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Effect of soilless media in Roof Top Gardening (RTG) of Guwahati

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Abstract

Urban and peri-urban horticulture (UPH) helps to make cities greener and also contributes to food security, employment, waste management and community well-being. Roof Top gardening (RTG) is one of the best solution for self-reliance in urban areas of Guwahati city. The major constraints in the urban areas are limited availability of productive lands, fertilizers and irrigation water. Therefore, soilless media is adopted as artificial soil by replacing the natural soil system. Here the chances of pests, diseases and weeds are eliminated. The changing health concern of people also demands high quality food. Plants grown in soil less culture has consistently superior quality, high yield, rapid harvest, and high nutrient content. Moreover, soilless growing media are easier to handle and may provide a better growing environment compared to soil. Under this context, the experiment was conducted in different locations of the Guwahati to study the effect of soilless media ((sand + coco peat + vermicompost + vermiculite + perlite (1:2:2:0.25:0.25)) in Roof Top Gardening (RTG) of Kamrup (M) district. The experiment was followed Factorial Completely Randomized Block Design with three treatments. Considering all parameters, soilless media showed the best result significantly in plant height (33.22 cm), plant spread (34.77 cm), shelf life (7.3 days), yield/box (2.9 kg), net return/box (Rs.103.8) and B:C Ratio (2.8) as compared to readymade potting soil (Check) and soil (Farmer's Practice) for various crops *eg.* Broccoli, Lettuce, Gerbera and Chrysanthemum.

Keywords: Roof top gardening, urban and peri-urban horticulture, soilless media, vermicompost, cocopeat, perlite, vermiculite

Introduction

A roof garden is a garden on the roof of a building which provides opportunities to the urban population to fulfil nutritive and aesthetic interest. Rooftop gardening is gaining popularity as a sustainable and innovative approach to urban agriculture (Gokul *et al.* 2024) ^[6]. In addition rooftop garden provides temperature control, ecological and recreational benefits. A rooftop garden is a garden set up on the top of a building. The plants grown on rooftop garden consist of ornamentals as well as vegetables. The purpose of a rooftop garden is to utilize the space to grow vegetables and flowers for food and recreational activities. Rooftop gardens also have an added benefit of cleaning the polluted air of urban areas. Rooftop gardens can also be a source of fresh and nutritious food of choice for urban residents. The concept of modern green roof originated at the turn of the 20th century in Germany, where vegetation was installed on roofs to mitigate the damaging physical effects of solar radiation on the roof structure. Early green roofs were also employed as fire retardant structures (Kohler and Keeley. 2005) ^[7]. Green-roof technology was quickly embraced and gained popularity due to improved aesthetics, air quality, energy efficiency and variety of other benefits resulting from enhanced green spaces. Living roofs also reduce sound pollution by absorbing sound waves outside buildings and preventing inward transmission (Dunnet and Kingsbury, 2004) ^[4]. For this there is need to develop technology for rooftop gardening based on scientific study. Cocopeat has been shown to have variable physical properties (water supply and availability, aeration and relative hydraulic conductivity) depending on the country of origin due to the differences in the particle density distribution caused by differences in processing methods (Abad *et al.*, 2005) ^[1]. Vermicompost is finely peat-like materials with high porosity, aeration, drainage, water holding capacity and microbial activity, which make them excellent soil amendments or conditioners (Edwards, 1988; Atiyeh *et al.*, 2002) ^[5, 3].

Perlite has emerged as an excellent medium with versatile use. It has been widely used to grow many horticultural crops including tomatoes, cucumber, melon, peppers, lettuce and rose (Rodriguez *et al.*, 2006) ^[9]. Vermiculite is also highly porous, insoluble in water and organic solvent, non-toxic and has good absorption properties (Suquet *et al.*, 1991, Mysore *et al.*, 2005) ^[10, 8].

Materials and Methods

KVK, Kamrup conducted experiment on “Effect of soilless media in Roof Top Gardening (RTG) of Guwahati” in different locations. Growing media were considered as treatments (T) *i.e* Soilless Media (AAU technology, T₁), Readymade potting media as T₂ (Check) as compared with Soil (T₃, Farmer’s practice) for various crops *eg.* Broccoli, Lettuce, Gerbera and Chrysanthemum. Planting was carried out in October, 2024 under open rooftop conditions, maintaining a row spacing of 30 cm and plant spacing of 20 cm within rows in Thermocol box (60 cm x 40 cm x 30 cm). Standard package of practices were followed. Observations of different parameters were recorded on plant height (cm), plant spread (cm), shelf life (days), Broccoli equivalent yield/box, Net return/box (Rs.), B:C Ratio. Data collection

followed a systematic approach, ensuring accuracy and precision. The experiment was followed Factorial Completely Randomized Block Design with three treatments. Soilless media developed by Assam Agricultural University, Jorhat is consist of sand, cocopeat , vermicompost, vermiculite and perlite in ratio of 1 : 2 : 2 : 0.25 : 0.25.

Results

The results obtained during the experimentation in the field and presented here with the table 1, 2 and figures 1. In Table 1. T₁ in broccoli was recored highest in plant height (40.07 cm), plant spread (45.20 cm) and shelf life (5.07 days). Broccoli equivalent yield in T₁ was at par with T₂ for lettuce. The plant height for lettuce gerbera and chrysanthemum for growing media was recorded highest growing media (sand + cocopeat + vermicompost + vermiculite + perlite, 1:2:2:0.25:0.25).Shelf life of lettuce, Gerbera, Chrysanthemum was observed 4.07 days, 7.10 days and 13.13 days respectively in T₁. BC ratio was revealed highest in T₁ for Broccoli (1.56), lettuce (1.43), Gerbera (5.31) and Chrysanthemum (1.63) respectively.

Table 1: Results of Cropwise different parameters in different treatments

Crops		Plant height (cm)	Plant spread(cm)	Shelf life (days)	Broccoli equivalent Yield/box	Net return/box	B:C ratio
Broccoli	T ₁	40.07	45.20	5.07	1.81	39.0	1.56
	T ₂	35.10	40.13	4.60	1.54	20.3	1.28
	T ₃	30.57	35.37	4.13	1.44	16.6	1.24
Lettuce	T ₁	22.13	30.43	4.07	1.67	30.0	1.43
	T ₂	20.13	29.13	3.50	1.67	27.5	1.38
	T ₃	19.90	28.17	2.23	1.53	22.0	1.31
Gerbera	T ₁	30.43	27.93	7.10	6.20	302.0	5.31
	T ₂	27.10	25.23	6.43	5.02	229.0	4.16
	T ₃	25.13	23.47	5.73	3.12	117.2	2.67
Chysanthe mum	T ₁	40.27	35.50	13.13	1.90	44.2	1.63
	T ₂	35.10	32.30	12.30	1.63	25.1	1.35
	T ₃	30.67	29.13	11.23	1.44	16.4	1.23
	Sed	0.10	0.06	0.04	0.25	15.29	0.22
	CD	0.22	0.14	0.08	0.53	31.92	0.45

In Table 2, Soilless media (T₁) is significantly difference with redymade pottng media T₂ and Soil (T₃) in plant height,

plant spread, shelf life, yield, net return and B:C ratio.

Table 2: Results of different parameters in different treatments

	Plant height	Pt spd (cm)	Shelf life (days)	Broccoli equivalent Yield/box	Net return/box	B:C
T ₁	33.2	34.7	7.3	2.8	103.8	2.5
T ₂	29.3	31.7	6.7	2.4	75.4	2.0
T ₃	26.5	29.0	5.8	1.8	43.0	1.6
Sed	0.05	0.03	0.02	0.12	7.64	0.11
CD	0.11	0.06	0.04	0.26	15.96	0.23

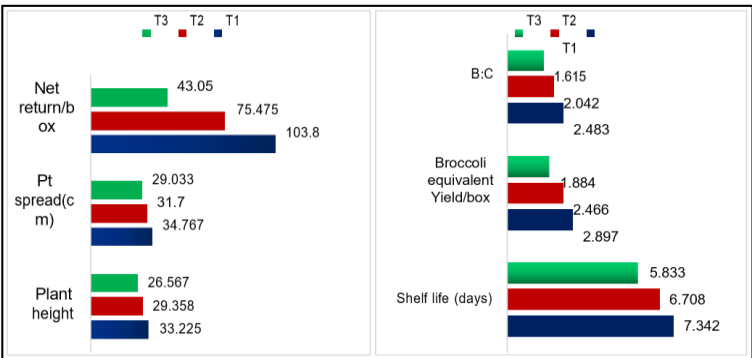


Fig 1: Graphical representation of different parameters in different treatments

Conclusion

Soilless media (Sand + Cocopeat + Vermicompost + Vermiculite + Perlite :: 1 : 2 : 2 : 0.25 : 0.25) showed the best result significantly in plant height (33.22 cm), plant spread (34.77 cm), shelf life (7.3 days), yield/box (2.9 kg), net return/box (Rs.103.8) and B:C Ratio (2.8) as compared to readymade potting soil (Check) and soil for various crops *eg.* Broccoli, Lettuce, Gerbera and Chrysanthemum. This might be due to the physico-chemical properties of the soilless media which consisted of bulk density 0.83g cc⁻¹, pH of 6.25 and the presence of perlite and cocopeat made the media well-drained and rich in organic matter respectively. The result indicated that the media was suitable for gerbera cultivation as gerbera thrives best in a light, rich and well-drained medium with a pH slightly below or above the neutral point as reported by Ahmad *et al.* (2012) ^[2]. The findings of the experiment for these flower and vegetable crops comprehensively revealed the utility of organic (cocopeat and vermicompost) and inorganic (vermiculite and perlite) components as effective media for rooftop gardening of solid hydroponic type.

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