

## Original Research Article

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## Effect of Growing Media and Depth on Rooftop Cultivation of Gerbera (*Gerbera jamesonii* Bolus) cv. Red Gem

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### ABSTRACT

An experiment was conducted to study the effect of growing media depth on gerbera (*Gerbera jamesonii* Bolus) cv. Red Gem for Rooftop Gardening during 2016. The experiment was laid out in two-factor completely randomised block design comprising of five growing medias having different components by volume at three different depths, viz. D<sub>1</sub>:10 cm, D<sub>2</sub>:20 cm and D<sub>3</sub>: 30cm depths. The media compositions were G<sub>1</sub>: soil + sand + coco peat + vermicompost (1:1:2:2), G<sub>2</sub>: sand + coco peat + vermicompost (1:2:2), G<sub>3</sub>: sand + coco peat + vermicompost + vermiculite (1:2:2:0.5), G<sub>4</sub>: sand + coco peat + vermicompost + perlite (1:2:2:0.5) and G<sub>5</sub>: sand + coco peat + vermicompost + vermiculite + perlite (1:2:2:0.25:0.25). Among the growing media and depth, G<sub>5</sub> and D<sub>3</sub> recorded the highest mean leaf area of 2785.69 cm<sup>2</sup> and highest leaf area of 3452.17cm<sup>2</sup> respectively. G<sub>5</sub> recorded the highest mean for root number (202.33), flower diameter (8.55cm), self-life (15.64 days) and vase life (7.90 days) of flower. Media depth D<sub>3</sub> recorded the highest mean of 245.13 for root number. On the other hand, D<sub>3</sub> found the maximum floral diameter (9.80cm), shelf life (17.29 days) and vase life (8.73 days) of the flower. Among the growing media and depth, the highest mean for fresh weight of flowers (11.18g) was recorded for G<sub>5</sub> and 12.64g in D<sub>3</sub>. The highest mean for dry weight of flowers (4.02g) was recorded for G<sub>5</sub>. The highest chlorophyll content (1.48mg g<sup>-1</sup> FW) was recorded for growing media G<sub>5</sub> and 1.82mg g<sup>-1</sup> FW in D<sub>3</sub>. G<sub>5</sub> (82.43%) and D<sub>3</sub> (83.45%) recorded the highest moisture content for growing media and media depth respectively.

### Keywords

*Gerbera jamesonii* B.,  
Rooftop gardening,  
Growing media, Media  
depth, Perlite,  
Vermiculite, Cocopeat,  
Vermicompost

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### Introduction

Rooftops are places of fantasy and imagination. Roof gardens which are the precursors of contemporary green roofs have ancient roots. The earliest acknowledged roof gardens were the hanging gardens of Semiramis, the present day Syria, considered one of the seven wonders of the ancient world. Today, similar elaborate and modern roof-garden projects have been designed for high-

profile international hotels, business centres, and private homes (Oberndorfer *et al.*, 2007). Since forests, agricultural fields, and suburban and urban lands are replaced with impervious surfaces resulting from development, the necessity to recover green space is becoming increasingly critical to maintain environmental quality (Getter and Rowe, 2006). In an accessible rooftop garden, space becomes available for localized small-scale urban agriculture, a source of local food production.

A rooftop garden can supplement the diets of the community it feeds with fresh and nutritious produce and provide a tangible tie to food production. Moreover rooftop agriculture allows for the retention of traditional or cultural gardening practices while local choice of plants can preserve heritage species and maintain diversity in diet. Rooftops are underutilized and rarely considered as urban space which otherwise could be utilized with potential for creative development. There are essentially three options for rooftop gardens. The first is container gardening, a less formal, cheaper form of roof gardening. In container gardening, few to no modifications are made to the existing roof-structure; containers like old bath tubs, tyres, wooden box, fish cartoons etc. are placed on a rooftop and filled with soil and plants. The second type of roof garden, in which the rooftop actually becomes a planting medium, involves more intensive investments. The third rooftop garden possibility is rooftop hydroponics, in which plants are grown in a soilless medium and fed a special nutrient solution. Rooftop hydroponics can be the lightest of the three options and may offer the possibility for faster plant growth and increased productivity.

### **Materials and Methods**

The study was conducted in the rooftop of New Administrative Building, Assam Agricultural University, Jorhat during 2016. The individual sucker was separated carefully from the mother plant. The roots were trimmed off and one-thirds of the top portion of the leaves was cut off. The suckers were then dipped in 0.2 per cent solution of Bavistin for 15-20 minutes to protect the plants from root rot disease. The planting was done on 23<sup>rd</sup> of November, 2016. Four plants were accommodated in each box. NPK, 19 All @ 2g/l was sprayed twice a week to the plants and a combination of micronutrients was sprayed @ 2 g/ l once a week to the plants.

The treatments were three depths of media along with five different compositions of media comprising of components mixed in various proportions by volume *viz.* D<sub>1</sub>:10 cm, D<sub>2</sub>:20 cm and D<sub>3</sub>: 30cm depths. The media compositions were G<sub>1</sub>: soil + sand + coco peat + vermicompost (1:1:2:2), G<sub>2</sub>: sand + coco peat + vermicompost (1:2:2), G<sub>3</sub>: sand + coco peat + vermicompost + vermiculite (1:2:2:0.5), G<sub>4</sub>: sand + coco peat + vermicompost + perlite (1:2:2:0.5) and G<sub>5</sub>: sand + coco peat + vermicompost + vermiculite + perlite (1:2:2:0.25:0.25). There were fifteen treatment combinations comprising of three level of depth of media and five different growing media. The experiment was designed based on two factor completely randomized block design with three replications. The average data were recorded on plant growth characters like plant height (cm), number of leaves per plant, plant spread, root volume, root length and flower characters like days to visibility of flower bud, days to bud opening from visibility, days to full bloom, number of sprays per plant and flowering period (from first to last flower) were recorded at maturity or at final growth stage. The experimental site was located at 26°47'N latitude, 94°12'E longitude and 86.8 m above the mean sea-level. Jorhat falls within Upper Brahmaputra Valley Agro Climatic Zone of Assam. The climatic condition of this zone is characterized by a subtropical humid climate having a hot humid summer and relatively dry and cool winter. The rainfall is about 2500 mm but unevenly distributed throughout the year. Normal rain starts from June and continues up to September with the pre-monsoon shower commencing from the mid-March. The intensity of rainfall is highest in monsoon season which normally begins from first week of June. Then the intensity of the rainfall decreases from October onwards reaching the minimum during December/January. In general the maximum temperature being

around 34.36°C during summer and the minimum around 7°C during winter.

## Results and Discussion

The highest leaf area per plant of 2785.69cm<sup>2</sup> was recorded in growing media G<sub>5</sub>. The highest leaf area could be due to the higher number of leaves recorded in G<sub>5</sub> for leaf number. With increase in the depth of growing media, the leaf area (3452.17cm<sup>2</sup>) of the plants increased as the leaf area of individual leaf increased for the plants grown in 30cm depth. The interaction between D<sub>3</sub>G<sub>5</sub> recorded the highest leaf area of 3644.67cm<sup>2</sup>, whereas D<sub>1</sub>G<sub>1</sub> recorded the least leaf area. The lowest leaf area in combination D<sub>1</sub>G<sub>1</sub> could be attributed to less volume of growing media which restricted the nutrient supply. Similar result was reported by Iersel (1997) in salvia.

Root number of 202.33 was recorded as highest in media G<sub>5</sub>. The air porosity of the media might have provided ambient aeration for the roots as media aeration is an important factor for root development in plants. Among the media depths, D<sub>3</sub> i.e. 30cm recorded the highest root number because a depth of 30cm facilitated the growth of feeder roots which was comparatively restricted in case of 10cm and 20cm growing media depths. The treatment combination of D<sub>3</sub>G<sub>5</sub> recorded the highest root number of 276.00. This might be due to the fact that there was less competition among the plants for space as the container size was bigger and the high porosity of the media facilitated vigorous growth.

The highest mean for diameter of flower was recorded in media G<sub>5</sub> which consisted of cocopeat, vermiculite and perlite among the media components. Higher performance of these characters might be due to the physico-chemical characteristics of G<sub>5</sub> in which the organic matter existence along with inorganic matter such as perlite improved the property

of the media. Similar results were reported by Fakhri *et al.*, (1995) who obtained the largest flower on mixes of perlite. The diameter of flower was highest in media depth 30cm. This might be due to increase in media volume which led to an increase in nutrient availability and less overlapping of the root zone. The treatment combination of D<sub>3</sub>G<sub>5</sub> recorded the highest diameter of flower. This might be due to the fact that the vegetative growth and root growth parameters were found to be the highest in this treatment.

Self-life and vase life of flower were found to be longest in growing media G<sub>5</sub> for both the crops. This could be due to the better availability of P and K and also due to higher amount of reserve food material content in the flower. Likewise, the longest self and vase life observed in media depth D<sub>3</sub> could be attributed to the larger amount of available N, P and K with greater volume of the media. The combination D<sub>3</sub>G<sub>5</sub> recorded the longest self-life and vase life. This character might be due to the larger amount of N, P and K made available by the presence of vermiculite in the rhizosphere of the plant.

Fresh and dry flower weight were found to be higher for growing media G<sub>5</sub>. This might be due to the larger leaf area which resulted in greater accumulation of photosynthates in the individual flowers. Similar results were reported by Nayak *et al.*, (2005) in gerbera. The highest fresh weight and dry weight of flower were found in media depth D<sub>3</sub> i.e. 30cm. This might be due to the vigorous growth of the plant which resulted in larger accumulation of photosynthates in the individual flowers. The treatment combination D<sub>3</sub>G<sub>5</sub> recorded the highest fresh weight and dry weight of flowers which might be due to resultant highest shoot and root characters signifying accumulation of higher photosynthates in the individual flowers compared to other combinations (Table 1).

**Table.1** Effect of media depth and composition on plant characters

Treatment	Leaf Area (cm <sup>2</sup> )	Root number	Diameter of flower (cm)	Self-life (days)	Vase life (days)	Fresh weight of flower (g)	Dry weight of flower	Chlorophyll Content (mg g <sup>-1</sup> FW)	Moisture content (%)
D <sub>1</sub>	1896.77	123.87	6.91	10.44	5.27	9.10	2.75	0.84	80.04
D <sub>2</sub>	2438.85	172.93	7.79	12.71	6.42	9.98	3.24	1.33	81.48
D <sub>3</sub>	3452.17	245.13	9.80	17.29	8.73	12.64	4.84	1.82	83.48
SEd(±)	19.186	2.060	0.074	0.235	0.119	0.154	0.061	0.011	0.020
CD (5%)	39.300	4.219	0.151	0.481	0.244	0.315	0.125	0.023	0.030
G <sub>1</sub>	2340.80	158.22	7.92	12.26	6.19	10.25	3.18	1.18	80.70
G <sub>2</sub>	2534.16	172.67	8.18	12.45	6.29	10.77	3.62	1.27	81.50
G <sub>3</sub>	2632.54	182.00	8.14	13.09	6.61	10.20	3.54	1.31	81.81
G <sub>4</sub>	2686.44	188.00	8.05	13.95	7.05	10.46	3.70	1.41	81.84
G <sub>5</sub>	2785.69	202.33	8.55	15.64	7.90	11.08	4.02	1.48	82.43
SEd(±)	24.769	2.659	0.095	0.303	0.154	0.199	0.079	0.015	0.020
CD (5%)	50.736	5.447	0.195	0.621	0.314	0.407	0.161	0.030	0.040
D <sub>1</sub> G <sub>1</sub>	1763.30	114.33	6.65	10.17	5.14	2.63	2.63	0.64	79.04
D <sub>1</sub> G <sub>2</sub>	1891.63	119.00	7.03	10.42	5.26	2.88	2.88	0.74	79.76
D <sub>1</sub> G <sub>3</sub>	1927.57	123.00	6.91	10.25	5.18	2.74	2.74	0.79	80.85
D <sub>1</sub> G <sub>4</sub>	1948.10	126.33	6.86	10.19	5.15	2.72	2.72	0.97	79.81
D <sub>1</sub> G <sub>5</sub>	1953.23	136.67	7.11	11.17	5.64	2.79	2.79	1.04	80.71
D <sub>2</sub> G <sub>1</sub>	2125.20	147.00	7.39	11.36	5.74	2.83	2.83	1.19	80.92
D <sub>2</sub> G <sub>2</sub>	2299.73	160.33	7.69	11.61	5.86	3.08	3.08	1.29	81.03
D <sub>2</sub> G <sub>3</sub>	2425.50	178.33	7.92	12.48	6.30	3.20	3.20	1.33	81.60
D <sub>2</sub> G <sub>4</sub>	2584.63	184.67	7.52	13.19	6.66	3.25	3.25	1.37	81.83
D <sub>2</sub> G <sub>5</sub>	2759.17	194.33	8.44	14.92	7.53	3.84	3.84	1.48	82.01
D <sub>3</sub> G <sub>1</sub>	3133.90	213.33	9.72	15.25	7.70	4.09	4.09	1.71	82.14
D <sub>3</sub> G <sub>2</sub>	3411.10	238.67	9.82	15.33	7.74	4.90	4.90	1.78	83.71
D <sub>3</sub> G <sub>3</sub>	3544.57	244.67	9.59	16.54	8.35	4.67	4.67	1.79	82.97
D <sub>3</sub> G <sub>4</sub>	3526.60	253.00	9.75	18.47	9.33	5.14	5.14	1.88	83.88
D <sub>3</sub> G <sub>5</sub>	3644.67	276.00	10.09	20.83	10.52	5.42	5.42	1.92	84.56
SEd(±)	42.900	4.606	0.165	0.525	0.266	0.136	0.136	0.026	0.040
CD (5%)	87.877	9.435	0.338	1.076	0.545	0.279	0.279	0.052	0.080

Highest mean chlorophyll content of 1.48mg g<sup>-1</sup> FW was observed in growing media G<sub>5</sub>. This might be due to the high availability of N in the media. The chlorophyll content was highest in media depth 30cm which might be due to the increase in media volume resulting in an increase in N availability. Chlorophyll content in the combination D<sub>3</sub>G<sub>5</sub> was

recorded highest. This might be due to the high CEC of vermiculite present in the media which made N available to the plant.

Growing media G<sub>5</sub> recorded the highest moisture content. This might be due to the perlite present in the media which have microspores to hold water and make it

available to the plants constantly. With the increase of media depth the moisture content also increased with the highest in D<sub>3</sub>. This might be due to the increase in media volume that made more water available for the plant. Treatment combination D<sub>3</sub>G<sub>5</sub> exhibited highest moisture content in plants due to better water holding capacity of perlite and vermiculite and increased depth of the media.

From the experimentation, it may be concluded that the media G<sub>5</sub> (sand + cocopeat + vermicompost + vermiculite + perlite, 1:2:2:0.25:0.25 v/v) along with media depth D<sub>3</sub> i.e. 30cm was considered as the best for rooftop gardening of gerbera.

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