



Research Article

STUDIES ON EFFECT OF DIFFERENT PROPAGATION MEDIA ON GROWTH AND SURVIVAL OF CLOVE (*Syzygium aromaticum* L. Meer) SEEDLINGS

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Abstract: The study was carried out to explore the effect of different propagation media on the growth and survival of clove (*Syzygium aromaticum* L. Meer.) seedlings. The trial was conducted at Dr Balasaheb Sawant Kokan Krishi Vidyapeeth, Dapoli, Ratnagiri during the year 2014-15 in dept. nursery. The experiment was designed on Factorial Randomized Block Design (FRBD) having three replications per treatment. Different treatments of propagation media like Sand, Soil, FYM, Coco Peat, Vermicompost and *Tricoderma* were given alone or in combination to clove seedling. The observations on seedling height, internode length, number of leaves, leaf area, root length, total chlorophyll, vigour index and survival percent were recorded. The results revealed that the influence of T4 (Sand + Soil + Coco Peat + *Tricoderma* drenching) was found significantly superior over other treatments and resulted in tallest plants (11.40 cm) with longest internodes (3.80 cm), more number of leaves (9.73), peak leaf area (31.50 dm² plant⁻¹) and highest total chlorophyll (1.92 mg g⁻¹), vigour index (195.41), more root length (12.21 cm) and highest survival percent (96.17 %) as compared to other propagation medias.

Keywords: Clove, Seedling, Vermicompost, Propagation media, Sand, Soil, Coco Peat and *Tricoderma viridae*

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Introduction

Clove is one of the most valuable spice crops and has been used for centuries as food preservative and culinary spice. Cloves are dried, unopened flower buds of tree of family Myrtaceae, *Syzygium aromaticum* L. Meer. It contains Eugenol (80-90%) [1] which possesses antiseptic [2], anesthetic [3] and anti-microbial properties against *Histeria monocytogenes* and *Lactobacillus sakei* in food [4]. The clove tree requires warm tropical climate with temperature range 20°C to 30°C and rainfall 1500 mm to 2000 mm [5]. The Kokan region of Maharashtra has tropical humid type of climate with temperature range of 16°C to 34°C and annual rainfall 2000 to 4000 mm which makes Kokan region suitable for commercial clove cultivation. Even with such favorable climatic conditions the area under clove cultivation has not significantly increased area under cultivation as compared to other spice crops. The major constraint in expansion of clove cultivation is unavailability of seedlings. Continuous supply of clove seedlings faces the hurdle due to low growth and its survival. In recent years, use of different propagation media has been shown to improve survival and growth of seedlings in various crops. Therefore, the present investigation was carried out with the objective to increase the growth and survival percent of seedlings in different propagation media

Materials and Method

The present experiment was conducted at Department of Horticulture, College of Agriculture, Dr Balasaheb Sawant Kokan Krishi Vidyapeeth, Dapoli during the year 2014-15. The experiment was conducted in Factorial Randomized Block Design (FRBD) with three replications. From each replication 10 seedlings were taken as sample to record observations. Treatments were as follows- T0: Sand + FYM (1:1), T1: Sand + Coco Peat (1:1), T2: Sand + Coco Peat (1:1), T3: Sand + Soil + Coco Peat + Vermicompost + *Tricoderma* drenching (1:1:1), T4: Sand + Soil + Coco Peat + *Tricoderma* drenching (1:1:1).

(1:1:1), T4: Sand + Soil + Coco Peat + *Tricoderma* drenching (1:1:1). The seeds of clove were purchased from private clove farm in Pechiparai, Tamil Nadu. The seeds were extracted by removing fleshy pericarp with hand and were washed thoroughly with water and used for carrying out different experiments. The seeds were sown in trays with Coco Peat and allowed to germinate for one month. After one month the germinated seeds were transplanted in different propagation medium. The observations of height, internode length and number of leaves were recorded at 15, 30, 45, 60, 75 and 90 DAT whereas total chlorophyll, leaf area, root length and vigour index were recorded at 45 and 90 DAT. The survival percent of seedlings was recorded at 90 DAT. Estimation of chlorophyll was done by spectrophotometer method as suggested by [6].

Result and Discussion

Effect of propagation media on plant height

The data [Table-1] revealed that, the effect of propagation media on plant height was significant except at 15 DAT. At 90 DAT, maximum height was observed in T4 (11.40 cm) followed by T3 (10.57 cm), whereas lowest height was recorded in control i.e. T0 (8.70 cm). In treatment T4, height increased by 41.62 percent with respect to control T0. The superior performance of propagation media may be attributed to improved physical status of this media due to nutritional properties of soil, aeration and drainage quality of sand, good water holding capacity of Coco Peat and reducing soil borne diseases by *Tricoderma viridae* [7]. Similar results were observed in crops like clove [8, 9] and black pepper [10].

Effect of propagation media on internode length

The data [Table-1] points towards a significant influence of propagation media on internode length at different intervals. T4 (3.80 cm) showed and extreme increase in internode length at 90 DAT, which was followed by T3 (3.51 cm) and T2 (3.36 cm). The internode length in T4 was increase by 14.80 percent over control T0.

Table-1 Effect of propagation media on plant height, internode length and number of leaves in clove (*Syzygium aromaticum* L.) seedling

Parameter	Media	15 DAT	30 DAT	45 DAT	60 DAT	75 DAT	90 DAT
Height (cm)	T ₀	6.2	6.61	7.11	7.65	8.11	8.7
	T ₁	6.18	6.62	7.23	7.71	8.75	9.76
	T ₂	6.2	6.71	7.25	7.83	9.01	9.92
	T ₃	6.13	7.06	8.1	8.96	9.8	10.57
	T ₄	6.23	7.8	8.75	9.45	10.18	11.4
	S.Em±	0.03	0.02	0.01	0.01	0.01	0.02
	CD @ 5 %	NS	0.06	0.03	0.03	0.04	0.08
Internode length (cm)	T ₀	1.83	2.08	2.31	2.7	2.93	3.31
	T ₁	1.78	1.96	2.36	2.91	3.08	3.26
	T ₂	1.75	2.06	2.45	2.83	3.16	3.36
	T ₃	1.83	2.2	2.58	2.91	3.3	3.51
	T ₄	1.85	2.33	2.83	3.21	3.55	3.8
	S.Em±	0.01	0.02	0.03	0.04	0.03	0.04
	CD @ 5 %	0.05	0.07	0.1	0.13	0.1	0.13
Number of leaves	T ₀	4.25	4.93	5.42	6.51	7.32	8.08
	T ₁	4.21	4.72	5.75	5.99	6.78	7.9
	T ₂	4.19	4.88	5.93	6.14	6.88	8.52
	T ₃	4.26	4.97	6.06	6.59	7.1	8.77
	T ₄	4.22	5.06	6.42	7.34	8.77	9.73
	S.Em±	0.07	0.04	0.03	0.02	0.01	0.2
	CD @ 5 %	NS	0.01	0.09	0.07	0.04	0.07

T₀: Sand + FYM (1:1), T₁: Sand + Coco Peat (1:1:1), T₂: Sand + Soil + Vermicompost + *Tricoderma* drenching (1:1:1), T₃: Sand + Soil + Coco Peat (1:1:1), T₄: Sand + Soil + Coco Peat + *Tricoderma* drenching (1:1:1)

Table-2 Effect of propagation media on leaf area, root length, vigour index and total chlorophyll in clove (*Syzygium aromaticum* L.) seedling

Parameter	Media	45 DAT	90 DAT
Leaf area (dm ² plant ⁻¹)	T ₀	15.5	25.08
	T ₁	14.86	23.36
	T ₂	16.82	28.82
	T ₃	20.24	30.06
	T ₄	22.05	31.5
	S.Em±	0.07	0.06
	CD @ 5 %	0.22	0.18
Root length (cm)	T ₀	6.89	10.35
	T ₁	6.31	10.31
	T ₂	7.48	11.22
	T ₃	7.86	11.65
	T ₄	8.51	12.21
	S.Em±	0.03	0.04
	CD @ 5 %	0.1	0.13
Vigour index	T ₀	105.43	154.83
	T ₁	95.44	144.5
	T ₂	114.16	166.5
	T ₃	126.87	185.5
	T ₄	138.04	195.41
	S.Em±	0.23	0.27
	CD @ 5 %	0.71	0.81
Total chlorophyll (mg g ⁻¹)	T ₀	0.355	1.455
	T ₁	0.254	1.354
	T ₂	0.631	1.731
	T ₃	0.791	1.883
	T ₄	0.822	1.922
	S.Em±	0.007	0.006
	CD @ 5 %	0.021	0.018

T₀: Sand + FYM (1:1), T₁: Sand + Coco Peat (1:1:1), T₂: Sand + Soil + Vermicompost + *Tricoderma* drenching (1:1:1), T₃: Sand + Soil + Coco Peat (1:1:1), T₄: Sand + Soil + Coco Peat + *Tricoderma* drenching (1:1:1)

The increase in internode length may be due to improved physical and chemical status which further influences nutrition, aeration, drainage and water holding capacity of soil. Thus, increase in the internode length may be attributed to improvement in propagation media [9]. This view is supported by similar results observed by other researchers in crops like clove [8], *Eucalyptus camaldulensis* [11] and Bush pepper [12].

Effect of propagation media on number of leaves

The data [Table-1] shows the significant impact of propagation media on number of leaves except at 15 DAT. At 90 DAT, Treatment T₄ (9.73) recorded highest number of leaves which was significantly superior over control T₀ (8.08) and T₄

showed an increase of 20.42 percent in number of leaves in as compared to control T₀. The increased number of leaves may be credited to high nutrient availability, water holding capacity, aeration and other physiochemical properties of media [7]. Similarly, the effect of increasing number of leaves by different propagation media was recorded in clove [8], cardamom [12] and pepper [10].

Effect of propagation media on Leaf area

The data [Table-2] indicates a significant effect of propagation media on leaf area at 45 and 90 DAT. At 90 DAT, treatment T₄ was significant over the rest of treatments and recorded maximum leaf area (31.50 dm² plant⁻¹) while T₀ recorded 25.08 dm² plant⁻¹. Treatment T₄ recorded an increase in leaf area by

25.59 percent as compared to control T0. Higher moisture retention capacity, porosity and nutrient status of propagation media may be the factors responsible Nasiruddin Shaikh, Ramteke S.D., Mane A.V., Pethe U.B. and Urkude V.

for increase in leaf area [10]. This view is supported by similar results in crops like clove [9], *Eucallptus camaldulensis* [11] and *African nutmeg* [13].

Effect of propagation media on Root length

The propagation media generated significant effects on root length of seedlings. Treatment T4 (12.21 cm) induced longest roots and varied significantly with respect to other treatments. It was followed by T3 (11.65 cm), T2 (11.22 cm), T1 (10.31 cm) and T0 (10.35 cm). Root length in T4 increased by 18.42 percent as compared to T0. Roots expand, increase in size and penetrate deep due to the better texture and porosity of Coco Peat [2]. This finding is supported by similar results in crops like African bread fruit [14] and Nutmeg [15].

Effect of propagation media on Vigour index

The influence of propagation media on vigour index was observed to be significant. Treatment T4 (195.41) recorded highest vigour index and was significantly superior to rest of the treatments. It was followed by T3 (185.50), T2 (166.50), T1 (144.50) and control T0 (154.83). Media T4 recorded increase in seedling vigour index by 26.20 percent over control T0. High vigour index may be probably due to synergistic effects of media components i.e. soil, sand and *Tricoderma* [15].

Effect of propagation media on Total chlorophyll

The total amount of chlorophyll varied significantly under the influence of different propagation media at 45 and 90 DAT. At 90 DAT, Treatment T4 (1.922 mg g⁻¹) showed a significant increase in chlorophyll over the rest of treatment. Treatment T4 recorded an increase in total chlorophyll by 32.09 percent as compared to control T0. The change in physiochemical properties of propagation of propagation media may have increased by increasing number of leaves and leaf area [16]. This outcome is supported by similar results in *Ficus concinna* [17].

Effect of propagation media on Survival percent

Survival percent is an essential factor to determine the utility of propagation media. At 90 DAT, effect of propagation media displayed a significant variation on survival of seedlings. Treatment T4 (96.17 %) recorded highest survival percent while T1 (63.00 %) displayed lowest survival. In the present study, media T4 recorded an increase in survival percent by 30.84 percent over control. The increase in survival could be attributed to better water holding capacity, nutrient availability and reduced root infection due to application of *Tricoderma* [18].

Table-3 Effect of propagation media on survival percent in clove (*Syzygium aromaticum* L.) seedling

Media	Survival percent (%)
	90 DAT
T ₀	73.50
T ₁	63.00
T ₂	86.17
T ₃	89.83
T ₄	96.17
S.E.m.±	0.77
C.D. at 5 %	2.99

T0: Sand + FYM (1:1), T1: Sand + Coco Peat (1:1:1), T2: Sand + Soil + Vermicompost + *Tricoderma* drenching (1:1:1), T3: Sand + Soil + Coco Peat (1:1:1), T4: Sand + Soil + Coco Peat + *Tricoderma* drenching (1:1:1)

Conclusion

The present investigation demonstrated the significant influence of propagation media on the growth and survival of clove seedlings. The propagation media T4: Sand + Soil + Coco Peat + *Tricoderma* drenching (1:1:1) was found to have a superior effect on all parameters viz height, internode length, number of leaves, leaf area, total chlorophyll, root length, vigour index and survival percent. On the basis of above data, it may be inferred that, the ability of T4 to enhance the growth and survival percent of seedlings is highly significant. Therefore, propagation media T4 can be used as propagation media for commercial production clove

seedlings.

Application of research: Research is applicable for commercial production of superior quality of clove seedlings.

Research Category: Growth and survival of clove seedling

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