

# Effect of Different Growing Media on Growth and Flowering of Petunia (*Petunia hybrida* L.)

## Abstract :

The Department of Floriculture and Landscape Architecture, COH, Mandasaur, RVSKVV, Gwalior undertook the current study to assess the effectiveness of various growing media on the growth and flowering of petunia (*Petunia hybrida* L.) (M.P.). The experiment had fourteen treatments, three replications, and was set up using a Completely Randomized Design (CRD). Different combinations of cocopeat, FYM, sand, soil and vermicompost were used to create the growth media. In terms of number of branches, flowers per plant, days to blooming, length of flowering, fresh weight of root mass, and dried weight of root mass, data showed that T<sub>14</sub> [Cocopeat + Sand + Soil + Vermicompost (1:1:1:1)] produced the greatest results. In contrast, T<sub>8</sub> [Sand + Vermicompost (1:1)] outperformed all other treatments in terms of floral diameter, fresh above-ground mass weight, and dry above-ground mass weight. Regarding plant length, number of leaf per plant, and stem diameter, treatment T<sub>2</sub> [vermicompost] has been shown to be superior to other treatments.

**Key words:** Cocopeat, FYM, Growing media like Soil, Petunia, Sand, Vermicompost,.

## INTRODUCTION

*Petunia* (*Petunia spp.*) is an annual or perennial plant belongs to the family solanaceae. The common kinds are weedy in habit, but their great profusion of bloom under all conditions makes them useful and popular. It is a decorative plant, grown for its beautiful flowers in beddings, borders, pots, hanging baskets, window boxes and containers. The range of flower shape, colour and size are incredible and can be effectively used in different landscape designs and forms. The common flower colours are pink, rose, salmon, red, white, blue bicolours and multicolours. Since the early days of horticulture, petunia is considered to be first cultivated bedding plant and has remained as a commercially vital ornamental crop and is one of the favourite genera for developing new varieties (Farooq *et al.*, 2021).

30 Garden petunias are small soft plants having a height of 25-35 cm with straggling or  
31 decumbent habit, pubescent and more or less sticky, with large showy flowers. The leaves are  
32 alternate, simple and entire, and are viscid pubescent. Flowers are beautiful, funnel shaped, small  
33 or large up to 6-12 cm across and produced on about 4-5 cm long flower stalk. Generally  
34 petunias are insect pollinated, with the exception of *P. exserta*, which is a rare, red flowered, and  
35 humming bird pollinated species.

36 Soilless media have proven popular with the majority of producers because of  
37 consistency, reproductivity, excellent aeration and low bulk density that reduce shipping and  
38 handling costs of the medium itself. Cocopeat acceptance as a growing medium is growing  
39 because of its superb aeration, lightness, durability and water holding characteristics (Nazari *et*  
40 *al.*, 2011).

41 The product of the composting method using a variety of species of worms generally  
42 earthworm to make a heterogeneous mixture of decomposing vegetables or food waste, bedding  
43 materials and vermicast is known as vermicompost. It has water-soluble nutrients and is an  
44 excellent, nutrient rich organic fertilizer and soil conditioner. It possesses characters like, fertility,  
45 water use efficiency, pH, substrate physical properties, microbial activity and organic matter  
46 components that may be responsible for increased growth (Padhiyar *et al.*, 2017).

47 Growth mediums are known to have been effective in value adding of potted ornamental  
48 plant and should have a best characteristics such as proper aeration, water holding capacity and  
49 adequate nutrient supply. Apart from this, growth medium plays a vital part in physiological  
50 parameters. It has been reported that the optimum amount of nutrient and environmental factors  
51 affect the plant growth, development and flowering of petunia (Khandaker *et al.*, 2018).

## 52 MATERIALS AND METHODS

53 The present investigation was conducted at the Department of Floriculture and Landscape  
54 Architecture, K.N.K. College of Horticulture, Mandasaur, Rajmata Vijayaraje Scindia Krishi  
55 Vishwa Vidyalaya, Gwalior (M.P.) during 2020-21 The experiment was laid out in a Completely  
56 Randomized Design (CRD) with fourteen treatments and three replications. Different growing  
57 media like soil, sand, vermicompost, FYM, cocopeat were taken and different combination of  
58 media according to the treatment were prepared. These media were filled into the polythene  
59 bags. [(T<sub>1</sub>) Soil], [(T<sub>2</sub>) Vermicompost], [(T<sub>3</sub>) Soil + Sand (1:1)], [(T<sub>4</sub>) Soil + FYM (1:1)], [(T<sub>5</sub>)

60 Soil + Vermicompost (1:1)], [(T<sub>6</sub>) Soil + Cocopeat (1:1)], [(T<sub>7</sub>) Sand + FYM (1:1)], [(T<sub>8</sub>) Sand  
61 + Vermicompost (1:1)], [(T<sub>9</sub>) Soil + Sand + FYM (1:1:1)], [(T<sub>10</sub>) Soil + Sand + Vermicompost  
62 (1:1:1)], [(T<sub>11</sub>) Soil + Sand + Cocopeat (1:1:1)], [(T<sub>12</sub>) Soil + Vermicompost + Cocopeat (1:1:1)],  
63 [(T<sub>13</sub>) Soil + FYM + Cocopeat (1:1:1)], [(T<sub>14</sub>) Soil + Sand + Vermicompost + Cocopeat  
64 (1:1:1:1)]. Observations parameters like Plant length (cm), Number of leaves / plant, Stem  
65 diameter (cm), Number of branch / plant, Number of flower / plant, Days taken to flowering  
66 (days), Flower diameter (cm), Flowering duration (days), Fresh weight of above ground mass  
67 (g), Dry weight of above ground mass (g), Fresh weight of root mass (g), Dry weight of root  
68 mass (g).

## 69 **RESULTS AND DISCUSSION**

### 70 **Plant length (cm)**

71 The findings of the present investigation revealed that the maximum plant length at 30  
72 and 45 DAP was observed by the treatment T<sub>2</sub> [Vermicompost] which was significantly different  
73 from most of the treatment and the minimum plant length was recorded with T<sub>1</sub> [Soil]. It may be  
74 inferred from these observations that only soil is not beneficial as a component of potting media  
75 for petunia in terms of plant length.

76 Present findings have indicated that potting media composition has a definite role to play  
77 in increasing the plant length of petunia. The increase in plant length in T<sub>2</sub> [Vermicompost]  
78 provide more nutritive media resulted in increment to plant length. This increase in plant length  
79 is due to the ability of this growing media to provide good aeration to plants in order to sustain  
80 the development and growth of roots and shoots. Further, vermicompost give maximum growth  
81 in account of favourable physiochemical properties of media and nutritional value. It is due to  
82 the fact that N is an essential constituent of protein and more availability of N, P and K in the  
83 substrate led to increase in cell number and cell size (Padhiyar *et al.* 2017).

84 Present findings are in conformity with the findings of Sardoei *et al.* (2014) in marigold  
85 and Gupta *et al.* (2014) in marigold.

### 86 **Number of leaves per plant**

87 The findings of the present investigation revealed that the maximum number of leaves  
88 per plant at 30 and 45 DAP was observed by the treatment T<sub>2</sub> [Vermicompost] which was

89 significantly different from most of the treatment and the minimum number of leaves per plant  
90 was recorded with T<sub>1</sub> [Soil]. It may be inferred from these observations that only soil is not  
91 beneficial as a component of potting media for petunia in terms of number of leaves per plant.

92 The increase in number of leaves could be attributed to the fact that the organic  
93 component i.e. vermicompost might have improved the physical structure of the substrate by  
94 reducing weight which in turn increases its water holding properties. It also has high cation  
95 exchange capacity (CEC) and therefore can store nutrients until required by the plant. All these  
96 factors might have contributed to cell multiplication, cell enlargement and differentiation which  
97 could have resulted in good photosynthesis and at last the plant exhibited more number of leaves  
98 per plant (Devavrata *et al.* 2020).

#### 99 **Stem diameter (cm)**

100 The findings of the present investigation revealed that the maximum stem diameter at 30  
101 and 45 DAP was observed by the treatment T<sub>2</sub> [Vermicompost] which was significantly different  
102 from most of the treatment and the minimum stem diameter was recorded with T<sub>1</sub> [Soil]. It may  
103 be inferred from these observations that only soil is not beneficial as a component of potting  
104 media for petunia in terms of stem diameter.

105 The increase in diameter of stem might be due to the reason that the growing media  
106 develop proper aeration, water holding capacity, supplying considerable amount of nutrients all  
107 the way through root absorption which converts in photosynthates helps in cell division and cell  
108 elongation results in higher stem diameter (Monika *et al.*, 2021). Similar findings have been  
109 reported by Sardoei *et al.* (2014) in marigold.

#### 110 **Number of branches per plant**

111 The findings of the present investigation revealed that the maximum number of branches  
112 per plant at 30 and 45 DAP was observed by the treatment T<sub>14</sub> [Soil + Sand + Vermicompost +  
113 Cocopeat (1:1:1:1)] which was significantly different from most of the treatment and the  
114 minimum number of branches per plant was recorded with T<sub>1</sub> [Soil]. It may be inferred from  
115 these observations that only soil is not beneficial as a component of potting media for petunia in  
116 terms of number of branches per plant.

117 Maximum number of branches per plant might be due to the reason that the potting media  
118 in combination might have provided optimal conditions for the better growth, more number of  
119 lateral shoots and increase in gibberellin synthesis in plant system consequently resulted in more  
120 branches per plant (Kala *et al.* 2020).

### 121 **Number of flower per plant**

122 The findings of the present investigation revealed that the maximum number of flower  
123 per plant was observed by the treatment T<sub>14</sub> [Soil + Sand + Vermicompost + Cocopeat (1:1:1:1) ]  
124 which was significantly different from most of the treatment and the minimum number of flower  
125 per plant was recorded with T<sub>1</sub> [Soil]. It may be inferred from these observations that only soil is  
126 not beneficial as a component of potting media for petunia in terms of number of flower per  
127 plant.

128 This might be due to the fact that pH of cocopeat medium is slightly acidic and most of  
129 the ornamental crops prefer acidic pH. In cocopeat medium, the exchangeable magnesium,  
130 calcium, potassium, DTPA and sodium, extractable iron, zinc, copper and manganese content  
131 were more. In spite of that, vermicompost adds to the organic matter in the potting media and is a  
132 source of nutrition. Vermicompost, in suitable proportions, to potting media has synergistic  
133 effects on number of flowers (Nair and Bharathi, 2015).

### 134 **Days taken to flowering (days)**

135 The findings of the present investigation revealed that the minimum days taken to  
136 flowering was observed by the treatment T<sub>14</sub> [Soil + Sand + Vermicompost + Cocopeat  
137 (1:1:1:1)] which was significantly different from most of the treatment and the maximum days  
138 taken to flowering was recorded with T<sub>1</sub> [Soil]. It may be inferred from these observations that  
139 only soil is not beneficial as a component of potting media for petunia in terms of days taken to  
140 flowering.

141 This might be due to influence of sand advances better drainage, aeration, lower  
142 compactness all along with vermicompost brings down the pH to optimum level for the  
143 accessibility of macro and micro nutrients uptake by plant root system with the aid of improve  
144 water holding capacity and higher photosynthetic activity resulted in better C:N ratio. When C:N

145 ratios gets improved, simultaneously florigen plant hormone level also improve, which is  
146 responsible for minimum days to flowering (Kala *et al.* 2020).

#### 147 **Flower diameter (cm)**

148 The findings of the present investigation revealed that the maximum flower diameter was  
149 observed by the treatment T<sub>8</sub> [Sand + Vermicompost (1:1)] which was significantly different  
150 from most of the treatment and the minimum flower diameter was recorded with T<sub>1</sub> [Soil]. It  
151 may be inferred from these observations that only soil is not beneficial as a component of potting  
152 media for petunia in terms of flower diameter.

153 The increase in flower diameter is mainly due to the genetic make up and which might  
154 have been further modified by prevailing environmental condition and potting media. It helps in  
155 more accumulation of photosynthates in the sink (flower) from source (leaves). Continuous  
156 availability of photosynthates, cell division, cell elongation & cell enlargement remain on peak  
157 resulted in higher flower diameter (Kala *et al.* 2020).

158

159

#### 160 **Flowering duration (days)**

161 The findings of the present investigation revealed that the maximum flower duration was  
162 observed by the treatment T<sub>14</sub> [Soil + Sand + Vermicompost + Cocopeat (1:1:1:1)] which was  
163 significantly different from most of the treatment and the minimum flower duration was recorded  
164 with T<sub>1</sub> [Soil]. It may be inferred from these observations that only soil is not beneficial as a  
165 component of potting media for petunia in terms of flowering duration.

166 Potting media T<sub>14</sub> [Soil + Sand + Vermicompost + Cocopeat (1:1:1:1)] might have  
167 provided optimum growing environment particularly in the root zone besides supplying  
168 sufficient nutrients in available forms as well as better physico-chemical and biological  
169 properties which led to better growth and flowering of plants. Thus exhibiting maximum  
170 flowering duration (Kala *et al.* 2020).

#### 171 **Fresh weight of above ground mass (g)**

172 The findings of the present investigation revealed that the maximum fresh weight of  
173 above ground mass was observed by the treatment T<sub>8</sub> [Sand + Vermicompost (1:1)] which was  
174 significantly different from most of the treatment and the minimum fresh weight of above ground  
175 mass was recorded with T<sub>1</sub> [Soil]. It may be inferred from these observations that only soil is not  
176 beneficial as a component of potting media for petunia in terms of fresh weight of above ground  
177 mass.

178 Fresh weight of above ground mass is related to the vegetative growth of plants such as  
179 plant height, the number leaves and the number of flowers. Good vegetative growth will increase  
180 the fresh weight of a plant. The planting medium must be porous and well drained to permit free  
181 roots penetration, secure anchorage, and have sufficient nutrients to support vegetative growth.  
182 The growing media can improve the physical properties of soils also can contribute nutrients for  
183 plant growth and development (Warnita *et al*, 2017)

184

#### 185 **Dry weight of above ground mass (g)**

186 The findings of the present investigation revealed that the maximum dry weight of above  
187 ground mass was observed by the treatment T<sub>8</sub> [Sand + Vermicompost (1:1)] which was  
188 significantly different from most of the treatment and the minimum dry weight of above ground  
189 mass was recorded with T<sub>1</sub> [Soil]. It may be inferred from these observations that only soil is not  
190 beneficial as a component of potting media for petunia in terms of dry weight of above ground  
191 mass.

192 Media have better physical properties such as porous, high water holding capacity, also  
193 can increase the pH media. In addition media will contribute nutrients for plant growth that will  
194 improve plant dry weight. Olosunde *et al*. reported that an effective growth media should provide  
195 anchorage to the plant; hold sufficient available nutrients; be porous and well drained; relatively  
196 low in soluble salts; standardized and uniform; free pests and pathogens; biologically and  
197 chemically stable (Warnita *et al*, 2017).

#### 198 **Fresh weight of root mass (g)**

199 The findings of the present investigation revealed that the maximum fresh weight of root  
200 mass was observed by the treatment T<sub>14</sub> [Soil + Sand + Vermicompost + Cocopeat (1:1:1:1)]

201 which was significantly different from most of the treatment and the minimum fresh weight of  
202 root mass was recorded with T<sub>3</sub> [Soil + Sand (1:1)]. It may be inferred from these observations  
203 that only soil is not beneficial as a component of potting media for petunia in terms of fresh  
204 weight of root mass.

205 Soil is a rich source of organic matter, nutrients and various micro organisms that hastens  
206 the root growth but has relatively lower porosity that is compensated by excellent porosity and  
207 water holding property of coco peat (Renuka and Sekhar 2017).

208 Presence of vermicompost acts as synergistic factor along with cocopeat, which might be  
209 due to the reason that vermicompost being a rich source of macro and micro nutrients enhanced  
210 the availability of these nutrients in an easily available form. Earthworm castings are known to  
211 be rich source of growth promoting substances viz., growth hormones, enzymes, antibiotics and  
212 vitamins. The enriched food and nutrient status of the rooting media and consequent  
213 development of conducting tissues could have facilitated greater uptake of water and thus  
214 leading to a higher fresh weight of roots in mycorrhizal inoculated media combinations  
215 especially in cocopeat + vermicompost based mixtures which could have complemented each  
216 other (Vijay *et al*, 2018).

#### 217 **Dry weight of root mass (g)**

218 The findings of the present investigation revealed that the maximum dry weight of root  
219 mass was observed by the treatment T<sub>14</sub> [Soil + Sand + Vermicompost + Cocopeat (1:1:1:1)]  
220 which was significantly different from most of the treatment and the minimum dry weight of root  
221 mass was recorded with T<sub>3</sub> [Soil + Sand (1:1)]. It may be inferred from these observations that  
222 only soil is not beneficial as a component of potting media for petunia in terms of dry weight of  
223 root mass.

224 The high dry weight of roots might be due to a high value of corresponding fresh weight  
225 which might in turn due to a large number of sprouted roots that survived and grew longer. The  
226 coco peat based media combinations recorded the maximum dry weight of roots which could be  
227 attributed to more number and length of roots. Vermicompost is a rich source of plant nutrients  
228 (N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O), secondary elements (Mg and Ca) and vital micronutrients like B, Fe, Mo  
229 and Zn, which directly or indirectly improved dry weight of roots (Vijay *et al*. 2018).

230

231

232

UNDER PEER REVIEW

**Table no 1: Effect of Different Growing Media on Growth and Flowering of Petunia**

Parameter Treatments	Plant length (cm) (30days)	Plant length (cm) (45days)	No. of leaves/plant (30days)	No. of leaves/plant (45days)	Stem diameter (cm) (30days)	Stem diameter (cm) (45days)	No. of branch/plant (30days)	No. of branch/plant (45days)	No. of flower/plant	Days taken to flowering	Flower diameter (cm)	Flowering duration (cm)	Fresh weight of above ground mass(g)	Dry weight of above ground mass(g)	Fresh weight of root mass(g)	Dry weight of root mass(g)
T1	7.17	9.70	16.53	24.86	0.32	0.42	1.06	1.86	8.00	62.73	3.55	25.20	30.37	2.96	0.45	0.23
T2	14.38	18.81	55.46	77.46	0.47	0.73	4.13	7.66	9.60	62.33	3.87	32.26	80.57	7.93	0.46	0.24
T3	8.64	11.46	27.26	36.46	0.37	0.43	1.20	1.60	9.06	61.66	3.72	27.40	30.85	3.02	0.43	0.20
T4	10.64	11.90	34.46	37.20	0.41	0.50	2.33	3.46	9.73	60.66	4.02	28.33	33.54	3.42	0.49	0.26
T5	11.68	14.65	47.40	69.93	0.41	0.63	3.13	3.66	11.13	58.86	4.79	37.13	45.16	4.65	0.49	0.26
T6	7.84	11.13	21.33	37.40	0.40	0.47	1.13	3.46	10.33	61.66	4.48	34.66	42.76	4.17	0.64	0.39
T7	10.46	15.40	45.06	57.40	0.46	0.50	3.20	5.73	10.13	62.06	4.13	29.66	59.03	6.13	0.61	0.35
T8	12.60	17.09	41.66	56.53	0.44	0.61	3.93	7.13	10.93	60.00	4.87	36.40	81.45	8.31	0.59	0.34
T9	9.34	16.29	38.73	55.40	0.40	0.58	3.80	7.06	10.80	58.66	4.39	31.66	70.01	6.74	0.51	0.24
T10	10.22	18.26	36.06	49.73	0.43	0.70	3.13	4.40	11.20	58.13	4.18	36.13	58.37	5.56	0.58	0.36
T11	8.22	10.16	19.46	29.60	0.34	0.46	1.13	2.66	9.13	60.53	4.30	32.40	32.96	3.13	0.49	0.25
T12	10.07	18.40	36.20	41.00	0.41	0.47	3.60	6.20	12.00	57.73	4.68	36.66	60.09	5.60	0.51	0.28
T13	9.27	16.17	35.40	47.93	0.37	0.51	3.00	4.33	10.33	60.20	4.79	28.00	51.95	5.28	0.50	0.29
T14	12.56	15.90	34.33	42.13	0.40	0.50	5.00	8.20	12.46	56.20	4.40	42.13	72.99	7.19	0.66	0.41
SE(m)	0.71	0.75	2.83	2.48	0.01	0.01	0.40	0.42	0.67	1.08	0.21	0.92	1.58	0.17	0.03	0.02
C.D.	2.07	2.18	8.24	7.23	0.03	0.05	1.18	1.24	1.97	3.17	0.61	2.67	4.61	0.51	0.11	0.05

## REFERENCES

- Devavrata, S. and Bahadur, V. (2020). Effect of different growing media on vegetative growth and flowering of petunia (*Petunia hybrida* L.) in vertical garden. *International Journal of Chemical Studies.*, Vol.9 (1): 3419-3422.
- Farooq, I.; Qadri, Z.A.; Rather, Z.A.; Nazki, I.T.; Neelofar Banday, N.; Rafiq, S.; Masoodi, K.Z.; Noureldeen, A. and Mansoor, S. (2021). Optimization of an improved, efficient and rapid in vitro micropropagation protocol for *Petunia hybrida* Vilm. Cv. "Bravo. *Saudi Journal of Biological Sciences.*, Vol.28: 3701-3709.
- Gupta, J. and Dilta, B.S. (2015). Effect of growing substrates and pot sizes on growth, flowering and pot presentability of *Primula malacoides* Franch. *International Journal of Current Research and Academic Review.*, Vol.3 (7): 174-183.
- Kala, D.; Mahawer, L.N. and Bairwa, H.L. (2020). Response of potting media composition for pot mum chrysanthemum production (*Dendranthema grandiflora* L.). *International Journal of Chemical Studies.*, Vol.8 (2): 1246-1251.
- Khandaker, M.M.; Fatini, A.; Abdulrahman, M.D.; Abdullahi, U.A. and Badaluddin, N.A. (2020). Growing media influence on the growth and development of *Rosa hybrida*. *Plant Archives.*, Vol.20 (2): 6001-6009.
- Monika.; Yadav, K.S. and Chandla, A. (2021). Response of potting mixtures against growth and flowering of chrysanthemum cv. Haldighati. *International Journal of Agricultural Science and Research.*, Vol.11 (2): 15–20.
- Nair, S.A. and Bharathi, U. (2015). Influence of potting media composition on pot mum production. *The Bioscan.*, Vol.10 (1): 73-76.
- Nazari, F.; Farahmand, H.; Khosh-Khui, M. and Salehi, H. (2011). Effects of coir as a component of potting media on growth, flowering and physiological characteristics of hyacinth (*Hyacinthus orientalis* L. cv. Sonbol-e-Irani). *International Journal of Agricultural and Food Science.*, Vol.1 (2): 34-38.
- Padhiyar, B.M.; Bhatt, D.S.; Desai, K.D.; Patel, V.H. and Chavda, J.R. (2017). Influence of different potting media on growth and flowering of pot chrysanthemum var. Ajina purple. *International Journal of Chemical Studies.*, Vol.5 (4): 1667-1669.

- Renuka, K and Sekhar, R.C. (2017). Studies on the effect of different media and their combinations on rooting of carnation (*Dianthus caryophyllus* L.) Cuttings of cv. Keiro under polyhouse conditions. *Plant Archives.*, Vol.17 (1): 509-512.
- Sardoei, A.S.; Roien, A.; Sadeghi, T.; Shahadadi, F. and Mokhtari, T.S. (2014). Effect of Vermicompost on the Growth and Flowering of African Marigold (*Tagetes erecta*). *American-Eurasian Journal of Agriculture & Environmental Sciences.*, Vol. 14 (7): 631-635.
- Vijay, J.; Dorajeerao, A.V.D.; Umajyothi, K. and Suneetha, D.R.S. (2018). Effect of Media on Root Parameters in Marigold. *International Journal of Current Microbiology and Applied Sciences*, Vol.7 (11): 3388-3401.
- Warnita.; Akhir, N. and Vina. (2017). Growth Response of Two Varieties Chrysanthemum (*Chrysanthemum sp.*) on Some Media Composition. *International Journal on Advanced Science Engineering Information Technology.*, Vol.7 (3).

UNDER PEER REVIEW