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Effect of different pot culture media on growth parameters, yield and economics of strawberry in vertical system

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Abstract

This study evaluated the development of above ground plant parts of strawberry cv. 'Winter dawn', in naturally ventilated polyhouse with seven media combinations using six pot culture media viz., soil, sand, farmyard manure, cocopeat, vermicompost and vermiculite under vertical faring system. The study revealed that maximum plant height (29.13 cm), number of trifoliolate leaves per plant (27.80), plant spread in North- South and East- West direction (31.27 cm and 30.21 cm, respectively), leaf area (108.26 cm²), number of crowns per plant (4.56), number of runners per plant (6.13), plant dry weight (38.50 g) at harvest, yield per plant (391.24 g), yield over control (61.12%), net income (1,22,183 ₹/ 1032 m²) and benefit to cost ratio (2.04) was observed in treatment T₄ containing Soil + cocopeat + vermiculite + vermicompost in 1:1:1:1 ratio on volume basis followed by the treatment T₆ containing cocopeat + vermiculite + vermicompost in the ratio of 1:1:1.

Keywords: Culture media, economics, strawberry

Introduction

Strawberry (*Fragaria × ananassa* Duch.) is one of the most delicious, temperate fruit of the world and can be cultivated in the hilly region of the subtropical conditions due its wider adoptability. The fruit is aggregate soft with refreshing aroma and taste, bearing seeds on the fruit surface called achenes. It is a herbaceous plant sensitive to a number of pathogens which affect almost all parts of the plant including roots, crown, leaves and fruits when grown on the bare soil. To overcome these drawbacks, the use of pot culture with artificial media combinations gaining popularity and number of substrate/media can be used to substitute the soil (De-Rijck and Schrevels, 1998) [2]. Pots that are available in the market are of different size and type to meet the requirement for different crops. The size or shape and type of the pot is important, which results in a significant influence on growth, canopy spread, yield and quality parameters of different crops by allowing sufficient root development (Manole *et al.*, 2008; Krezel and Kolota, 2009) [7, 5]. Vertical system accommodates a greater number of plants and hence growing in a pot culture aims at taking care of individual plants for achieving maximum yields. The use of pot culture with artificial media is gaining popularity and number of substrate/ media combinations can be used instead of routine cultivation. The objective was to know the effect of pot culture media on growth and yield of strawberry in vertical farming system.

Material and Methods

The research was carried out in a naturally ventilated polyhouse of the Department of Fruit Science, College of Horticulture, Mudigere, during 2018-19 in a Completely Randomized Design (CRD) with three replications and seven treatments for the statistical analysis. Mudigere is situated in the Western Ghats, represents the typical climate of hill zone (Zone-9 and Region-V) of Karnataka. It is located at 13° 7' North latitude and 74° 37' East Longitude with an altitude of 980 m above mean sea level (MSL). The experiment tested in vertical system has three set of structures each with five tiers constructed using cement blocks with the height and width of 0.8 m and 2 m, respectively. The pots were filled using six different media viz., soil, sand, farmyard manure, cocopeat, vermicompost and vermiculite.

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The media combinations were made according to the treatments on volume (v/v) basis and placed on the vertical farming system provided with wooden planks. The test variety was "winter dawn". Planting was done in evening, on 2nd November 2018.

The media based treatment combination includes T₁- Soil + sand + FYM (1:1:1) (Control), T₂- Soil + cocopeat + vermiculite (1:1:1), T₃- Soil + cocopeat + vermicompost (1:1:1), T₄- Soil + cocopeat + vermiculite + vermicompost (1:1:1:1), T₅- Cocopeat + vermicompost + FYM (1:1:1), T₆- Cocopeat + vermiculite + vermicompost (1:1:1) and T₇- Soil + vermiculite + vermicompost (1:1:1). The effects of media combinations observed by determining the different growth parameters like plant height (cm), number of trifoliolate leaves/ plant, number of crowns/ plant, number of runners/ plant, plant spread (cm²) and yield per plant (g) recorded as per standard practices at 120 days after planting. The leaf area (cm²) was measured by using digital leaf area meter (LAM 211) and expressed in cm². The data subjected to statistical analysis for drawing conclusion (p= 5%).

Economics of cultivation

The benefit cost ratio for different treatments was worked out based on the price of inputs used for cultivation and price of marketable produce in the local market by using the following formula and it is expressed in a ratio.

$$\text{Benefit: Cost} = \frac{\text{Net income (₹/ ha)}}{\text{Cost of cultivation (₹/ ha)}}$$

Results and Discussion

The data pertaining to the study (Table 1 and Fig.1) indicated that media combinations significantly influenced the

vegetative growth and yield of strawberry. The media combination of soil + cocopeat + vermiculite + vermicompost (1:1:1:1) significantly increased the plant height (29.13 cm), number of trifoliolate leaves (27.80), plant spread (31.27 cm N-S and 30.21 cm E-W), leaf area (108.26 cm²), number of crowns (4.56) and number of runners (6.13). followed by media combination of cocopeat + vermiculite + vermicompost (1:1:1). On the other Hand lower values for different yield parameters recorded in soil + sand + FYM (1:1:1) which sewed as control. The probable reason may be the use of cocopeat vermicompost, vermiculite along with soil at optimum quantity improved the physical, chemical and biological properties of growing medium and hence influenced positive effects on vegetative growth of strawberry due to increase in bulk density of the growing media and amount of readily available water in the pots (Hashemimajd *et al.*, 2006 and Abul-Soud *et al.*, 2015) ^[4, 1]. Also, cocopeat and vermicompost helped to release the nutrients and provides a better micro climate for root development thereby significantly enhanced growth attributes of plants (Lata, 2017) ^[6].

The similar results for plant dry weight (38.50 g) at harvest was observed in T₄ followed by the treatment T₃- Soil + cocopeat + vermicompost (1:1:1). The increased dry weight was attributed to the maximum vegetative growth of the plants and production of photosynthates by the application of organic and inorganic materials. Amendment of soil structure, soil productivity and other plant growth regulating substances produced by microorganisms affected the plant growth and helped in higher photosynthates assimilation resulted in increased dry weight of the plant (Tomati *et al.*, 1988) ^[10]. The similar results for plant dry weight were observed by Follet *et al.* (1981) ^[3] and Subbaiah *et al.* (2018) ^[9] in strawberry and ivy guard, respectively.

Table 1: Effects of pot culture media combination on growth traits of strawberry in vertical farming

Treatment	Plant height (cm)	No. of trifoliolate leaves / plant	Plant spread (cm)		Leaf area (cm ²)	No. of crowns / plant	No. of runners / plant	Plant dry weight (g) at harvest
			N-S	E-W				
T ₁	19.67	19.13	24.27	22.16	95.16	2.23	4.60	25.55
T ₂	25.53	26.06	28.25	27.42	103.40	3.07	5.80	31.15
T ₃	23.90	24.26	26.82	26.87	101.15	2.67	5.66	35.84
T ₄	29.13	27.80	31.27	30.21	108.26	4.56	6.13	38.50
T ₅	21.13	20.67	25.80	24.87	96.47	2.47	5.13	26.97
T ₆	27.60	26.63	29.20	28.34	106.13	3.67	5.90	32.48
T ₇	22.10	23.13	26.13	25.93	98.27	2.53	5.26	28.59
S. Em ±	0.38	0.28	0.30	0.29	0.27	0.04	0.14	0.43
CD @ 5%	1.17	0.88	0.92	0.90	0.82	0.14	0.45	1.31

Among different treatments, T₄ recorded significantly higher fruit yield of 391.24 g/ plant thereby achieved 61.12 per cent higher yield over the control, this was followed by T₆ and minimum yield was observed in T₁ (Fig. 1). The increase in yield was due to the presence of higher number of berries per plant and increased fruit length, diameter, fruit weight as influenced by media containing vermicompost induce the protein production that caused more meristem cells, cell division, and maximum potassium content of vermiculite increased berry filling, which leads to higher yield per plant. The similar results were also obtained by Salardini and Mojtahedi (1988)^[8] and Abul-Soud *et al.* (2015) ^[1] in cucumber

and strawberry, respectively.

The maximum net income (₹. 122183/ 1032 m²) was accounted by treatment T₄- Soil + cocopeat + vermiculite + vermicompost (1:1:1:1) followed by T₆- Cocopeat + vermiculite + vermicompost (1:1:1), whereas the lowest net income (₹. 49764/ 1032 m²) was accounted by treatment T₇- Soil + vermiculite + vermicompost (1:1:1). The maximum benefit cost ratio (2.04) was obtained from treatment T₄- Soil + cocopeat + vermiculite + vermicompost (1:1:1:1) followed by T₃- Soil + cocopeat + vermicompost (1:1:1) and treatment T₇- Soil + vermiculite + vermicompost (1:1:1) showed lowest benefit cost ratio of 1.50 (Table 2).

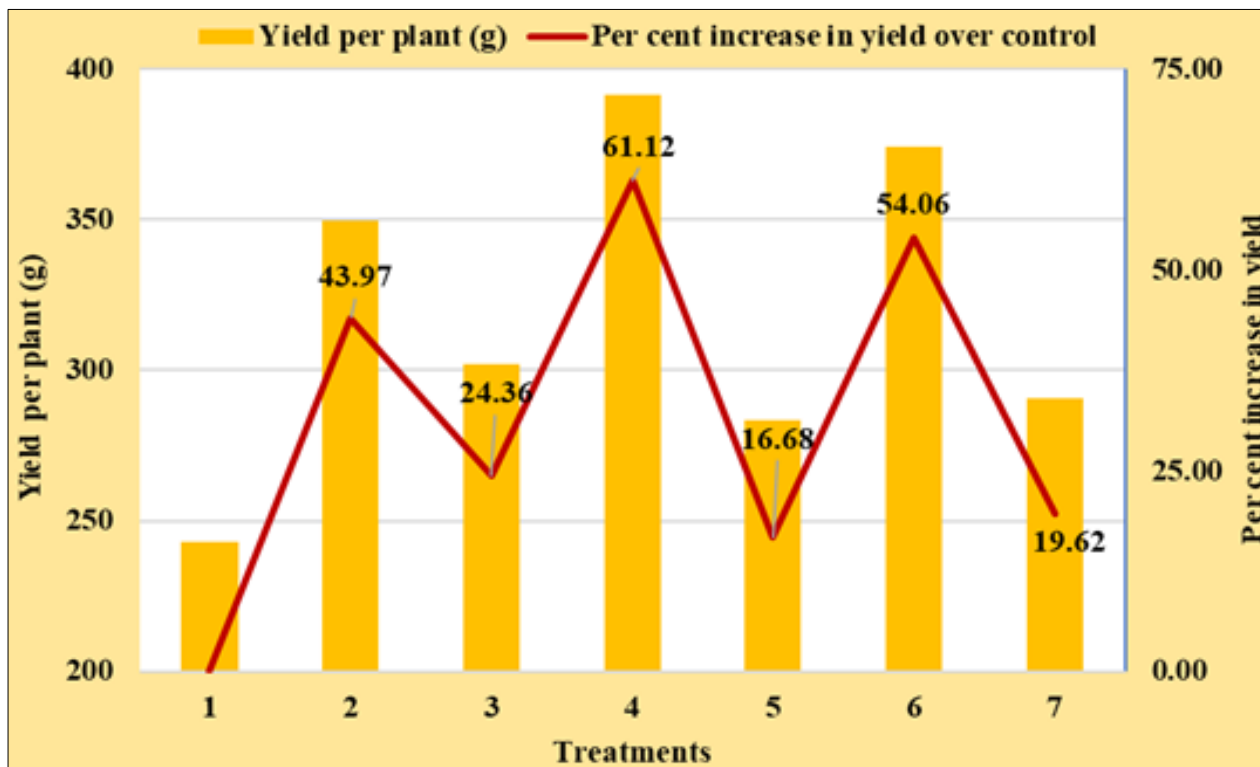


Fig 1: Effect of different pot culture media on yield per plant and per cent increase in yield of strawberry in vertical farming system

Table 2: Economics of strawberry cultivation in vertical farming system with different pot culture media

Treatment	Total cost of cultivation (₹/ 1032 m ²)	Returns from fruit yield (₹/ 1032 m ²)	Returns from runners (₹/ 1032 m ²)	Gross income (₹/ 1032 m ²)	Net income (₹/ 1032 m ²)	Benefit: cost
T1	111795	135979	51520	187499	51388	1: 1.68
T2	145507	195764	64960	260724	90901	1: 1.79
T3	123807	168694	63392	232086	83963	1: 1.87
T4	145053	219094	68656	287750	122183	1: 2.04
T5	126607	158659	57456	216115	65192	1: 1.71
T6	159507	209490	66080	275570	91747	1: 1.73
T7	147495	162663	58912	221575	49764	1: 1.50

Note: Price of strawberry @ 200 ₹/ kg

Price for runners @ 4 ₹/ runner

Cost of cultivation calculated for standard polyhouse area (1032 m²) accommodates 2800 pots





Fig 2: Media combinations



Fig 3: General view

Conclusion

The results of the present study revealed that cultivation of strawberry variety “winter dawn” in Soil + cocopeat + vermiculite + vermicompost media with 1:1:1:1 combination found better for getting growth parameter and yield followed by Cocopeat + vermiculite + vermicompost media with 1:1:1 combination in vertical system under naturally ventilated polyhouse.

References

1. Abul-soud MA, Emam MSA, Noha G, Abd el-rahman. The potential use of vermicompost in soilless culture for producing strawberry. *Int. J. Plant & Soil Sci.* 2015; 8(5):1-15.
2. De-rijck G, Schrevens E. Distribution of nutrients and water in rockwool slabs. *J Sci. Hort.*, 1998; 72:277-285.
3. Follet R, Donahue R, Murphy L. *Soil and Soil Amendments.* Prentice-hall, Inc., New Jersey, 1981.
4. Hashemimajd KM, Kalbasi A, Golchin H, Knicker H, Shariatmadari, Rezaee-Nejad Y. Use of vermicomposts produced from solid wastes as potting media. *Eur. J Hort. Sci.* 2006; 71(1):27-39.
5. Krezel J, Kolota E. The influence of seedlings age and pots size on growth and yielding of Chinese cabbage in spring and autumn cultivation. *Veg. Crop. Res. Bull.* 2009; 71:25-31.
6. Lata K. Effect of growing media and fertigation schedules on growth and yield of cucumber (*Cucumis sativus* L.) under polyhouse condition. *M.Sc. thesis*, Sri Karan Narendra Agriculture University, Jobner (India), 2017.
7. Manole MS, Rosu M, Dobrin E, Ciofu R, Gheorghita N. The influence pot type on the biological activity of the substrate and the seedlings growth. *Analele Universitatii din Craiova.* 2008; 13:313-320.

8. Salardini A, Mojtahedi A. *Principal of plant nutrition.* University of Tehran Press, Tehran, Iran, 1988.
9. Subbaiah KV, Reddy RVSK, Babu JD, Raju GS, Karunasree E, Reddy AD *et al.* Effect of different potting media on propagation of ivy gourd through stem cuttings. *Int. J. Pure & Applied Biosci., (IJPAB).* 2018; 6(1):894-897.
10. Tomati U, Grappelli A, Galli E. The hormone- like effect of earthworm casts on plant growth. *Soil Biol. Biochem.*, 1988; 5:288-294.