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Rooting of Cuttings of Damask Rose (*Rosa damascena*) cv Ranisahiba as Influenced by Substrates and Growth Regulators

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Abstract A field experiment was carried out during the year 2014 to study the effect of growing substrates and growth regulators on rooting of Damask Rose (*Rosa damascena* Mill.) cv Ranisahiba. Study revealed that number of primary roots (23.73), diameter of root (1.53 mm), fresh weight (2.55g) and dry weight (0.84g) of root, except length of root (23.73 cm) which was found longest in soil + cocopeat medium. Among different concentration of plant growth regulators, best results were obtained with application of IBA 1000 ppm, whereas IBA 500 ppm gave best resullt in diameter of root (1.64 mm).

Keywords Ranisahiba, Damask rose, IBA, Substrates, Cuttings.

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Introduction

Damask rose (*Rosa damascena* Mill.) belonging to family Rosaceae is one of the most important medicinal and ornamental plant that is planted mainly for its essential oil and medicinal aspects. During the course of work on genetic improvement of Kannauj damask rose (*Rosa damascena* var *bifera*) race via seed progeny researches, a variety named as Ranisahiba with doubled essential oil productivity and standard oil quality, was developed at CSIR-CIMAP Research Center, Pantnagar, Uttarakhand. Percentage of rooting and quality of roots can in many ways be directly linked to the medium itself and that the characteristics of the medium. Locally and readily available materials such as vermi-compost, farmyard manure, coconut fiber, rice hull, sawdust, peanut hull, river sand and mixtures of these materials can be used as rooting media under *Tarai* region of Uttarakhand, the information on the soil amendment practices and responses of rooting hormones for producing quality planting material is in scanty. Therefore, the present experiment was carried out to find the best rooting substrate and suitable concentration of hormone on cuttings of *Rosa damascena* cultivar Ranisahiba.

Materials and Methods

The present study was conducted during the year 2014 under protected condition at the Model Floriculture Center, GB Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India. The treatment combinations in this experiment consisted

Table 1. Effect of substrates, growth regulators on average number of primary roots per cutting.

Substrates (S)	Growth regulators (G) G_0 (control)	G_1 (IBA 500 ppm)	G_2 (IBA 1000 ppm)	G_3 (IBA 1500 ppm)	G_4 (NAA 500 ppm)	G_5 (NAA 1000 ppm)	G_6 (NAA 1500 ppm)	Mean
S_1 (Soil)	11.35	19.74	22.91	20.45	20.35	19.08	18.23	18.87
S_2 (Soil + FYM)	15.32	20.72	25.27	23.59	22.43	22.73	20.88	21.56
S_3 (Soil + Vermicompost)	18.96	22.70	28.37	25.45	22.70	24.91	23.02	23.73
S_4 (Soil + Cocopeat)	14.59	24.01	24.60	23.51	22.29	22.76	21.54	21.90
S_5 (Soil + Rice husk)	12.83	21.22	24.51	23.21	22.61	22.70	21.90	21.28
Mean	14.61	21.68	25.13	23.24	22.07	22.44	21.12	21.47
			S		G		S × G	
CD (5%)			0.46		0.55		1.22	
SEM ±			0.16		0.19		0.43	
CV %			3.50					

of five growing substrates viz Soil (S_1), Soil + FYM (S_2), Soil + Vermicompost (S_3), Soil + Cocopeat (S_4), Soil + Ricehusk (S_5) which were mixed in the ratio 2 : 1 (v/v). Three concentrations each of indol-3-butyric acid (IBA) and naphthalene acetic acid (NAA) in different combination i. e. 500 ppm, 1000 ppm and 1500 ppm were applied at the basal end of the cutting as a quick dip method for 10 seconds. The experiment with 35 combinations was laid out in factorial randomized block design. each treatment combination was applied to 10 cuttings and replicated thrice. All cuttings were maintained under uniform cultural practices during the whole period of investigation.

Results and Discussion

In case of root parameters both growing substrates and growth regulators and their interaction effect played a significant role in all the parameters (Table 1—5). In case of rooting substrates maximum number of primary root (23.73), diameter of thickest root (1.53 mm), fresh weight of root (2.55 g), dry weight of root (0.84 g) was found in S_3 (soil + vermicompost) medium, except length of longest root (23.73 cm) which was found to be maximum in S_4 (soil + cocopeat) medium . Minimum values were recorded in S_1 i.e. soil medium except diameter of thickest root which was at par with S_5 i.e. (soil + rice husk) medium (Fig.1).

The increase in primary root number may be attributed to increased nutrient uptake and enhanced availability of nutrients and growth promoting substances. The enhanced hydrolytic activity in presence of applied IBA might be responsible for the enhance-

Table 2. Effect of substrates and growth regulators on length of longest root per cutting.

Substrates (S)	Growth regulators (G) G_0	G_1	G_2	G_3	G_4	G_5	G_6	Mean
S_1	12.45	18.16	19.55	16.85	17.71	17.66	17.21	17.08
S_2	14.54	19.34	22.45	20.08	21.62	20.57	18.74	19.62
S_3	16.30	24.21	25.41	24.28	23.69	21.73	23.06	22.67
S_4	19.81	23.06	26.70	25.08	24.35	22.98	24.15	23.73
S_5	14.49	22.76	23.76	22.28	22.34	20.02	22.06	21.10
Mean	15.52	21.51	23.58	21.71	21.94	20.59	21.04	20.84
			S		G		S × G	
CD (5%)			0.49		0.58		1.30	
SEm ±			0.17		0.21		0.46	
CV %			3.82					

Table 3. Effect of substrates and growth regulators on average diameter of thickest root per cutting.

Substrates (S)	Growth regulators (G) G_0	G_1	G_2	G_3	G_4	G_5	G_6	Mean
S_1	0.79	1.48	1.20	1.18	1.16	1.08	1.08	1.14
S_2	0.96	1.59	1.41	1.26	1.38	1.31	1.19	1.30
S_3	1.05	2.11	1.80	1.47	1.56	1.33	1.37	1.53
S_4	0.80	1.70	1.23	1.47	1.48	1.35	1.26	1.33
S_5	0.76	1.32	1.18	1.11	1.22	1.12	1.25	1.14
Mean	0.87	1.64	1.37	1.29	1.36	1.24	1.23	1.29
			S		G		S×G	
CD (5%)			0.07		0.80		0.18	
SEm±			0.02		0.23		0.06	
CV %			8.55					

ment of rooting of cuttings. Similar results have also been reported in *Cammelia japonica* cuttings [1]. The positive effect of vermicompost in inducing better root growth may be due to the beneficial growth substances viz. gibberellins, cytokinins and auxins released in vermicompost and metabolic activity of microbes harbored in medium. But in case of root length longest root length was found in soil + cocopeat medium which might be due to better texture, higher cation exchange capacity of the coconut dust and porosity of coco-peat which facilitated easy penetration of roots and also being a well drained medium, it promoted better root characters. Positive effect of cocopeat in production of longest root was also reported in russian olive [2], in golden pothos [3]. The poorest performance of rooted cuttings in soil may be due to nutritionally poor medium, lacking in organic material that resulted in minimum number of root.

Among growth regulators both IBA and NAA showed superior effect over control in all root parameters. Maximum number of primary root (25.13), length of longest root (23.58cm), fresh weight of root (2.51 g) and dry weight of root (0.85 g) was found with application of IBA 1000 ppm except diameter of thickest root (1.64 mm) which was found to be maximum with application of IBA 500 ppm.

In case of growth regulators, the superiority of IBA might be due to the application of proper concentration of IBA resulting in high carbohydrate and low nitrogen level leading to more root formation. Exogenous auxin application breaks starch into simple sugars and boron which enhances the mobilization of sugars that are needed to a greater extent for the production of new cells and for the increased respiratory activity in the regenerating tissues at the initiation of new root primordial. In case of fresh weight of root it can also be explained in the light of

Table 4. Effect of substrates and growth regulators on average fresh weight of root.

Substrates (S)	Growth regulators (G) G_0	G_1	G_2	G_3	G_4	G_5	G_6	Mean
S_1	0.95	1.48	2.09	1.77	1.97	1.99	1.69	1.70
S_2	2.15	2.48	2.59	2.41	2.49	2.36	2.36	2.41
S_3	2.48	2.61	2.93	2.52	2.53	2.37	2.42	2.55
S_4	2.01	2.17	2.49	2.31	2.38	2.24	2.15	2.25
S_5	1.95	2.11	2.47	1.96	1.97	2.02	2.03	2.07
Mean	1.91	2.17	2.51	2.19	2.27	2.19	2.13	2.19
			S		G		S×G	
CD (5%)			0.04		0.05		0.11	
SEm±			0.02		0.02		0.04	
CV %			3.20					

Table 5. Effect of substrates and growth regulators on average dry weight of root.

Substrates (S)	Growth regulators (G)							
	G_0	G_1	G_2	G_3	G_4	G_5	G_6	Mean
S_1	0.22	0.48	0.64	0.47	0.45	0.39	0.41	0.44
S_2	0.30	0.61	1.01	0.72	0.73	0.48	0.54	0.62
S_3	0.45	0.75	1.10	0.84	0.92	0.94	0.87	0.84
S_4	0.35	0.58	0.75	0.52	0.59	0.51	0.57	0.55
S_5	0.29	0.44	0.76	0.49	0.60	0.47	0.39	0.49
Mean	0.32	0.57	0.85	0.61	0.65	0.55	0.56	0.59
		S		G		S×G		
CD (5%)		0.03		0.03		0.07		
SE m±		0.009		0.011		0.026		
CV %		8.55						

the statement that, production of higher number of roots with treatment of 1000 ppm IBA naturally gave highest fresh weight of root, as the fresh weight of the root is directly co-related with number of root, thickness of the root and it subsequently gave higher dry weight of root also. The positive effect of auxin in dry weight of root is also supported in *Rosa damascena* cuttings [4], Khirni seedlings [5], chrysanthemum cv Piwali Rewadi [6].

Interaction effect between growing substrates and growth regulators was significant regarding all vegetative parameters. Interaction between substrates and growth regulators was found significant may be because of positive effect of media and auxin in production of more number of root per cutting and subsequently higher fresh weight and dry weight of root. This is supported in *Vitis vinifera* cuttings [7].

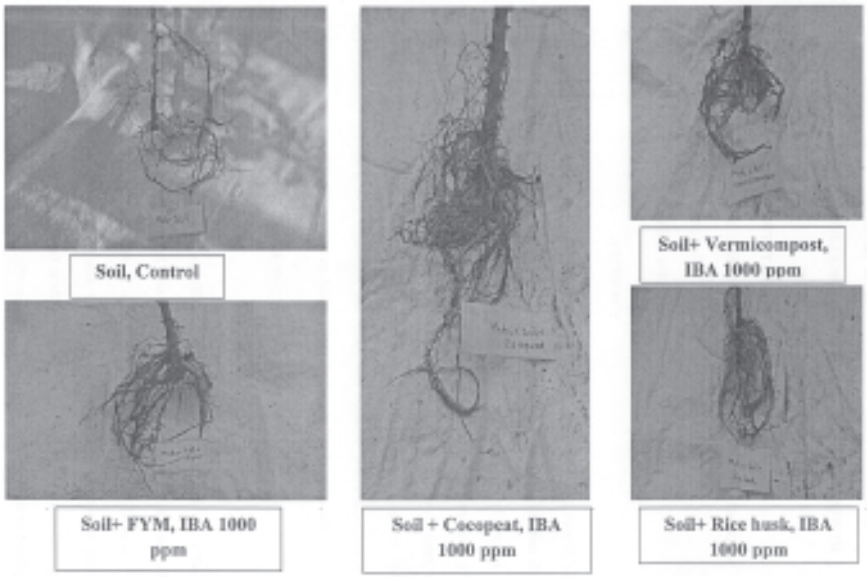

Fig. 1. Effect of growing substrates and growth regulators on stem cuttings of Damask Rose cv Ranisahiba.

Conclusion

Experimental findings indicate that combination of soil + vermicompost and IBA 1000 ppm may be recommended for the production of quality planting material of *Rosa damascena* cv Ranisahiba through stem cuttings under *Tarai* region of Uttarakhand.

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