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Effect of Different Propagating Media and Plant Growth Promoting Rhizobacteria on Rooting of Stem Cuttings and Survival Rate of Cuttings in Sarpagandha (*Rauvolfia tetraphylla*)

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ABSTRACT

The experiment entitled "Effect of different propagating media and PGPRs on rooting of stem cuttings in Sarpagandha (Rauvolfia tetraphylla)" was conducted with 8 treatments in CRD design replicated for four times., The cuttings raised in Red soil + sand + vermicompost + VAM + PSB + Pseudomonas fluroscens were significantly higher as they took minimum days for rooting and recorded maximum sprouting, number of roots(10.47), root volume(3.53cc) and survival rate (50 %) compared to all other treatments. So it is better to raise cuttings in Red soil + sand + vermicompost + VAM + PSB + Pseudomonas fluroscens.

Key words: *Rauvolfia tetraphylla, VAM + PSB + Pseudomonas fluroscens.*

INTRODUCTION

Sarpagandha belongs to the family apocynaceae and whole root is rich source of alkaloidsand particularly known for their efficacy in reducing high blood pressure and as a sedative. Reserpine is the active principle used for hypertension in allopathy.The vegetative propagation by shoot cuttings his being advocated for multiplying and raising genetically superior clones though they are hard to root[1].

Propagation media is a basic need in which the rooting of cuttings or germination of seeds takes place and also for growing stock plants. Media being a store house of water, air and mineral supply, ensuring easy rooting of cuttings and their further growth[3]. The plant growth promoting rhizobacteria plays an important role in increasing metabolic activity in rooting of cuttings and protecting seedlings by various mechanisms such as anti-biotics production and siderophores production thus, resulting in early rooting and higher survival rate of rooted cuttings[2,4].

MATERIALS AND METHODS

The experiment was conducted in Department of Plantation. Spices, Medicinal and Aromatic crops, College of Horticulture.

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Bengaluru University of Horticultural sciences Bagalkot Campus using CRD design replicated for four times. Experiment contained 8 treatments *viz.,*

T_1 = Red soil + Sand + FYM

T_2 = Red soil + Sand + Vermicompost

T_3 = Red soil + Sand + Coco peat

T_4 = Red soil + Sand + Coir pith

T_5 = Red soil + Sand + FYM + VAM + PSB + *Pseudomonas fluroscens*

T_6 = Red soil + Sand + Vermicompost + VAM + PSB + *Pseudomonas fluroscens*

T_7 = Red soil + Sand + Coco peat + VAM + PSB + *Pseudomonas fluroscens*

T_8 = Red soil + Sand + Coir pith+ VAM + PSB + *Pseudomonas fluroscens*

The semi hard wood stem cuttings of 10 – 15 cm were brought from social forestry Sirsi, and were slantly cut at the base and were planted in polybags of size 6/9 inches containing respective media. At different growth xtzgex of growth of cutting the following observations were taken days taken to sprout, number of sprouts per cutting, days taken to rooting, number of roots per rooted cutting, length of the longest root per cutting (cm), thickness of longest root (mm), root volume(cc), fresh weight of roots per rooted cutting (g), dry weight of roots per rooted cutting (g), microbial count (before and after experiment) and survival rate of rooted cuttings.

RESULTS AND DISCUSSION

The following results were obtained from the experiment conducted and are discussed below

Days taken to sprout and rooting and survival rate of rooted cuttings

The influence of media and PGPR's on days taken to sprouting of stem cuttings are presented in table 1.There was no significant difference among the treatments with respect to days taken to sprouting. Significant differences were observed among the treatments with respect to days taken to rooting. The media containing Red soil + Sand + Vermicompost + VAM + PSB + *Pseudomonas fluroscens* took minimum days for rooting (22.50) and was *on par* with Red soil + Sand + FYM + VAM + PSB + *Pseudomonas fluroscens*(23.50).Whereas, the Red soil + Sand + FYM took maximum number of days for rooting (34.75). The maximum rate of survival of rooted cuttings was recorded in Red soil + Sand + FYM + VAM + PSB + *Pseudomonas fluroscens* and Red soil + Sand + Vermicompost + VAM + PSB + *Pseudomonas fluroscens* (50.00 %) which were *at par* with Red soil + Sand + Coco peat + VAM + PSB + *Pseudomonas fluroscens* and Red soil + Sand + Coir pith + VAM + PSB + *Pseudomonas fluroscens*. While the minimum survival rate of rooted cuttings was found in Red soil + Sand + Coco peat and Red soil + Sand + Coir pith (38.25 %).

The cuttings planted in media having Red soil + Sand + Vermicompost + VAM + PSB + *Pseudomonas fluroscens* took minimum days for rooting with maximum survival rate of rooted cuttings. This might be due to fact that synergistic effect among these microbial populations with ideal media may have provided array of phytonutrients needed for rooting. There was no significant effect of media and PGPRs on days taken to sprouting as reserves of carbohydrates, starch and sugar in cuttings resulted early sprouting of cuttings. Similar findings were also observed by Rakshapal *et al*.[11] and Desai and Thirumala[13] in Patchouli and Coleus, respectively.

Number of sprouts

The influence of media and PGPR's on number of sprouts per rooted cutting at various stages of growth. At 30 days after planting, Red soil + Sand + Vermicompost + VAM + PSB + *Pseudomonas fluroscens* recorded maximum number of sprouts (1.60), and was *at par* with Red soil + Sand + Vermicompost (1.47) and Red soil + Sand + Coco peat + VAM + PSB + *Pseudomonas fluroscens* and Red soil + Sand + Coir pith + VAM + PSB + *Pseudomonas fluroscens*(1.40). The minimum number of sprouts was found in treatment containing Red soil + Sand + FYM and Red soil + Sand + Coir pith (1.20).There was no significant difference among the treatments with respect to number of sprouts at 45 days

after planting. At 60 days after planting, Red soil + Sand + Vermicompost + VAM + PSB + *Pseudomonas fluroscens* recorded maximum number of sprouts (4.73).While the minimum number of sprouts (3.40) was found in Red soil + Sand + FYM.

These results are in line with research conducted in *Sphaeranthes amaranthoides*, *Strobilanthes ciliatus* by Sumithra and Selvaraj[9] and Asha and Rajeshkumar[5], respectively. Which might be due to supply of Vermicompost as a rich source nutrients with good water retention capacity and PGPRs helped in faster availability of nutrients and production of some phytoharmones, that might have resulted in production of more number of sprouts per cutting.

Table 1: The sprouting and rooting in stem cuttings of Sarpagandha (*Rauvolfia tetraphylla*) as influenced by different propagating media and plant growth promoting rhizobacteria

Treatments	Days taken to		Number of sprouts		
	Sprout	root	30 DAP	45 DAP	60 DAP
T_1	14.50	34.75	1.20	2.40	3.40
T_2	13.75	28.50	1.47	2.60	3.80
T_3	14.75	29.00	1.27	2.40	3.60
T_4	13.50	32.50	1.20	2.20	3.67
T_5	14.75	23.50	1.27	2.75	4.13
T_6	12.00	22.50	1.60	2.80	4.73
T_7	13.75	26.00	1.40	2.60	3.53
T_8	13.00	27.50	1.40	2.35	3.55
S.Em ±	0.82	0.78	0.06	0.12	0.17
C.D at 5%	**NS**	*	*	**NS**	*
F test	2.40	2.30	0.20	0.36	0.50

* = Significant at 5% probability level

T_1 = Red soil + Sand + FYM

T_2 = Red soil + Sand + Vermicompost

T_3 = Red soil + Sand + Coco peat

T_4 = Red soil + Sand + Coir pith

T_5 = Red soil + Sand + FYM + VAM + PSB + *Pseudomonas fluroscens*

T_6 = Red soil + Sand + Vermicompost + VAM + PSB + *Pseudomonas fluroscens*

T_7 = Red soil + Sand + Coco peat + VAM + PSB + *Pseudomonas fluroscens*

T_8 = Red soil + Sand + Coir pith+ VAM + PSB + *Pseudomonas fluroscens*

Length, girth, volume and number of roots per cutting

The maximum number of roots was noticed in the treatment containing Red soil + Sand + Vermicompost + VAM + PSB + *Pseudomonas fluroscens* (10.47) and was *at par* with Red soil + Sand + FYM + VAM + PSB + *Pseudomonas fluroscens* (9.20). The minimum number of roots was recorded in the Red soil + Sand + FYM (5.30).Significant differences were observed among the treatments with respect to root length. The media containing Red soil + Sand + Vermicompost + VAM + PSB + *Pseudomonas fluroscens* recorded maximum root length (4.73 cm) and minimum root length was recorded in media containing Red soil + Sand + FYM (3.40 cm). The media containing Red soil + Sand + Vermicompost + VAM + PSB + *Pseudomonas fluroscens* recorded maximum root girth (3.10 mm) and minimum root girth (2.00 mm) was noticed in media containing Red soil + Sand + FYM (Table 2).The maximum root volume (3.53 cc) was recorded in media containing Red soil + Sand + Vermicompost + VAM + PSB + *Pseudomonas fluroscens*. The minimum root volume (1.50 cc) was recorded in media containing Red soil + Sand + FYM.

The increase in length and thickness of longest roots may be due to production of higher number of sprouts with more number of leaves, which might have hastened the flow of

food into the root system leading to the production of thicker and lengthier roots and PGPRs might have helped in root growth through various mechanisms. Similar findings have been observed by, Soundy *et al*.[8], in Fever tea, Yousif and Janana[10], in Periwinkle, Robin and Chikkaswamy.[7], in *Tinospora cordifolia* and Malleswari *et al.*[6], in Coleus.

Fresh and dry weight of roots

Significant differences were observed among the treatments with respect to fresh weight of root. Themedia containing Red soil + Sand + Vermicompost + VAM + PSB + *Pseudomonas fluroscens* recorded maximum fresh weight of root (0.74 g) and minimum fresh weight of root (0.21 g) was found in media containing Red soil + Sand + FYM. The media containing Red soil + Sand + Vermicompost + VAM + PSB + *Pseudomonas fluroscens* recorded maximum dry weight of root (0.24 g) and the minimum dry weight of root (0.07 g) was found in media containing Red soil + Sand + FYM. Which might be due to higher growth of plant in ideal media with beneficial effect of PGPR and particularly.

Table 2: Effect of different propagating media and plant growth promoting rhizobacteria on number, length and girth of roots per cutting, root volume, fresh and dry weight of roots and survival rate in stem cuttings of Sarpagandha (*Rauvolfia tetraphylla*)

Treatments	No. of roots	Root length (cm)	Root girth (mm)	Root volume (cc)	Fresh weight of roots (g)	Dry weight of roots (g)	Survival rate (%)
T_1	5.30	3.40	2.00	1.50	0.21	0.07	40.00
T_2	5.60	3.80	2.53	1.93	0.32	0.19	41.25
T_3	7.33	3.60	2.73	2.47	0.34	0.11	38.75
T_4	7.10	3.67	2.57	1.67	0.35	0.12	38.75
T_5	9.20	4.13	2.73	2.77	0.47	0.16	50.00
T_6	10.47	4.73	3.10	3.53	0.74	0.24	50.00
T_7	8.00	3.53	2.70	2.77	0.57	0.18	45.00
T_8	7.90	3.55	2.70	2.60	0.37	0.13	45.00
S.Em ±	0.62	0.17	0.08	0.09	0.01	0.018	2.77
F test	*	*	*	*	*	*	*
C.D at 5%	1.81	0.50	0.25	0.26	0.029	0.055	8.10

* = Significant at 5% probability level

T_1 = Red soil + Sand + FYM

T_2 = Red soil + Sand + Vermicompost

T_3 = Red soil + Sand + Coco peat

T_4 = Red soil + Sand + Coir pith

T_5 = Red soil + Sand + FYM + VAM + PSB + *Pseudomonas fluroscens*

T_6 = Red soil + Sand + Vermicompost + VAM + PSB + *Pseudomonas fluroscens*

T_7 = Red soil + Sand + Coco peat + VAM + PSB + *Pseudomonas fluroscens*

T_8 = Red soil + Sand + Coir pith+ VAM + PSB + *Pseudomonas fluroscens*

Phosphorus solubilizing bacteria through increased uptake of nutrients resulted in higher root weight. These results are in line with, Soundy*et al*.[8], in Fever tea, Yousif and Janana[10], in Periwinkle, Robin and Chikkaswamy[7], in *Tinospora cordifolia*, Malleswari *et al*.[6], in Coleus and Mulla *et al*.[12], in Sarpagandha, respectively.

Cost of cultivation (B: C ratio)

Among different treatments, the higher B.C ratio of 1.30:1 and net returns of 362/-Rs. was observed in media containing Red soil + Sand +FYM and minimum of 0.20 B.C ratio and net returns of 112/- Rs. was obtained in Red soil + Sand + Vermicompost with stem cuttimgs of Sarpagandha. Among different combination of media and PGPR's, the highest B:C ratio of 1.30:1 was observed in media containing Red soil + Sand + FYM and minimum B.C ratio of 0.20 B:C ratio is obtained in Red soil + Sand + Vermicompost with stem cuttings of Sarpagandha. The higher B:C ratio in stem cuttings planted in red soil + sand + FYM might be due to lower cost of cultivation and higher net returns. These findings are in line with study conducted by Desai and Thirumala[13], in Coleus and Rakshapal *et al*.[11], in Patchouli cuttings.

Table 3: Economics of production of rooted cuttings in Sarpagandha (Rauvolfiatetraphylla)s influenced by different propagating media and plant growth promoting rhizobacteria

Treatments	Gross returns per treatment	Cost of cultivation per treatment	Net returns per treatment	B.C ratio per treatment
T_1 = Red soil + Sand + FYM	640	278	362	1.30
T_2 = Red soil + Sand + Vermicompost	660	548	112	0.20
T_3 = Red soil + Sand + Coco peat	620	438	182	0.41
T_4 = Red soil + Sand + Coir pith	620	278	342	1.23
T_5 = T_1 + VAM + PSB + *Pseudomonas fluroscens*	800	374	426	1.13
T_6 = T_2 + VAM + PSB + *Pseudomonas fluroscens*	800	644	156	0.24
T_7 = T_3 + VAM + PSB + *Pseudomonas fluroscens*	720	524	196	0.37
T_8 = T_4 + VAM + PSB + *Pseudomonas fluroscens*	720	374	346	0.92

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