1.7:1
C_2M_2	Transparent polythene bag + red soil+ coco peat+ FYM in 3:1:1	5.10	1.90	1.37:1
C_2M_3	Transparent polythene bag + red soil + sand + vermicompost in 3:1:1	4.98	2.10	1.40:1
C_2M_4	Transparent polythene bag + red soil + sand + press mud in 3:1:1	3.90	3.10	1.79:1
C_2M_5	Transparent polythene bag + M_1+ *Pseudomonas fluorecens* (5g/ kg FYM)	4.28	2.72	1.63:1
C_2M_6	Transparent polythene bag + M_5 +VAM (10g/kg)	4.53	2.47	1.54:1
C_2M_7	Transparent polythene bag + M_5+ PSB (10g/kg FYM) + Nitrogen fixing bacteria (10g/kg FYM)	4.78	2.22	1.46:1
C_3M_1	Protray raised seedlings in black polythene bag + red soil+ sand+ FYM in 3:1:1	4.21	2.79	1.66:1
C_3M_2	Protray raised seedlings in black polythene bag + red soil+ coco peat+ FYM in 3:1:1	5.21	1.79	1.34:1
C_3M_3	Protray raised seedlings in black polythene bag + red soil + sand + vermicompost in 3:1:1	5.09	1.91	1.37:1
C_3M_4	Protray raised seedlings in black polythene bag + red soil + sand + press mud in 3:1:1	4.01	2.99	1.74:1
C_3M_5	Protray raised seedlings in black polythene bag + M_1+ *Pseudomonas fluorecens* (5g/ kg FYM)	4.39	2.61	1.59:1
C_3M_6	Protray raised seedlings in black polythene bag + M_5 +VAM (10g/kg FYM)	4.64	2.36	1.50:1
C_3M_7	Protray raised seedlings in black polythene bag + M_5+ PSB (10g/kg FYM) + Nitrogen fixing bacteria (10g/kg FYM)	4.89	2.11	1.43:1
C_4M_1	Root trainers + red soil+ sand+ FYM in 3:1:1	2.47	4.52	2.82:1
C_4M_2	Root trainers + red soil+ coco peat+ FYM in 3:1:1	2.59	4.41	2.70:1
C_4M_3	Root trainers + red soil + sand + vermicompost in 3:1:1	2.58	4.42	2.71:1
C_4M_4	Root trainers + red soil + sand + press mud in 3:1:1	2.45	4.55	2.85:1
C_4M_5	Root trainers + M_1+ *Pseudomonas fluorecens* (5g/ kg FYM)	2.54	4.46	2.75:1
C_4M_6	Root trainers + M_5 +VAM (10g/kg FYM)	2.63	4.37	2.65:1
C_4M_7	Root trainers + M_5+ PSB (10g/kg FYM) + Nitrogen fixing bacteria (10g/kg FYM)	2.72	4.28	2.57:1
C_5M_1	Raising in beds + red soil+ sand+ FYM in 3:1:1	5.10	1.90	1.37:1
C_5M_2	Raising in beds + red soil+ coco peat+ FYM in 3:1:1	7.10	0.10	0.98:1
C_5M_3	Raising in beds + red soil + sand + vermicompost in 3:1:1	6.85	0.15	1.02:1
C_5M_4	Raising in beds + red soil + sand + press mud in 3:1:1	4.70	2.30	1.48:1
C_5M_5	Raising in beds + M_1+ *Pseudomonas fluorecens* (5g/ kg FYM)	5.47	1.53	1.27:1
C_5M_6	Raising in beds + M_5 +VAM (10g/kg FYM)	5.97	1.03	1.17:1
C_5M_7	Raising in beds + M_5+ PSB (10g/kg FYM) + Nitrogen fixing bacteria (10g/kg FYM)	6.47	0.53	1.08:1

Results and Discussion

It was found that, treatment root trainers filled with red soil + sand + press mud in 3:1:1 (C_4M_4) recorded maximum benefit cost ratio (2.85) which was followed by C_4M_1 where root trainer filled with red soil + sand + FYM in 3:1:1 (2.82) and C_4M_3 (2.71) where seedlings were grown in root trainer using the media red soil + sand + vermicompost in 3:1:1. Whereas, the minimum benefit cost ratio (0.98) was obtained in C_5M_2 (Raising in beds using red soil + coco peat + FYM in 3:1:1 (Table 24 and Fig 23). This is because root trainer cups once purchased can be used for 8-10 years. Cost of root trainer cup is ₹ 5, every year the cost involved is ₹ 50 paisa per root trainer which is cheaper compared to polybag and raised bed (Sunil, 2014) [2].

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