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## Response of different growing media on the growth and yield of gerbera (*Gerbera jamesonii*) under hydroponic open system

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**Abstract :** The study on the effect of different substrate on growth and yield of gerbera was carried out in a Randomized Complete Block Design with 14 treatments and 3 replications. Treatments consists of were as fallow : fine sand, peat + fine sand (25%+ 75%), peat + fine sand (50% + 50% ), perlite + peat (75% + 25%), perlite + peat(50% + 50% ), perlite + peat (25% + 75%), perlite + peat + expanded clay (25% + 70% + 5%), perlite + peat + expanded clay (50 %+ 25% + 25% ), perlite + peat + expanded clay (25%+ 50% + 25% ), perlite + expanded clay (50%+ 50% ), coco peat , coco peat + perlite (75% + 25% ),coco peat + perlite (50% + 50% ), coco peat + perlite + expanded clay (50% + 25% + 25% ), plants were fertilized with a same nutrient solution. Results showed that, the growing medium [perlite + peat + expanded clay (25% + 70% + 5%)] was the best of all. In this substrate, flower number, flower diameter, shoot diameter, stem neck diameter, flower height and vase life showed significant difference among growing media.

**Key words :** Gerbera, Perlite, Coco peat, Peat, Expanded clay

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**G**erbera (*Gerbera jamesonii*) is one of the herbaceous plants with colorful and beautiful flowers that are used as cut, pot and garden flower. Various planting beds around the world is used for growing gerbera such as perlite, rock wool, vermiculite, sand, coconut fiber (coco peat), expanded clay, organic substrates, compost cow, zeolite, pumice, sand etc. reported by Khalaj (2007) and Fakhri *et al.*(1995). Soil-less cultures have been successfully used for several decades with the aim to intensify production and reduce cost (Maloupa *et al.*, 1993). Peat is the most widely used substrate for potted plant production in the nurseries and accounts for a significant portion of the materials used to grow potted plants (Marfa' *et al.*, 2002 and Ribeiro *et al.*, 2007). Since the last few years, coco peat, also known as coir dust or coconut mesocarp has been considered as a renewable sphagnum peat substitute for the use in horticulture (Yau and Murphy, 2000). Perlite has been

widely used in soil-less cultures too. Perlite, an aluminosilicate of volcanic origin, is rather inert (low buffering and cation exchange capacities of 0–1 mg L<sup>-1</sup>). In general, it has a closed cellular structure, with the majority of water being retained superficially and released slowly at a relatively low tension, providing excellent drainage of the medium and aeration of rhizosphere (Maloupa *et al.*, 1993). The objective of this study was to determine the effect of different substrates on growth and yield of gerbera under an open soil-less production system.

### RESEARCH METHODS

This experiment was carried out as Randomized Complete Block Design (RCBD) with 14 treatments and 3 replications for study on the effect of different substrate on growth and yield of gerbera (*Gerbera jamesonii*) over a period of 6 months as follows:

T <sub>0</sub>	Fine sand
T <sub>2</sub>	Peat + Fine sand (25%+75%)
T <sub>3</sub>	Peat + Fine sand (50% +50%)
T <sub>4</sub>	Perlite + Peat (75% + 25%)
T <sub>5</sub>	Perlite + Peat (50% + 50%)
T <sub>6</sub>	Perlite + Peat (25% + 75%)
T <sub>7</sub>	Perlite + Peat + Expanded clay (25% + 70% + 5%)
T <sub>8</sub>	Perlite + Peat + Expanded clay (50 %+ 25%+ 25%)
T <sub>9</sub>	Perlite + Peat + Expanded clay (25%+ 50% + 25%)
T <sub>10</sub>	Perlite + Expanded clay (50% + 50% ,
T <sub>11</sub>	Coco peat
T <sub>12</sub>	Coco peat + Perlite (75 %+ 25%)
T <sub>13</sub>	Coco peat + Perlite (50% + 50%)
T <sub>14</sub>	Coco peat + Perlite + Expanded clay (50% + 25% + 25%)

[Treatments mix by (v/v) of substrates]

Plants were fertilized with a same nutrient solution. In this experiment, sand, perlite and expanded clay were used with 0.5-1, 1-2 and 3-5 mm in diameter range, respectively. The greenhouse temperature and relative humidity were 18-28°C and 50-70 per cent and also the amount of light was 23000-25000 (Lumen/m<sup>2</sup>). Gerbera transplanted in 4 litres size pots. They were irrigated 3-4 times in the basis of, every day. Electrical conductivity and pH of water (nutrient solution) was 5.5-6.5 and 1.5-2 ds/m, respectively. In a period of six months, some quality and quantity characteristics of flowers were measured such as: flower number, flower stem height, flower disc diameter, stem diameter, stem neck diameter and vase life. Standard procedures were followed to collect the data for growth and flowering parameters. The data collected were analyzed statistically by using Duncan's

Multiple Range (DMR) test at 1 per cent and 5 per cent probability level and used to compare the difference among treatments means (Steel *et al.*, 1996).

## RESEARCH FINDINGS AND DISCUSSION

The selection of media is based on many factors as existence; ease of use, cheap for producers. The different types of media can be used as peat and recently coco peat (coconut fiber), rock wool, vermiculite, perlite, expanded clay, pumice, sand and... . In this experiment, based on various sources of external and internal reviews, common media used in various gerbera cultures were evaluated (Sindahu *et al.*, 2010; Khalaj, 2007; Venezia *et al.*, 1997; Mascecarini, 1998; pisanu *et al.*, 1994).

The results of analysis (Table 1 and 2) showed that 7th treatment, which includes a mixture of perlite + peat + expanded clay (25% + 70% + 5%) produced maximum flower numbers against others with 10.33 numbers and sand bed alone produced 3.77 flowers that had lowest production. The flower numbers of gerbera in 7th treatment could be the results of faster plant development due to good root system and better physicochemical properties of mixes. Growth medium is known to have a large effect on value of potted ornamental plants (Vendrame *et al.*, 2005). Cation exchange capacity (CEC) of bed No.7 is 80 Cmol charge kg<sup>-1</sup>. According to different researches, organic materials and high cation exchange capacity (CEC) increase the absorption and storage of nutrient, water and also by creating suitable conditions for plant root growth, can increase qualitative and quantitative characteristics of flowers. If peat has been used alone, it because of pressing and decreasing ventilation and so sand or perlite due to little or no good

**Table 1: Physical and chemical properties of substrates used in this experiment**

Sr. No.	Substrates	CEC (cmolC/ kg)	Porosity (%)	EC (ds/m)	pH
1.	Fine sand	1.04	0.75	40	6.91
2.	Peat + Fine sand (25%+75%)	1.02	3.5	41.1	6.87
3.	Peat + Fine sand (50% +50%)	0.99	7.7	42.7	6.82
4.	Perlite + Peat (75% + 25%)	0.84	26.5	73.7	6.54
5.	Perlite + Peat (50% + 50%)	0.65	57.2	79.4	6.15
6.	Perlite + Peat (25% + 75%)	0.41	94.9	86.3	6.65
7.	Perlite + Peat + Expanded clay (25% + 70% + 5%)	0.34	80.3	80.7	6.17
8.	Perlite + Peat + Expanded clay (50 %+ 25%+ 25%)	0.49	22.4	62.7	7.75
9.	Perlite + Peat + Expanded clay (25%+ 50% + 25%)	0.39	43.5	66.2	6.51
10.	Perlite + Expanded clay (50% + 50%),	0.18	35.3	59	8.29
11.	Coco peat	0.5	75	90	5.29
12.	Coco peat + Perlite (75 %+ 25%)	0.64	54	84.1	5.75
13.	Coco peat + Perlite (50% + 50%)	0.77	34.5	78.6	6.17
14.	Coco peat + Perlite + Expanded clay (50% + 25% + 25%)	0.45	27.6	66.3	7.48

properties would not be useful (Khalaj, 2007). Among the physical characteristics, aeration and water holding capacity are probably the most important factors while, among the chemical characteristics, nutritional status, and salinity level have a crucial role on plant development (Dewayne *et al.*, 2003). Nowak and Strojny (2004) reported that the total porosity, bulk density, shrinkage water capacity and air capacity of the growing substrates had significant effects on the number and weight of fresh flowers in gerbera.

Data showed that flower disc diameter was influenced by the different media and the largest flower diameter (11.6 cm) was in 7th treatment while the lowest flower diameter 10.9 cm from 1st (sand alone) was derived (Table 2). Fakhri *et al.* (1995) reported, that the largest flower diameter obtained from mixes of peat and perlite. They noted that media physicochemical characteristics improving because of the organic matter existence was the main reason of differences.

There was significant difference in the flower height, significantly greater mean flower height was produced in medium 7 (54.5 cm), the highest of growing media (Table 2). Greater flower height and more yields produced by plants grown in medium 7 suggest that this treatment is best suited for growing gerbera flower in among these media. Medium 7, by 0.39 ds /m had the least salinity than other media, so good root medium has provided for nutrient absorption and growth for plants.

Survey conducted by Papadopoulos *et al.* (1996) has shown that mixture of perlite and peat with equal volume produced the maximum flower height with 69 cm. Aswath and Padmanabha and Pillai (2004) reported that in gerbera

electrical conductivity in medium had significant influence on stalk length, stalk thickness and flower diameter.

Ozcelik *et al.* (1997) studied during the 1994-95 the effects of different planting media as the alone or the combination on quality and quantity of gerbera, they observed that the most appropriate mixture for gerbera yield in 15-month period. A strong relationship between substrate physicochemical properties, gerbera quantity and quality characteristics has been reported in this survey.

Data showed that significant differences in the gerbera vase life grown on media were observed with varying substrate (Table 2). Medium 7, had the longest gerbera vase life (13.6 days) (Table 2). The vase life is directly related to dry matter production as well as size of flowers. This finding is in agreement with Manins *et al.* (1995) findings which showed significant differences between different substrates on gerbera vase life. De Jong (1978) found that gerbera flowers with strong stem were less likely to fold in the vase due to turgor pressure maintained. As the vegetative growth was found to be better in cocopeat combinations, the flower set was early producing high quality cut flowers.

The resent study confirms the fact that selection of the appropriate medium of growth for cut flower plants (in this case *Gerbera jamesonii* L.) was very important from yield and quality point of view. The medium must ensure the production of plants of the required quality on cost effective basis. In the present study, perlite + peat + expanded clay mix (%25 + %70 + %5) produced significantly the maximum number of flowers per plant and other quality characteristics among different media.

**Table 2 : Effect of different substrates on the yield and growth of gerbera**

Treatments	Flower height (cm)	Stem neck diameter (cm)	Stem diameter (cm)	Flower disc diameter (cm)	Flower number (per plant)	Vase life (days)
T <sub>1</sub>	48.4	0.49	0.66	10.9	3.77	10.6
T <sub>2</sub>	51.3	0.52	0.69	11.6	3.9	11.4
T <sub>3</sub>	50.4	0.52	0.66	11.1	5.67	10.7
T <sub>4</sub>	45	0.5	0.65	11	7.9	11.6
T <sub>5</sub>	51.6	0.51	0.64	11.1	7.43	10.8
T <sub>6</sub>	54	0.5	0.67	11.5	7.76	10.3
T <sub>7</sub>	54.5	0.58	0.79	12.4	10.33	13.6
T <sub>8</sub>	48.4	0.5	0.68	11	7.9	11.3
T <sub>9</sub>	48.2	0.51	0.68	11.2	9.23	11.1
T <sub>10</sub>	46	0.51	0.69	11.2	7.9	11.3
T <sub>11</sub>	51	0.51	0.7	11.1	5.57	10.6
T <sub>12</sub>	54.3	0.5	0.69	11.3	6.67	10.7
T <sub>13</sub>	54.2	0.5	0.69	11.3	6	10.3
T <sub>14</sub>	53.2	0.5	0.7	10.9	7.77	10.1
C.D. (P=0.05)	3.04	0.04	0.04	0.41	3.49	1.27

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