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PERFORMANCE OF STEM CUTTINGS IN DIFFERENT PROPAGATING MEDIA IN PATCHOULI (*POGOSTEMON PATCHOULI* BENTH.)

Amit Tiwari[1], Dipender Kumar[1]*, Venkatesha K.T.[1], Priyanka Suryavanshi[2], Amit Chauhan[1], Sonveer Singh[1], Prawal Pratap S. Verma[3], Rakesh Kumar[2] and Ved Ram Singh[1]

[1]CSIR-Central Institute of Medicinal & Aromatic Plants, Research Centre, Pantnagar (Uttarakhand), India.
[2]CSIR-Central Institute of Medicinal & Aromatic Plants, Lucknow (Uttar Pradesh), India.
[3]CSIR-Central Institute of Medicinal & Aromatic Plants, Research Centre, Purara, Bageshwar, (Uttarakhand), India.

Abstract

Patchouli (*Pogostemon patchouli* Benth.) crop rarely flowers and do not possess seed setting ability, so it is generally propagated through stem cuttings. However, limited information is available for characterising the most efficient media which can be used for vegetative propagation of patchouli. The aim of our study was to check the influence of different growing media on morphological traits in patchouli. The experiment was conducted in open field at Central Institute of Medicinal & Aromatic Plants, Research Centre, Pantnagar (Uttarakhand), India during rainy season, 2019. Experiment was laid out in Completely Randomized Design (CRD) with treatments of T_1: Geranium manure (GM), T_2: Geranium manure & FYM (1:1), T_3: Farm yard manure (FYM only), T_4: FYM & soil (1:1), T_5: Soil & Geranium manure (1:1) and T_6: Soil as control with three replications. Observations on mortality (%) at 30 days after planting, survival (%) at 30 days after planting, root length, no. of roots per plant, no. of leaves per plant, stem diameter (cm) and plant height (cm) were recorded. The treatment T_4: FYM & soil (1:1) recorded significantly superior values compare to other treatments. So, it is better to raise cuttings in combination of FYM & soil (1:1) as growing media.

Key words : Patchouli, growing media, soil, FYM, root length.

Introduction

Patchouli scientifically Known as *Pogostemon cablin* Benth. is a perennial aromatic herb and valued to give an aromatic oil with base fragrance which is largely used in perfumery industry, cosmetics, medicines etc. Patchouli has many species but *Pogostemon patchouli* is the only superior species which is grown for oil purpose. Leaves contain aromatic oil which is an essential component in the plant. In patchouli oil approx. 40-45 per cent cablin alcohol is present. Patchouli oil is one of the best fixatives for heavy perfumes with long lasting qualities. Itself it is a perfume and is highly valued in perfumes, soaps, cosmetics and flavour industries. It also is having anti-insecticidal properties, anti-fungal and bacteriostatic properties (Kukreja *et al.,* 1990; Yang *et al.,* 1996). It is also used as a scent in several products like paper towels, laundry and air fresheners. Mainly two important compounds are present in the oil of patchouli *i.e. patchoulol* and *norpatchoulenol*.

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. Considering the importance of this crop, it is essential to multiply this crop vegetatively from stem cuttings in order to maintain planting material and genetic character for commercial cultivation. Shade is required for Patchouli growth and it is possible through only by stem cuttings and can be raised at any time of the year. Vijaylalitha and Rajsekaran (1997) reported that terminal cuttings and three node cuttings gave higher rooting percentage. Bijalwa *et al.,* (2014) reported in rose scented geranium that well drained loam and sandy loam soil with sufficient amount of organic matter is ideal for geranium cultivation. Rawat *et al.,*

***Author for correspondence :** E-mail: dipenderkumar@cimap.res.in

(2014) conducted an experiment on Geranium; he reported that cocopeat and vermicompost resulted in higher survival percentage (86.7%) and lowest was recorded in soil (66.7%). Prawal P.S. Verma *et al.,* (2017) reported in Marjorum and oregano that combination of vermicompost and FYM (1:1) influenced the all the growth parameters and highly recommended.

Therefore, the kind of propagating media plays a significant role in increasing the commercial multiplication of this potential crop. Organic manures such as Vermicompost and soil are used as growing media to increase the survival percentage in Patchouli and other growth parameters. The aim of this study is to study the effect of organic manure, FYM and soil and in combination on mortality, survival percentage, root length, stem diameter, plant height in Patchouli cuttings.

Materials and Methods

The experiment was conducted in open field at Central Institute of Medicinal & Aromatic Plants, Research Centre, Pantnagar (Uttarakhand), India during rainy season, 2019. Stem cuttings of Patchouli were used as planting material on polybags. Experiment was laid out in completely Randomized block design with treatments of T_1: Geranium manure (GM), T_2: Geranium manure & FYM (1:1), T_3: Farm yard manure (FYM only), T_4: FYM & soil (1:1), T5: Soil & Geranium manure (1:1) and T_6: Soil as control with three replications. Observations on mortality percentage at 30 days after planting, survival percentage at 30 days after planting, root length, no. of roots per plant, no. of leaves per plant, stem diameter (cm) and plant height (cm) were recorded. At the time of recording observations, cuttings were carefully uprooted and washed.

The data on survival percentage of cuttings was recorded according to mortality percentage of cuttings. The survival percentage was calculated as the per cent of mortality cuttings starting from the first mortality to no further mortality. Plant height was measured from upper soil surface up to the maximum leaf tip by straightening all the leaves. Number of roots and root length was measured by destructive method *i.e.* by uprooting the plant and measured the root length and number of roots. Numbers of leaves were also recorded by manual counting per plant. All the data was subjected to analysis of variance (ANOVA) to determine significant differences and comparison of means at significant level of 5%.

Results and Discussion

Data pertaining to mortality percentage, survival percentage, root length, no. of roots per plant, no. of leaves per plant, stem diameter and plant height are presented in table 1.

Effect of growing media on mortality percentage

Data on mortality percentage is presented in table 1 & Fig. 1 and showed significant effect on mortality of stem cuttings. Least mortality of cuttings (10.7 %) was recorded in when the cuttings were grown in growing media of FYM & soil (T_4) which was significantly better as compared to rest of the growing media. Maximum mortality of stem cuttings were recorded in treatment T_6 (37.3 %). Mortality of cuttings were statistically at par with each in treatments T_1 (22.7 %), T_3 (21.3%) and T_2 (18.7 %) statistically at par with each other and T_3 (21.3%), T_2 (18.7 %) and T_5 (17.3 %) were also statistically at par with each other.

Effect of growing media on survival percentage

It is evident from the data that survival percentage was significantly influenced by different growing media (Table 1 & Fig. 1). The highest survival percentage (89.3%) was observed in treatment T_4 (FYM & soil; 1:1) which was significantly higher than other growing media. Treatments T_2 (GM & FYM; 1:1) and T_5 (soil & GM; 1:1) were statistically at par with each other. Similarly, treatments T_1 (GM only) and T_3 (FYM only) were also statistically at par with each other. Lowest survival percentage (62.7%) was observed in treatment T_6 (soil). Highest survival percentage in growing media of FYM & soil in the ration of 1:1 might be due to that this combination of growing media increased more availability of nutrients to the roots, improved water holding capacity of soil which provides better nourishment to the cuttings. Similar findings were reported by Maurya *et al.,* (2012) and Rymbai *et al.,* (2012) with cocopeat and moss in guava.

Effect of growing media on root length

Data on root length Table 1 & Fig. 1 showed that maximum root length (16.7 cm) was recorded when the cuttings were grown in the treatment of FYM & soil combination (T_4) in the ratio of 1:1 which was significantly higher as compare to rest of the growing media treatments. Treatments T_2 (15 cm), T_3 (14.7 cm) and T_5 (15.3 cm) were statistically at par with each other with respect to root length, respectively. Minimum root length (8.0 cm) was recorded in treatment T_6, when stem cuttings were grown in soil only. FYM when added to the soil add more nutrients to the rhizosphere area near the root zone which makes quick availability of the nutrients to the roots and soil provide better medium for growth. Similar result was also reported by Prawal P.S.

Table 1: Effect of different treatments on mortality, survival percentage and growth performance in Patchouli var. CIM-Samarth.

Treatments	Mortality (%) of cuttings after 30 DAP	Survival (%) of cuttings after 30 DAP	Root length (cm)	No. of roots/ plant	No. of leaves/ plant	Stem diameter (cm)	Plant height (cm)
T_1: GM only	22.7	77.3	12.7	16.3	20.7	3.6	20.0
T_2: GM & FYM (1:1)	18.7	81.3	15.0	21.9	22.7	3.9	23.3
T_3: FYM only	21.3	78.7	14.7	16.7	22.0	3.8	23.0
T_4: FYM & Soil (1:1)	10.7	89.3	16.7	25.7	25.0	4.6	28.3
T_5: Soil & GM (1:1)	17.3	82.7	15.3	23.3	233	4.3	23.3
T_6: Soil only	37.3	62.7	8.0	11.7	16.3	3.5	11.0
SEm (±)	1.4	1.4	0.4	0.5	0.7	0.3	0.5
C.D. at 5%	4.5	4.5	1.1	1.5	2.4	NS	1.5

Table 2: Correlation between characters in Patchouli that are affected by different growing media.

Characters	Mortality (%)	Survival (%)	Root length (cm)	No. of roots/ plant	No. of leaves/ plant	Stem diameter (cm)	Plant height (cm)
Mortality (%)	1.00						
Survival (%)	-1.00**	1.00					
Root length (cm)	-0.98**	0.98**	1.00				
No. of roots/plant	-0.93**	0.93**	0.89*	1.00			
No. of leaves/plant	-0.25NS	0.25NS	0.28NS	0.41NS	1.00		
Stem diameter (cm)	-0.85*	0.85*	0.80NS	0.93**	0.43NS	1.00	
Plant height (cm)	-0.99**	0.99**	0.99**	0.90*	0.19NS	0.82*	1.00

Verma *et al.,* (2015) worked on pyrethrum seedling where media containing vermicompost: FYM: soil produced vegetative and root growth better than soil, sand and other growing media.

Effect of growing media on number of roots per plant

Number of roots per plant was significantly influenced in different growing media and their combinations presented in Table 1 & Fig.1. More number of roots per plant (25.7) was observed in FYM & soil growing media (T_4) which was superior to any other growing media. Growing media of soil & GM (T_5) produced 23.3 number of roots per plant which were statistically at par with the growing media of GM & FYM (21.9) treatment (T_2). Treatments, T_5 (23.3) and T2 (21.9) were significantly higher than T_1 (16.3) and T_6 (11.7), respectively. Treatment T_1 (16.3) recorded more number of roots per plant which was significantly higher than treatment T_6 (11.7). Combination of FYM & soil in 1:1 ratio help in better aeration, more nutrient availability and helpful bacterial population which helped in better root initiation. These results are in line with Rymbai *et al.,* (2012).

Effect of growing media on number of leaves per plant

The data on number of leaves per plant is depicted in table 1 and Fig. 1. Number of leaves per plant varied from 16.3 to 25.0. Least number of leaves per plant (16.3) was recorded when the cuttings were planted in treatment of soil only (T_6) which was significantly lower as compared to other growing media. Maximum number of leaves per plant (25.0) was observed in treatment T_4 *i.e.* FYM & soil growing media which was statistically at par with T_5 (23.3), T_2 (22.7) but significantly higher than T_3 (22.0), T_1 (20.7) and T_6 (16.3). T_5 showed more number of leaves per plant, this may be due to better root growth, more number of roots helps in better absorption of nutrients from the soil and FYM which translocated to the upper part of the plant cause more production of leaves. The results are in agreement with Renuka *et al.,* (2015) in carnation and Kumar *et al.,* (2011) in Patchouli.

Effect of growing media on stem diameter (cm) and plant height (cm)

The evidence of data pertaining to stem diameter (cm) and plant height is presented in table 1 and Fig. 1. All the growing media for stem cuttings growth did not significantly influenced the stem diameter (cm). Data pertaining to plant height (cm) revealed that growing media had significant effect on the plant height in stem cuttings

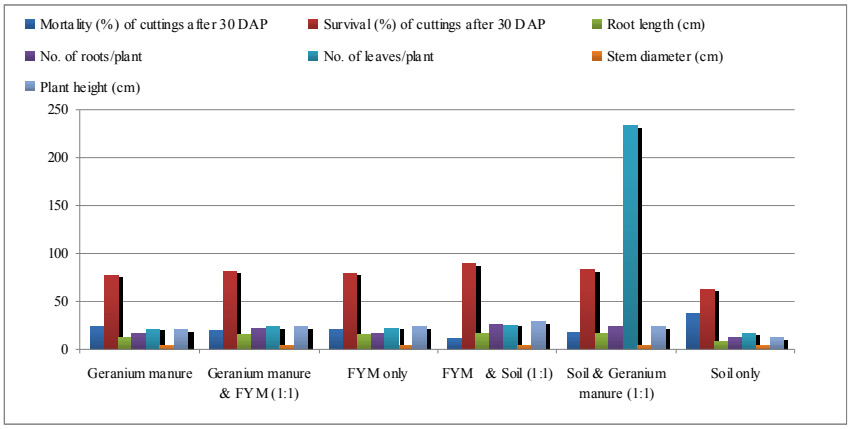

Fig. 1: Effect of different treatments on mortality, survival percentage and growth parameters in Patchouli var. CIM-Samarth.

of Patchouli. Plant height varied from 11.0 to 28.3 cm. Maximum plant height (28.3 cm) was recorded in treatment of FYM & soil growing media combination which was significantly higher as compared to rest of the growing media treatments and least value for plant height (11.0 cm) was recorded in treatment of soil only (T_6). Treatments T_2 (23.3 cm), T_5 (23.3 cm) and T_3 (23.0 cm) were statistically at par with each other but significantly higher than treatments T_1 (20.0 cm) and T_6 (11.0 cm). This might be due better root growth promotes more translocation of carbohydrates, more nutrient availability which cause cell expansion, cell elongation cause more plant in FYM and soil growing media. Results are in line with Prawal P.S. Verma *et al.,* (2015) in stevia.

Correlation between characters that are affected by different growing media

Correlation between various characters presented in table 2. Root length is positively correlated with survival (%) at 1% level of significance but non-signficant at 5% level of significance. Similarly, number of roots per plant is also positively correlated with survival (%) at significance level of 1%. Stem diameter (cm) showed positive correlation with survival (%) at 5% level of significance value but not at 1% level of significance. Plant height is also positively correlated with survival (%) at 1% level of significance but not at 5% level of significance.

Root length recorded positive correlation with number of roots per plant at 5% level of significance but not at 1% significance level. Similarly, Root length (cm) also showed positive correlation with plant height (cm) at 1% level of significance only. Number of roots per plant showed correlation positively with stem diameter (cm) at 1% significance level and with plant height at 5% level of significance. Stem diameter (cm) showed positive correlation with plant height only at 5% level of significance.

Conclusion

Present study demonstrated the effect of different propagating media on morphological traits in patchouli. Propagating media of FYM & soil (1:1) was the most appropriate media for stem cutting vegetative propagation of *Pogostemon patchouli* as it gives the best results in all growth parameters tested. It is thus suggested and recommend FYM & soil (1:1) as suitable growing medium for propagation of *P. patchouli* in commercial scale plant production.

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