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EFFECT OF IBA ON LENGTH OF CUTTINGS AND ROOT FORMATION OF PATCHOULI [*POGOSTEMON CABLIN* (BLANCO) BENTH.] UNDER MIST CHAMBER

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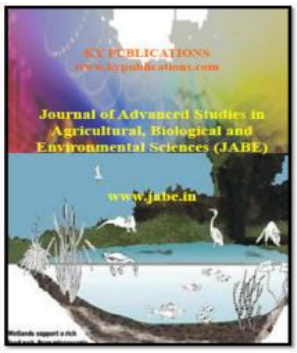

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ABSTRACT

Experiment on stem cutting of Patchouli [*Pogostemon cablin* (Blanco) Benth] with three different cutting length (8, 10, 12cm) and application of growth regulator (IBA) with 0 ppm, 500 ppm, 1000 ppm and 1500 ppm inside the mist chamber was carried out in Forest Nursery and Research centre, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad, India during rainy season in 2009-10 and 2010-11. Application of IBA (500 ppm) with length cuttings 12 cm recorded highest plant height (14.94 cm), number of leaves (16.49), collar diameter (4.91 cm). The concentration of IBA (500 ppm) with the length cuttings 12 cm was found most effective in improving root numbers as well as root length over other treatment. The experiment revealed that 12 cm length of Patchouli cuttings when treated with IBA (500 ppm) is good for mass multiplication of this plant under mist chamber condition.

Key words: Patchouli, IBA, Cutting, Mist Chamber, ppm, Plant Height, Collar Diameter, Root length

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INTRODUCTION

The Patchouli scientifically Known as *Pogostemon cablin* (Blanco) Benth. is a perennial aromatic herb and valued to give an aromatic oil with base fragrance which is largely used in perfumery industry (Fig. 1). The essential oil of Patchouli is used for a variety of purposes such as cosmetic industry, perfumery industry, toiletries, breath fresheners, beverages (Alcoholic & Non- alcoholic) and pharmaceutical industries. Continuous increase in high demand of Patchouli oil equally in national and international market it has got massive importance, so it is requisite to take up cultivation of crops on a commercial scale. This plant is native to Philippines and commercially cultivated in Indonesia, Singapore, China, Brazil, Malaysia, West Indies and India. Considering the importance of this crop, it is essential to multiplying of this crop vegetatively from stem cuttings in order to maintain planting material and genetic character for commercial cultivation. Patchouli can be easily multiplying by apical stem cuttings in rainy season (1). Patchouli stem cuttings treated in a solution of IBA – 2000 ppm rooted within 7 days with high rooting percentage (2). The cuttings treated with IBA - 500 ppm and placed under mist chamber recorded high rooting percentage (97.5-100.0) with fairly good root quality and robust plantlets (3). Therefore, the standard size of cuttings and concentration of growth hormone

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is usefull methods to increase the commercial multiplication of this potential crop. In the present study to find out the suitable combination of growth hormone in respect of length of cutting and rooting of patchouli which can be used to prepare quick and large scale propagative material under nursery condition.

Materials and Methods

The present experiment was carried out in Forest nursery and Research centre, School of Forestry and Environmental Science, SHIATS - Deemed to be University, Allahabad, India during rainy season 2009-10 and 2010-11. Stem cuttings were prepared in the early morning from good and healthy vigorous mother plants. The cuttings were taken from the terminal portion in three different sizes 8, 10, 12 cm with 2-3 internodes respectively (Fig. 2 & 3). Different size cuttings were dipped in different concentration of growth regulator (IBA) at 0 ppm, 500 ppm, 1000 ppm and 1500 ppm (Fig. 4) for one minute and shifted in root trainers filled with good potting mixture. The root trainer planted with cuttings shifted in mist chamber for initiation of rooting (Fig. 5). The experiment was laid out in Completely Randomised Design (CRD) with 12 cuttings each treatment. Observations were recorded at 30 days after sowing (DAS) , starting from after planted in root trainer on plant height, number of leaves, collar diameter, root length and root numbers.

Table: 1. Effect of concentration of IBA on different length of stem cutting and their interaction on plant height (cm) of Patchouli under Mist chamber condition at 30 days after sowing

Length of Stem cutting (L)	Concentration of IBA (T)				Mean (L)
	T0 (0ppm)	T1 (500ppm)	T2 (1000ppm)	T3 (1500ppm)	
L1 (8 cm)	9.85	14.72	14.43	13.88	13.22
L2 (10 cm)	12.65	14.74	14.46	13.96	13.95
L3 (12 cm)	13.42	15.35	14.62	14.31	14.42
Mean (T)	11.97	14.94	14.50	14.05	
F- test		S.Ed.(±)	C.D at 5 %		
Stem cuttings		S	0.02	0.04	
Treatment of IBA		S	0.02	0.04	
Interaction (LXT)		S	0.04	0.08	

Table: 2. Effect of concentration of IBA on different length of stem cutting and their interaction on number of leaves per plant of Patchouli under Mist chamber condition at 30 days after sowing

Length of Stem cutting (L)	Concentration of IBA (T)				Mean (L)
	T0 (0ppm)	T1 (500ppm)	T2 (1000ppm)	T3 (1500ppm)	
L1 (8 cm)	11.82	16.15	15.92	12.72	14.15
L2 (10 cm)	12.65	16.16	15.95	14.19	14.74
L3 (12 cm)	12.74	17.17	15.96	15.85	15.43
Mean (T)	12.40	16.49	15.94	14.25	
F- test		S.Ed.(±)	C.D at 5 %		
Stem cuttings		S	0.02	0.04	
Treatment of IBA		S	0.02	0.05	
Interaction (LXT)		S	0.04	0.08	

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Table: 3. Effect of concentration of IBA on different length of stem cutting and their interaction on collar diameter (cm) of Patchouli under Mist chamber condition at 30 days after sowing

Length of Stem cutting (L)	Concentration of IBA (T)				Mean (L)
	T0 (0ppm)	T1 (500ppm)	T2 (1000ppm)	T3 (1500ppm)	
L1 (8 cm)	3.95	4.81	4.52	4.14	4.35
L2 (10 cm)	4.12	4.81	4.52	4.18	4.41
L3 (12 cm)	4.12	5.12	4.62	4.21	4.52
Mean (T)	4.06	4.91	4.55	4.18	
F- test		S.Ed.(±)	C.D at 5 %		
Stem cuttings		S	0.01	0.01	
Treatment of IBA		S	0.01	0.01	
Interaction (LXT)		S	0.01	0.02	

Table: 4. Effect of concentration of IBA on different length of stem cutting and their interaction on root length (cm) of Patchouli under Mist chamber at 30 days after sowing

Length of Stem cutting (L)	Concentration of IBA (T)				Mean (L)
	T0 (0ppm)	T1 (500ppm)	T2 (1000ppm)	T3 (1500ppm)	
L1 (8 cm)	3.25	6.14	4.75	4.62	4.65
L2 (10 cm)	3.69	6.38	4.82	4.62	4.88
L3 (12 cm)	4.44	6.82	5.02	4.72	5.25
Mean (T)	3.79	6.45	4.86	4.65	
F- test		S.Ed.(±)	C.D at 5 %		
Stem cuttings		S	0.01	0.01	
Treatment of IBA		S	0.01	0.02	
Interaction (LXT)		S	0.01	0.03	

Table: 5. Effect of concentration of IBA on different length of stem cutting and their interaction on number of roots per plant of Patchouli under Mist chamber condition at 30 days after sowing

Length of Stem cutting (L)	Concentration of IBA (T)				Mean (L)
	T0 (0ppm)	T1 (500ppm)	T2 (1000ppm)	T3 (1500ppm)	
L1 (8 cm)	42.72	81.54	66.26	57.95	58.40
L2 (10 cm)	47.83	81.08	68.10	58.29	63.82
L3 (12 cm)	51.95	83.82	66.67	58.96	65.35
Mean (T)	47.50	82.15	67.01	58.40	
F- test		S.Ed.(±)	C.D at 5 %		
Stem cuttings		S	0.09	0.18	
Treatment of IBA		S	0.10	0.20	
Interaction (LXT)		S	0.17	0.36	

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Photographs of Patchouli plants

Figure- 1: A view of single Patchouli plant

Figure- 2: stem cuttings of Patchouli

Figure- 3: Three different size of stem cuttings of Patchouli

Figure- 4: Treatment of Patchouli cuttings by IBA

Figure- 5: Cuttings of Patchouli placed in Mist Chamber

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RESULTS AND DISCUSSION

Plant Height

Results of the present study are given two years pooled data from Table 1 to 5. It is evident that the internal and external climatic factor influenced the root formation of crops. The favorable environment (Physiological, nutritional, biochemical) positively affected the rooting of crops and its growth. The efficiency of IBA hormone to development of root and shoots was noticed by the differences between the treated sample of length cuttings and the controls. It is revealed at 30 DAS, maximum plant height was observed in T_1 (14.94 cm). However, the minimum plant height was recorded in control (11.97 cm) (Table 1). Interaction table on stem cuttings also showed that maximum plant height was observed in L_3 (14.42 cm) whereas, minimum plant height was recorded in L_1 (13.22 cm) at 30 DAS). The treatment T_1 L_3 (12 cm + 500 ppm) resulted maximum plant height (Table 1). This improved effect could be attributed to the fact that the combined nutrient supplement of the entire rooting media acted optimally with the growth hormone (IBA) concentration added which created enable soil condition for example, optimum aeration and moisture leve(4;5). It was also observed earlierand recommended that for better rooting of scented geranium four leaves were optimum (6). The mist chamber conditions provided optimum temperature, high relative humidity and there by ensures high leaf water potential of cuttings which triggers profuse rooting (3).

Number of Leaves

Interactions effect obtains between the growth hormone and length of stem cuttings in all respects of crop. The number of leaves was recorded maximum (16.49) at 30 DAS and minimum was observed in control (12.40) during the crop seasons 2009-10 and 2010-11. Interaction for among stem cuttings, maximum number of leaves were recorded (15.43) in L_3 however, minimum number of leaves was recorded in L_1 (14.15) at 30 DAS (Table 2). The interaction was significant between the size of stem cuttings and different concentrations of IBA for number of leaves during seasons 2009-10 and 2010-11.In contrast to plant height and number of leaves was found to increase with the decrease in concentration of IBA. This may be due to the positive effect of IBA on the movement of hydrolyzing enzymes within plant which encourage of the number of leaves. These confirmative findings are same in patchouli (7).

Collar Diameter

The interaction studies revealed that the application of IBA with stem cuttings observed maximum collar diameter at 30 DAS in T_1 (4.91 cm), followed by T_2 (4.55 cm). However, minimum collar diameter (4.06 cm) was observed in control. The stem cuttings at 30 DAS, maximum collar diameter was observed in L_3 (4.52 cm) and a minimum collar diameter was recorded in L_1 (4.35 cm) (Table 3). Among the length of cuttings the application of IBA (500 ppm) with 12 cm cuttings gave better performance, it may be due to the increased plant height and number of leaves. Similar results also reported in patchouli (8).

Root length

The stem cuttings treated with different concentrations of IBA observed with significantly higher root length. The average root length was observed maximum in T_1 (6.45 cm), whereas, minimum in T_0 (3.79 cm) at 30 DAS during both the year of study. The maximum root length was recorded in L_3 (5.25 cm) however, minimum was observed in L_1 (4.69 cm) at 30 DAS. The second order interaction for root length and concentration of IBA with stem cuttings were also found to be significant (Table 4). Higher root length was recorded in T_1L_1 (IBA 500 ppm+12 cm) at 30 DAS. It may be due to increased growth in all respect of cuttings and help in the production of photosynthates and further supply to the roots. It was also observed same line in patchouli (3).

Number of roots per plant

The concentration of IBA 500 ppm with the lentgth of 12 cm cuttings creates significant effect on the number of roots per plant. Lower concentration of IBA increased the number of roots per plant significantly.The average number of roots per plant was maximum in T_1 (82.15), whereas, minimum number of roots per plant was observed in control (47.50) at 30 DAS. The interaction shows the Length of stem cuttings was observed

maximum number of roots per plant in L_3 (65.35) at 30 DAS, and minimum number of roots per plant was observed in L_1 (62.12) during both the years of study (Table 5). The control sample of stem cuttings supported low development shoot and root than the IBA treated samples in the entire experiment. Stems are an ideal rooting material, because they generally have undifferentiated tissues to permit easy differentiation of root priomordia. So selection of optimum length of cuttings contributes to a great extent to root formation in patchouli (1). It has also been reported that rooting hormone to a certain instances could be inhibitory to the development of roots in the cuttings, especially during the initiation stage (5).

The present study has shown that though standardize of stem cuttings and different concentration of growth hormone (IBA) may create differences in multiplication of vegetative planting material, quantity and quality of patchouli oil. Higher concentration of IBA may be inhibiting effect on the growth of cuttings and affect the quantity, quality and chemical composition of the oil.

CONCLUSION

Standardize of stem cuttings of patchouli with cutting length size 12 cm and concentration with 500 ppm growth hormone (IBA) has proven to be most effective in the root initiation and shoot development of stem cuttings in *Pogostemon cablin*. This can be promoted for commercial multiplication of *Pogostemon cablin* (patchouli) containing a maximum rooting percentage and healthy in nature.

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