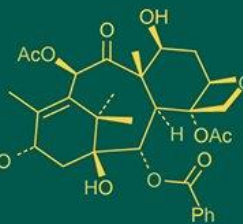
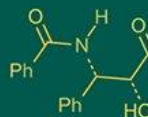


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Effect of different growing media on growth and flowering of stock (*Matthiola incana* L.)

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Abstract

The present investigation entitled “Effect of different growing media on growth and flowering of Stock (*Matthiola incana* L.)” was conducted at Horticulture Research cum Instructional Farm, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during the *Rabi* season of 2025-26. The experiment was laid out in a Completely Randomized Design (CRD) with eight treatments and three replications. The treatments comprised T₀-Garden soil (control), T₁-Garden soil + Sand + FYM (1:1:1), T₂-Garden soil + Sand + Vermicompost (1:1:1), T₃-Garden soil + Sand + Vermicompost + FYM (1:1:1:1), T₄-Garden soil + Sand + Vermicompost + Cocopeat (1:1:1:1), T₅-Garden soil + Sand + FYM + Cocopeat (1:1:1:1), T₆-Cocopeat + Vermicompost + Composted paddy straw + Rice husk (2:1:1:1) and T₇-Cocopeat + Vermicompost + Perlite + Leaf manure (2:1:1:1). All the growing media were prepared by mixing the respective components in the prescribed proportions (v/v). The results revealed that different growing media combinations significantly influenced the vegetative growth, rooting, flowering, flower yield and vase life of stock. Among the treatments, T₇ recorded the maximum plant height (29.94 cm), number of leaves (39.87), flower diameter (29.99 mm), number of flowers per spike (13.05), spike length (16.73 cm), flower yield per plant (29.72 g), vase life (7.67 days), number of roots (19.87), root length (16.62 cm), fresh root weight (2.52 g) and dry root weight (1.23 g). It also recorded earliest first bud appearance (26.73 days), minimum number days to 50% flowering (40.00 days) and the longest flowering duration (20.00 days), followed by T₃. Therefore, T₇ was found to be the most suitable growing media for stock (*Matthiola incana* L.).

Keywords: *Matthiola incana* L., stock, growing media, vermicompost, cocopeat and composted paddy straw

Introduction

Matthiola incana L. (stock) is an important ornamental flowering crop belonging to the family Brassicaceae. It is native to the Mediterranean region and widely cultivated as a cut flower owing to its attractive flower spikes, pleasant fragrance, wide range of colours and excellent vase life Saleem *et al.* [1] The crop is extensively used in bouquets, floral arrangements, interior decoration and landscape gardening Sarwar *et al.* [2]. In India, stock is cultivated during the winter season and is gaining commercial importance due to the increasing demand for high-quality cut flowers Waseem *et al.* [3] Growing media play an important role in determining the growth, flowering, and overall quality of ornamental crops Chamani *et al.* [4] An ideal growing medium should provide adequate support to the plant, ensure proper aeration and drainage, retain sufficient moisture, and supply essential nutrients for healthy root development and vigorous plant growth khandekar *et al.* [5]. Various materials, including garden soil, sand, farmyard manure (FYM), vermicompost, cocopeat, perlite and leaf manure, are commonly used individually or in different combinations to improve the physical, chemical and nutritional properties of the growing medium Singh *et al.* [6]. The composition of the growing medium can significantly affect vegetative growth, flowering characteristics, flower yield and post-harvest quality of stock Kareem *et al.* [7]. Hence, evaluating different growing media combinations is essential for identifying a suitable medium that promotes optimum growth, abundant flowering, and better quality of stock (*Matthiola incana* L.). Although different organic and inorganic materials are used as components of growing media for ornamental crops, comparative information on suitable combinations for improving growth, rooting, flowering, flower yield and vase life of stock under the agro-climatic conditions of Raipur is limited.

Therefore, the present study was undertaken to evaluate different combinations of growing media for identifying a suitable medium for improved growth and flowering performance of Stock (*Matthiola incana* L.).

Materials and Methods

The experiment was conducted at the Horticulture Research cum Instructional Farm, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.), during the Rabi season of 2025-26. The experiment was laid out in a Completely Randomized Design (CRD) with 8 treatments and 3 replications. The treatments comprised T₀-Garden soil (control), T₁-Garden soil + Sand + FYM (1:1:1), T₂-Garden soil + Sand + Vermicompost (1:1:1), T₃-Garden soil + Sand + Vermicompost + FYM (1:1:1:1), T₄-Garden soil + Sand + Vermicompost + Cocopeat (1:1:1:1), T₅-Garden soil + Sand + FYM + Cocopeat (1:1:1:1), T₆-Cocopeat + Vermicompost + Composted paddy straw + Rice husk (2:1:1:1) and T₇-Cocopeat + Vermicompost + Perlite + Leaf manure (2:1:1:1). All the growing media were prepared by mixing the respective components in the prescribed proportions (v/v). Seeds of stock (*Matthiola incana* L.) were sown on a raised nursery bed to raised healthy seedlings. After 30-45 days, uniform and healthy seedlings were transplanted into grow bags filled with different growing media combinations as per the treatments. All the recommended cultural practices, including irrigation, weeding and plant protection measures, were followed uniformly throughout the experimental period. The recorded observations were subjected to analysis of variance appropriate for a Completely Randomized Design (CRD). Treatment means were compared using the critical difference (CD) at the 5% level of significance. Standard error of mean (SEM $\pm$) and CD at 5% were calculated for comparison among treatments."

Results

Vegetative Parameters

Plant height (cm): Plant height was significantly influenced by different growing media combinations (Table 1). Among the treatments, T₇ recorded the maximum plant height (29.94 cm), followed by T₃ (23.37 cm), whereas T₀ the control recorded the minimum plant height (16.69 cm). The superior plant height under T₇ may be attributed to the favourable physical and nutritional properties of the growing medium, which improved root development, water retention, aeration and nutrient uptake, thereby promoting vigorous vegetative growth.

Number of leaves: The number of leaves per plant was significantly influenced by different growing media combinations was presented in Table 1. The maximum number of leaves per plant was found in T₇ i.e. 39.87 followed by T₃ i.e. 31.20 while the T₀ (control) observed the minimum number of leaves (22.00). The higher leaf production under T₇ might be attributed to better moisture retention, improved aeration and enhanced nutrient availability, which together supported stronger root system and efficient nutrient uptake, resulting in better vegetative growth.

Plant spread (cm): Plant spread (N-S) and (E-W) directions was significantly influenced by different growing media combinations was presented in Table 1. In treatment T₇

recorded the maximum plant spread followed by T₃ in the N-S and T₆ in the E-W direction among the different treatment, whereas the T₀ (control) recorded the minimum plant spread in (N-S) and (E-W) directions. The increased plant spread under T₇ may be attributed to the favourable physical and nutritional properties. The combination of cocopeat, vermicompost, perlite and leaf manure provided improved moisture retention, aeration and nutrient availability, which influenced the healthy root development and vigorous vegetative growth, resulting in greater plant spread.

Flowering Parameters

Days to first bud appearance: The number of days to first bud appearance was significantly influenced by different growing media combinations (Table 2). The foremost bud appearance was recorded in T₇ (26.73 days) followed by T₃ (29.40 days), whereas again the T₀ (control) took the maximum number of days (42.40 days). The earlier bud initiation under T₇ likely due to improved root development, better nutrient uptake and favourable moisture conditions, which promoted early transition from the vegetative to the reproductive phase.

Days to 50% flowering: The number of days to 50% flowering was influenced by different growing media combinations which was presented in Table 2. The minimum number of days to 50% flowering was recorded in T₇ (40.00 days), followed by T₃ (43.27 days), while the T₀ (control) required the maximum number of days (57.40 days). The reduction in days to 50% flowering under T₇ may be due to improved root activity, balanced nutrient availability and favourable moisture conditions, which enhanced physiological processes and promoted early flowering.

Flowering duration: Flowering duration was significantly influenced by different growing media combinations (Table 2). The longest flowering duration was recorded in T₇ (20.00 days), followed by T₂ (16.60 days), whereas T₀ (control) recorded the shortest flowering duration (11.20 days). The longer flowering duration recorded in T₇ might be assigned to the continuous supply of moisture and nutrients, which maintained metabolic processes and delayed floral aging, thereby extended the blooming period.

Flower diameter (mm): Flower diameter was influenced by different growing media combinations which was shown in Table 2. The highest flower diameter (29.99 mm) was recorded in T₇ closely related with T₆ (27.11 mm) and T₂ (26.78 mm), in contrast T₀ (control) recorded the lowest flower diameter (21.82 mm). The increased flower diameter found under T₇ could be linked to enhanced production and movement of assimilated, which advanced stronger flower bud development and growth, leading to bigger blooms.

Number of flowers per spike: The number of flowers per spike was significantly influenced by different growing media combinations (Table 3). The highest number of flowers per spike (13.05) was recorded in T₇ followed by T₃ (11.30), whereas T₀ (control) observed the minimum number of flowers per spike (9.54). The highest number of flowers under T₇ might be owing to improved increased vegetative growth, efficient nutrient uptake and greater

accumulation of photosynthates, which encouraged FBD and increased flower production.

Spike length (cm): Spike length was significantly influenced by different growing media combinations (Table 3). The maximum spike length (16.73 cm) was recorded in T₇, followed by T₃ (13.40 cm), whereas T₀ (control) recorded the minimum spike length (9.16 cm). The increased spike length under T₇ may be observed under improved root growth and balanced nutrient supply, which promoted cell elongation and supported the longer flower spikes.

Flower yield per plant (g): Flower yield per plant was significantly affected by different growing media combinations was presented in Table 3. The maximum flower yield per plant (29.72 g) was recorded in T₇ was presented in T₃ (18.77 g), while T₀ (control) recorded the minimum flower yield per plant (12.57 g). The higher flower yield under T₇ may be attributed to increased flower production and improved flower size, resulting from favourable growing conditions and efficient utilization of nutrients.

Vase life (days): Vase life was significantly influenced by different growing media combinations (Table 3). The longest vase life (7.67 days) was recorded in T₇, followed by T₃ and T₄ (7.33 days), whereas T₀ (control) recorded the shortest vase life (4.33 days). The improved vase life observed under T₇ might be attributed to the enhanced WHC of the growing medium, which maintained better water balance in the flower tissues and reduced moisture loss after harvest. Concurrently, balanced supply of nutrients also buildup greater carbohydrate accumulation, thereby delaying senescence and extending vase life. In addition, longer and stronger flower spikes further improved post-harvest durability.

Root Parameters

Number of roots: The results revealed that different growing media combinations significantly influenced the number of roots (Table 4). Treatment T₇ (Cocopeat + Vermicompost + Perlite + Leaf manure) recorded the highest number of roots, followed by T₆ (Cocopeat + Vermicompost + Composted paddy straw + Rice husk), whereas the control (T₀) observed the lowest number of roots. The higher number of roots in T₇ may be attributed to better moisture retention, improved aeration, and enhanced nutrient availability provided by cocopeat, perlite, vermicompost and leaf manure.

Root length (cm): Those results identified that root length was significantly influenced by different growing media combinations (Table 4). Treatment T₇ recorded the longer root length and then T₆, while the control (T₀) recorded the minimum root length. Improved aeration, water-holding capacity and nutrient availability in the growing medium promoted root elongation and overall root growth.

Fresh weight of roots (g): The fresh weight of roots varied significantly among the treatments was shown in Table 4. The greatest fresh root weight was recorded in T₇ followed by T₆ while the lowest value was recorded in the control (T₀). Better moisture availability, nutrient uptake and more favourable root-zone conditions likely contributed to the higher accumulation of root biomass.

Dry weight of roots (g): The dry weight of roots was significantly influenced by different growing media combinations (Table 4). Treatment T₇ recorded the highest dry root weight, followed by T₆, while the control (T₀) recorded the lowest value. The increased dry matter accumulation may be attributed to enhanced nutrient absorption and vigorous root development under the improved growing medium.

Table 1: Effect of different combinations of growing media on plant height (cm), numbers of leaves per plant and plant spread E-W(cm) and N-S (cm) at 30, 45 and 60 days after transplanting (DAT)

Tr. No.	Plant height (cm)	Numbers of leaves per plant	Plant spread E-W (cm)	Plant spread N-S (cm)
	60 DAT	60 DAT	60 DAT	60 DAT
T ₀	16.69	22.00	11.10	11.65
T ₁	20.74	25.20	13.32	12.68
T ₂	21.78	28.07	13.85	14.67
T ₃	23.37	31.20	15.69	16.53
T ₄	22.47	27.80	12.47	12.45
T ₅	19.99	24.27	12.89	14.09
T ₆	20.21	30.93	13.93	15.29
T ₇	29.94	39.87	16.03	17.13
SEm±	0.83	1.19	0.75	0.84
C.D.(P @ 5%)	2.51	3.60	2.26	2.55

Table 2: Effect of different combinations of growing media on days taken to first flower bud initiation, days to 50% flowering, flowering duration, and flower diameter (mm)

Tr. No.	Days taken to first flower bud initiation	Days to 50% flowering	Flowering duration	Flower diameter (mm)
T ₀	42.40	57.40	11.20	21.82
T ₁	36.80	51.00	14.67	24.64
T ₂	33.27	48.40	16.60	26.78
T ₃	29.40	43.27	15.87	25.77
T ₄	32.80	46.53	15.20	24.31
T ₅	34.13	48.33	14.00	25.43
T ₆	33.60	47.40	16.00	27.11
T ₇	26.73	40.00	20.00	29.99
SEm±	1.35	1.42	0.45	1.02
C.D.(P @ 5%)	4.09	4.28	1.36	3.09

Table 3: Effect of different combinations of growing media on number of flowers per spike, spike length (cm), flower yield per plant (g) and vase life.

Tr. No.	Number of flowers per spike	Spike length (cm)	Flower yield per plant (g)	Vase life
T ₀	9.54	9.16	12.57	4.33
T ₁	10.61	11.30	13.91	6.33
T ₂	10.49	10.93	17.39	7.00
T ₃	11.30	13.40	18.77	7.33
T ₄	11.22	12.47	17.49	7.33
T ₅	9.84	11.57	12.57	6.33
T ₆	10.17	12.00	16.41	5.33
T ₇	13.05	16.73	29.72	7.67
SEm±	0.59	0.67	0.74	0.31
C.D.(P @ 5%)	1.78	2.02	2.23	0.94

Table 4: Effect of different combinations of growing media on numbers of roots, root length (cm), fresh weight of roots (g) and dry weight of roots (g).

Tr. No.	Numbers of roots	Root length (cm)	Fresh weight of roots (g)	Dry weight of roots (g)
T ₀	14.67	8.13	1.45	0.56
T ₁	15.33	10.19	1.56	0.52
T ₂	16.27	8.88	1.75	0.72
T ₃	15.07	9.99	1.73	0.64
T ₄	17.60	8.55	1.97	0.72
T ₅	16.07	9.75	2.04	0.73
T ₆	17.93	10.71	2.32	1.20
T ₇	19.87	16.62	2.52	1.23
SEm±	0.72	0.37	0.08	0.02
C.D.(P @ 5%)	2.19	1.13	0.23	0.07

Discussion

Vegetative Parameters

Plant height (cm): Similar findings were reported by Padhiyar *et al.* [8] in chrysanthemum, Devavrata and Bahadur [9] in petunia and Singh *et al.* [6] in pot mum chrysanthemum.

Number of leaves: Similar observations were reported by Thakur and Grewal [10] in potted chrysanthemum, Chauhan *et al.* [11] in gerbera, Deogade *et al.* [12] in calendula and Yadav *et al.* [13] in China aster.

Plant spread (cm): Similar findings were reported by Gupta and Diltia [14] in primula, Wazir *et al.* [15] in alstroemeria and Singh *et al.* [6] in pot mum chrysanthemum.

Flowering Parameters

Days taken for first bud appearance: Similar findings were reported by Monika *et al.* [16] in chrysanthemum using cocopeat + FYM + garden soil (2:1:1), Chauhan *et al.* [11] in gerbera using soil + rice husk + cocopeat + castor cake + vermicompost (1:1:1:1:1), Deogade *et al.* [12] in calendula using garden soil + FYM + vermicompost + cocopeat, and Padhi *et al.* [17] in chrysanthemum, who reported the earliest bud appearance in garden soil + sand + FYM + vermicompost (1:1:0.5:0.5).

Days taken for 50% flowering: Similar observations were reported by Deogade *et al.* [12] in calendula using garden soil + FYM + vermicompost + cocopeat, and Padhi *et al.* [17] in chrysanthemum, who recorded the earliest 50% flowering in garden soil + sand + FYM + vermicompost (1:1:0.5:0.5).

Flowering duration: Similar findings were reported by Padhiyar *et al.* [8] in chrysanthemum using cocopeat + vermicompost + biocompost, Singh *et al.* [6] in pot mum using cocopeat + vermicompost + leaf mould (2:1:1), and

Padhi *et al.* [17] in chrysanthemum using garden soil + sand + FYM + vermicompost (1:1:0.5:0.5).

Flower diameter (mm): Similar observations were reported by Singh *et al.* [6] in pot mum using cocopeat + vermicompost + leaf mould (2:1:1), Padhiyar *et al.* [8] in chrysanthemum using cocopeat + vermicompost + biocompost, and Padhi *et al.* [17] in chrysanthemum using garden soil + sand + FYM + vermicompost (1:1:0.5:0.5).

Number of flowers per spike: Similar findings were reported by Chauhan *et al.* [11] in gerbera using soil + rice husk + cocopeat + castor cake + vermicompost (1:1:1:1:1), Singh *et al.* [6] in pot mum using cocopeat + vermicompost + leaf mould (2:1:1), and Padhi *et al.* [17] in chrysanthemum using garden soil + sand + FYM + vermicompost (1:1:0.5:0.5).

Spike length (cm): Similar findings were reported by Thakur and Grewal [10] in potted chrysanthemum using cocopeat + FYM (2:1), Padhiyar *et al.* [8] in chrysanthemum using cocopeat + vermicompost + biocompost.

Flower yield per plant (g): Similar observations were reported by Singh *et al.* [6] in pot mum using cocopeat + vermicompost + leaf mould (2:1:1), Chauhan *et al.* [11] in gerbera using soil + rice husk + cocopeat + castor cake + vermicompost, and Padhi *et al.* [17] in chrysanthemum using garden soil + sand + FYM + vermicompost (1:1:0.5:0.5).

Vase life (days): Similar findings were reported by Chauhan *et al.* [11] in gerbera using soil + rice husk + cocopeat + castor cake + vermicompost (1:1:1:1:1), Singh *et al.* [6] in pot mum using cocopeat + vermicompost + leaf mould (2:1:1), and Padhi *et al.* [17] in chrysanthemum using garden soil + sand + FYM + vermicompost (1:1:0.5:0.5).

Root Parameters

Number of roots: Similar findings were reported by Kumar *et al.* ^[18], who observed a higher number of roots in vermicompost-based growing media, and Parmer ^[19], who reported maximum root production in a medium comprising soil + sand + vermicompost (1:1:1).

Root length (cm): Similar findings were reported by Panyang and Verma ^[20] in sand + soil + vermicompost and by Singh *et al.* ^[6] in cocopeat + vermicompost + leaf mould (2:1:1).

Fresh weight of roots (g): Similar observations were reported by Parmer ^[19] in soil + sand + vermicompost (1:1:1) and Panyang and Verma ^[20] in marigold.

Dry weight of roots (g): Similar findings were reported by Swetha *et al.* ^[21] in cocopeat-based growing media and Parmer ^[19] marigold.

Conclusion

The results indicating the effect of different growing media combinations on growth, flowering, and yield parameters of Stock (*Matthiola incana* L.) revealed that treatment T₇ performed best with regards to maximum plant height (29.94 cm), highest number of leaves (39.87), maximum plant spread, early first bud appearance (26.73 days), minimum days to 50% flowering (40.00 days), maximum flowering duration (20.00 days), highest flower diameter (29.99mm), longest spike length (16.73 cm), maximum flower yield per plant (29.72 g), and maximum vase life (7.67days). While, highest root parameters including root length, number of roots, and root weight were also recorded in T₇. Therefore, it can be concluded that growing media containing (Cocopeat + Vermicompost + Perlite + Leaf manure) T₇ was found best for vegetative, flowering, yield, and post-harvest parameters of Stock plants.

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