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Potting Media for Strawberry in Terrace Gardening: Review Paper

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Abstract

Strawberry (Fragaria × ananassa Duch.) is a perennial plant which grows predominantly in the temperate climate and belongs to the family Rosaceae. Strawberry is one of the most delicious, rich sources of vitamins, minerals with a tasty flavor constituting of vitamin C, vitamin A and proteins. However, growth, yield and quality production of strawberry is declining due to growing urbanization, industrialization etc. There are numerous ways to overcome the declining growth, yield and quality of strawberry but the best method is by utilizing the unallocated areas like terrace, rooftop or balcony gardening in urban areas to meet the demand of increased population. Thus, strawberry being a shallow rooted plant can be easily grown in a container filled with a potting media and suitable for growing in terrace garden or rooftop gardening. The present review focuses on the Effect of Potting Media on Growth, Yield and Quality of Strawberry (Fragaria × ananassa) in terrace gardening.

Keywords: Potting Media; Terrace Gardening; Growth; Yield; Quality

Abbreviations: FYM: Farmyard manure; PS: Potting Substrates; VC: Vermi-Compost.

Introduction

Terrace garden, rooftop garden and balcony garden, are an important part of urban agriculture which provides organic fresh vegetables to the kitchen. A garden on the roof is called a terrace garden or rooftop garden. This indicates that vegetation, including trees, bushes, and grasses, covers every roof Morgan K, et al. [1]. Terrace gardening is becoming more and more popular as urban residents become more concerned about consuming safe and wholesome food Santo R, et al. [2] . In addition to providing wholesome, fresh food, it also lowers building energy use by serving as insulation, prolonging roof life, and lowering stormwater runoff Khapte PS, et al. [3]. Terrace gardening uses a variety of containers, including plastic pots, dirt pots, grow bags, and poly bags Badmi MG, et al. [4]. Soilless cultivation is an artificial means of providing plants with support and a reservoir for nutrients and water Raja WH, et al. [5]. The growing popularity of soilless media is due to the fact that they are free from soil borne pest, diseases and nematodes Tehranifar A, et al. [6] and also addresses the problem of poor drainage, structure, soil fumigation and salt accumulation thereby resulting in good vegetative growth characteristics, number of fruits and yield of better-quality strawberries Shylla B, et al. [7]. Most commonly used soilless growing media for strawberries are peat moss, rockwool, perlite, cocopeat, vermicompost and many other mixtures. The properties of different materials used as growing media exhibit direct and indirect effects on plant growth and productivity. Less soil and water are needed for terrace gardening Taylor JR, et al. [8]. Irrigation facility is become easy to cultivate. Storm and rain water is also used

directly on the terrace. Strawberry (Fragaria × ananassa Duchesne) is one of the most preferred crops for terrace gardening as it is short duration crop and requires relatively less care Sharma RR [9]. The different potting media for strawberry grown in terrace gardening are discussed below:

Cocopeat: Cocopeat is a commonly used substrate in India. The compostable material is a waste product of the coconut industry, making it an attractive substrate due to its affordability, porosity, draining properties and durability Akshay M, et al. [10].

Perlite: Perlite is a crushed volcanic rock expanded by heat, resulting in a white porous material. Perlite is sterile, has a neutral pH for increased air space and water drainage in the nursery medium. Using perlite helps to keep the medium lightweight compare to soil. The positive influence of perlite and its mixtures on better root development may have improved aeration thus forming greater root system which may have promoted shoot nutrient uptake leading to increased berry yield Shylla B, et al. [7].

Vermicompost: Vermicompost contains mobile plant nutrients and other elements such as nitrogen, exchangeable phosphorus, potassium, calcium and magnesium that have been released through the course of organic matter decomposition. Application of vermicompost in soilless culture boosted strawberry growth and yields Arancon NQ, et al. [11].

Sand: Sand serves as a fundamental element of soil with grain sizes from 0.05 mm to 2.0 mm. It improved aeration and drainage at the slightest cost. While sterile sand is vulnerable to diseases and pests, it still makes a powerful potting base and propagative medium.

Farmyard manure (FYM): Farmyard manure (FYM) is a nutrient-rich organic fertilizer derived from decomposed animal dung and plant residues. It enhances soil fertility by supplying essential nutrients such as nitrogen, phosphorus, and potassium, promoting healthy plant growth. FYM improves soil structure and water retention capacity, reducing soil erosion and increasing drought tolerance. FYM proved to be the best media when combined with perlite for strawberry cultivation resulting in healthier plants with higher fruit yield and better runner development Shylla B, et al. [7].

Effect of Potting Media on Growth, Yield and Quality of Strawberry

Different potting media helps in increasing the growth, yield and quality of various fruit crops in horticulture sector. Godara AK, et al. [12] conducted an experiment on the Influence of soilless media and containers on shoot growth of strawberry Fragaria x ananassa Duch cv. Sweet Charlie. Three substrates were used viz cocopeat, perlite and vermicompost and five treatments in addition to control which were M0: soil cultivation(control), M1: cocopeat + perlite +vermicompost (3:1:1), M2: cocopeat + perlite + vermicompost (4:0:1), M3: cocopeat + perlite + vermicompost (4:1:0), M4: cocopeat + perlite + vermicompost (4:1:1), M5: cocopeat + perlite + vermicompost (4:1:2). Three types of containers were used in this experiment i.e. C1 (polyethylene bags 16 x16 cm and 20 x 20 cm), C2 (PVC pots 15 and 25 cm) and C3 (earthen pots 15 and 25 cm). Significant differences between mean values were obtained using the completely randomized design with three replications following three-way ANOVA. The result revealed that maximum shoot length (23.60 cm), fresh and dry weight (29.60 and 8.11 g respectively) and root/shoot ratio (0.67) were obtained in interaction M1 (soilless substrate and large sized earthen pot). The different containers also improved the growth parameters in strawberry and the finding reported that maximum increase was in earthen pots followed by PVC pots and polyethylene bags. Similar result was reported by Rostami Z, et al. [13] that the yield of strawberry significantly differed when substrates were composed of different ratios of cocopeat, perlite and FYM. Similarly, Tabatabaei SJ, et al. [14] concluded that the media consisted of perlite, increased the plant height in strawberries.

Lakshmikanth KH, et al. [15] study the effect of different pot culture media on growth parameters, yield and economics of strawberry in vertical system. The 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). Completely Randomized Design (CRD) was used with three replications for the statistical analysis. The results revealed that the plant height (29.13 cm), number of trifoliate leaves per plant (27.80), plant spread in N-S and E-W direction (31.27 cm and 30.21 cm, respectively), number of crown per plant (4.56), area of leaf (108.26 cm2), runners per plant (6.13), plant dry weight (38.50 g) at harvest, net income (1,22,183 / 1032 m2) and benefit to cost ratio (2.04) was found maximum in treatment T4 i.e. soil + cocopeat + vermiculite + vermicompost in 1:1:1:1 ratio. Maximum TSS (7.73 ºBrix), chlorophyll- a (1.82 mg g-1), chlorophyll- b (0.54 mg g-1), total chlorophyll (2.36 mg g-1), reducing sugar (5.29 %), non-reducing sugar (1.16 %), total sugar (6.45 %), ascorbic acid (54.80 mg/100 g), sugar to acid ratio (6.58) was observed in media combination T6: soil + cocopeat + vermicompost in the ratio of 1:1:1.

Kumar P, et al. [16] conducted an experiment on the potting substrate effect on yield and quality of strawberry (Fragaria × ananassa) in terrace gardening. The treatments included two strawberry cultivars i.e. Sweet Charlie and Winter Dawn, and nine potting substrates (PS), viz. PS1: Soil + Farm yard manure (FYM); PS2: Soil + Vermi-compost (VC); PS3: Soil + FYM + Cocopeat; PS4: Soil + Vermicompost + Cocopeat; PS5: Soil + FYM + Vermicompost + Cocopeat; PS6: Soil; PS7: FYM; PS8: Vermicompost; PS9: Cocopeat. The experiment was laid out in factorial randomized block design with three replications. The result revealed that maximum plant height, leaf number, number of fruits per plant, fruit yield, fruit weight, fruit length and fruit breadth, TSS content, TSS/acid ratio, ascorbic acid and juice content was recorded in substrate PS4: soil + vermicompost + cocopeat. Among the two cultivated variety, Winter Dawn variety gave the maximum height, higher number of crowns per plant, length of stolen, number of fruits per plant, fruit yield, ascorbic acid content and juice content compared to Sweet Charlie. The study concluded that combination of soil + vermicompost + cocopeat or soil + FYM + cocopeat in 1:1:1 ratio was found to be the most appropriate potting substrate for strawberry cultivation, hence it is suggested as a suitable growing medium for production of strawberries in terrace or rooftop gardening in peri-urban areas. Similarly, Godwa BM [17] revealed that the accumulation of starch, carbohydrates, and photosynthates provided by vermicompost and perlite leads to an increase in fruit set and thereby increasing the number of berries.

Sharma, et al. [18] studied the Effect of container size and growing media on growth, yield and quality of strawberry (Fragaria × ananassa Duch.). Three media consisting cocopeat, perlite and vermicompost was used in ratio of 1:1:1, 2:1:1, 3:1:1, 4:0:1, 4:1:0 and 4:1:1 respectively, and control having soil, sand and FYM in ratio of 1:1:1. Six types of container of different sizes (24 cm × 24 cm × 14 cm, 25 cm × 21 cm× 12 cm, 20 cm ×20 cm ×10 cm, 37 cm × 23 cm × 9cm, 35 cm × 18 cm × 14 cm and 23 cm × 23 cm × 10 cm). The experiment was laid out according to factorial randomized block design with 42 treatment combination and replicated thrice with two plants in each replication. The study reported that among all the treatments the plants raised in PVC pots with a growing media cocopeat + perlite + vermicompost in the ratio of 3:1:1 (C2T3) had significantly greater height, higher growth, maximum flowering and fruiting. Plant grown in polyethylene bags with a growing media cocopeat + perlite + vermicompost in the ratio of 3:1:1 (C1T3) reported the higher cost and returns with a benefit cost ratio of 1:1.70. The study recommended that for strawberry production in open areas, PVC pots with growing media in a 3:1:1 ratio be used, as this will increase the production and provide disease-free, healthy strawberries. Similarly, Ameri A, et al. [19] reported that the maximum plant spread was observed in 50% cocopeat + 50% perlite and 5% vermicompost + 45% perlite + 50% cocopeat in Camarosa. Yeganeh MA, et al. [20] also revealed that maximum of 10.3 number of leaves were recorded in Camarosa cultivar when grown with 50% perlite/50% peat moss. The results were similar to the finding of Hesami A, et al. [21] that the yield of strawberries significantly varied by soilless potting media composed of different ratios of cocopeat, perlite, pumice, vermicompost, sawdust, and zeolite.

Conclusion

Terrace gardening or rooftop gardening is becoming popular in urban and peri-urban areas of metro cities worldwide including in India. Among various crops suitable for growing in terrace garden, strawberry is one of the most popular fruits. Strawberry being an annual herbaceous with delicious taste can be grown in a container filled with a potting media in terrace or rooftop gardening in the urban areas where the area of cultivation is less. Our reviewed has demonstrated that different potting media combination like soil, organic manure (vermicompost and FYM) and cocopeat etc. were beneficial for the growth, yield and quality of strawberry and production of diseases free strawberry.

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