Indian J. Hort. 67(Special Issue), November 2010: 391-394

Effect of medium amendments on growth and flowering in gerbera

S.S. Sindhu*, Gholap D.B., M.C. Singh and M.R. Dhiman**
Division of Floriculture and Landscaping, Indian Agricultural Research Institute, New Delhi 110012

ABSTRACT

An experiment was conducted to study the effects of different amendments in growing medium on growth and flowering in gerbera under greenhouse condition using available materials viz. soil, farm yard manure (FYM), vermicompost, samridhi (a soil conditioner) and sawdust. The experiment was conducted using completely randomized design (CRD) with three replications having five plants per replication with single plant per pot. The results revealed that the medium amended with soil + FYM + vermicompost + samridhi + sawdust took maximum number of days (9.81days) for the appearance of first new leaf. Leaf length (35.45 cm) and Leaf width (17.24 cm) was found to be significantly higher in medium amended with samridhi. Maximum plant height (29.89 cm), number of leaves per plant (31.10 leaves), number of flowers produced per plant (10.03 flowers), flower head diameter (10.82 cm), flower stalk length (59.20 cm) and vase life (13.17 days) was found highest in medium amended with samridhi. Based on the results obtained, samridhi was found to be a better soil conditioner for enhanced growth and flowering in gerbera.

Key words: Growing media, protected cultivation, amendments, soilless, growth and flowering

INTRODUCTION

Gerbera (*Gerbera jamesonii* Boleux ex Hoof. F), is one of the beautiful cut flower being grown commercially under protected cultivation. It is considered a promising and valuable cut flower crop next to rose, ranks fifth among top ten cut flowers of world market. The major production of gerbera has been promoted in and around Bangalore, Pune and certain pockets of Uttrakand on commercial scale. Recently, its production has picked up and being grown under semi and controlled growing conditions. Soil alone as a growing medium does not fulfill all requirements for its higher yield and quality. The introduction of the soilless medium has brought radical change in its protected cultivation and is gaining importance day by day. Gerbera grows well in substrates such as coco peat, peat, sawdust, vermicompost, perlite, etc. Production of gerbera can be further enhanced and improved by growing in substrate culture. So keeping in view, an attempt has been made to study the performance of growth and flowering of gerbera affected by different amendments in growing medium.

MATERIALS AND METHODS

The present investigations were carried out at the greenhouse of Centre for Protected Cultivation Technology (Formerly Indo-Israel Project), Indian Agricultural Research Institute (IARI), New Delhi on Gerbera cv. Tesrina during September 2005 to March 2006. The standard growing medium cocopeat, vermiculite and perlite were used. The amendments used were garden soil, farmyard manure (FYM), vermicompost, Samridhi (soil conditioner) and sawdust. The details of substrates after amendments are shown in Table 1. Earthen pots of 20 cm height and 20 cm diameter were selected. Five-weak-old tissue cultured plants with 4-5 leaves were planted in pots and experiment was designed in a completely randomized design (CRD) with three replications consisting of 10 treatments each. Each replication consisted of five plants and each pot contained only one plant. The details of the treatments are as follow.

T_1(control)	Cocopeat:Vermiculite:Perlite (CVP) (4:1:1)
T_2	CVP+ Soil (4:2)
T_3	CVP+ FYM (8:1)
T_4	CVP+ Vermicompost (8:1)
T_5	CVP+ Samridhi (8:1)
T_6	CVP+ Sawdust (8:1)
T_7	CVP+ Soil + FYM (8:2:1)
T_8	CVP+ Soil + FYM + Vermicompost (8:2:1:1)
T_9	CVP+ Soil + FYM + Vermicompost + Samridhi (8:2:1:1:1)
T_{10}	CVP+ Soil + FYM + Vermicompost + Samridhi + Sawdust (8:2:1:1:1:1)

(Each treatment consists of 800 g (w/v) of cocopeat: vermiculite: perlite)

*Corresponding author's E-mail: sssindhu2003@yahoo.co.in
**IARI, Regional Station, Katrain, Kullu-valley 175129

The medium samples were collected from two layers of the pots, viz. the upper half and lower half of the pots at the beginning of the experiment. While, the leaf samples were collected at the end of the experiment. The observations related to vegetative and flowering parameters were recorded using standard procedures. The comparative LSD multiple range test (P= 0.05) was used to determine differences between treatments. The statistical analysis based on mean values per treatment was made using the technique of analysis of variance with COSTAT.

RESULTS AND DISCUSSION

The experimental data were recorded and critically analysed under the two different heads. The data on vegetative characteristic presented in table 1 shows that, the days required for first leaf appearance after transplanting was found to be significantly lesser (5.74 days) in control than other treatments having different amendments. The medium amended with soil + FYM + vermicompost + samridhi + sawdust recorded maximum number of days (9.81days) for appearance of first leaf. The above results show the clear influence of cocopeat on the appearance of first leaf after transplanting, as the number of days required increases with the decreasing proportion of the cocopeat in the medium. Barreto and Jagtap (3) also reported that the days required for the appearance of new leaf after transplanting was the lowest in cocopeat alone.

The average number of leaves at the appearance of the first flower bud was found to be significantly lower (6.73 leaves/plant) in medium amended with FYM than other treatments having different amendments. Maximum number of leaves (9.07 leaves/plant) at the time of first flower bud appearance was recorded in control which was at par with medium amended with CVP+ samridhi. Leffring (5) reported that in gerbera, the flower production was influenced by total number of leaves produced per plant. Leaf length was found to be significantly higher (35.45 cm) in medium amended with samridhi followed by control (34.71 cm). The medium amended with soil + FYM + vermicompost has recorded the lowest leaf length (28.74 cm). Maximum leaf length in 35.45 cm may be attributed to the lower bulk density of medium as well as lower pH of the medium which is essential for the better growth of the plant. Nowak (6) reported that there was a significant decrease in leaf length and width with decreasing P level in medium in African daisy (*Osteospermum* sp.).

Data on plant height presented in Table 2 revealed that there was no significant effect of different amendments on the average plant height at the end of the experiment. Plant height was recorded maximum (29.89 cm) in medium amended with Samridhi (T5) whereas it was least (23.81 cm) in medium amended with soil + FYM + vermicompost.

The fresh weight of the plant at the end of the experiment varied among the treatments and was found to be significantly higher in control than all other treatments. Highest fresh weight per plant (107.14 g) was recorded in control followed by medium amended with Samridhi (103.01 g). In chrysanthemum, medium combining cotton green trash compost and rice hulls with the high EC at the beginning of the culture in

Table 1. Effect of different amendments on the vegetative growth of gerbera.

Treatment	Days for appearance of first new leaf	No. of leaves at appearance of first flower	Av. leaf length (cm)	Av. leaf width (cm)	Av. plant height (cm)	Fresh wt. (g)	Dry wt. (g)	Total No. of leaves produced	No. of suckers produced
T1(control)	5.74	9.07	34.71	16.41	27.75	107.14	27.21	30.2	1.4
T2	7.40	7.33	30.99	15.97	26.73	95.76	22.30	25.4	1.3
T3	6.45	6.73	30.61	14.68	25.31	92.57	22.59	26.9	1.4
T4	7.88	7.60	33.72	16.25	28.65	92.94	23.68	30.1	1.5
T5	7.97	8.73	35.45	17.24	29.89	103.01	27.03	31.1	1.5
T6	8.53	8.53	29.77	14.69	28.19	99.02	26.09	28.2	1.4
T7	8.78	6.87	29.81	14.40	27.83	89.61	23.43	27.6	1.1
T8	8.95	7.07	28.74	14.18	23.81	91.10	23.21	27.7	1.2
T9	8.15	8.67	34.59	14.96	26.45	92.76	22.28	28.0	1.1
T10	9.81	8.53	31.17	12.73	27.76	89.84	21.47	21.9	1.1
CD at 5%	0.92	0.89	3.83	NS	NS	7.76	2.19	2.18	NS

Table 2. Effect of different amendments on flowering parameters of gerbera.

Treatment	Days taken till first flower bud appearance	Days for harvesting of first flower	Flower head dia. (cm)	Flower disc dia. (cm)	No. of ray florets (cm)	Flower stalk length (cm)	Flower stalk dia. (cm)	Flower yield (No./ plant)	Vase life (days)
T1(control)	59.2	77.83	10.48	4.17	55.85	58.2	0.87	9.78	12.0
T2	71.1	89.52	9.16	3.99	54.83	54.8	0.82	8.23	10.0
T3	64.6	85.75	9.11	4.09	55.99	54.8	0.81	8.13	9.8
T4	60.9	81.58	9.48	4.14	56.02	57.7	0.79	9.7	12.0
T5	61.1	82.42	10.82	4.53	56.15	59.2	0.86	10	13.0
T6	67.2	83.92	9.10	4.13	55.73	56.9	0.81	9.27	9.8
T7	69.7	89.83	9.53	4.09	55.14	55.9	0.8	8.49	9.8
T8	76.8	97.12	8.71	3.99	54.33	53	0.77	8.23	9.4
T9	73.7	92.8	8.86	4.13	54.89	53.1	0.8	8.08	9.7
T10	77.8	98.28	8.97	3.97	54.21	52.7	0.81	7.99	9.6
CD at 5%	5.94	5.81	1.16	NS	NS	2.68	0.04	1.03	0.99

combination with fast water draining negatively affected plant development (Papafotiou *et al.* 8).

Dry weight of the plant was significantly affected by the medium amendments and it was recorded the highest (27.21 g) when the media was amended with Samridhi. The least dry weight per plant (21.47 g) was recorded in medium amended with soil + FYM + vermicompost + Samridhi + sawdust. Bailey and Hammer (1986) reported a linear increase of shoot dry weight and leaf number of petunia seedlings when pH was reduced from 6.4 to 5.6.

The total number of leaves produced per plant was found to be significant in different substrate medium. Medium amended with Samridhi recorded highest number of leaves per plant (31.10). The medium amended with soil + FYM + vermicompost + Samridhi + sawdust recorded minimum number of leaves per plant (21.87 leaves).

Data on flowering parameters have been presented in Table 2. It is evident from the table that the first flower bud appearance was significantly differing in all the treatments. Earliest bud appearance (59.20 days) was recorded in control as compared to other treatments. Medium amended with soil + FYM + vermicompost + Samridhi + sawdust took maximum number of days (77.78) for bud appearance. These results are contrary with the results of Nowak.

The days required for the harvesting of first flower follows the same trend as that of the number of days required for the appearance of first flower. Earliest flowering was recorded in control; while the medium amended with soil + FYM + vermicompost + Samridhi + sawdust took maximum number of days (98.28 days) for flowering. This may be due to better aeration, higher porosity, higher moisture and fertilizer retention of this medium as well as better vegetative growth of plants in these medium which results in higher accumulation of carbohydrate that ultimately results in early flowering.

Average flower head diameter was found to be higher (10.82 cm) in medium amended with Samridhi followed by control (10.48 cm) while it was least in medium amended with soil + FYM + vermicompost (8.71cm), followed by medium amended with soil + FYM + vermicompost + Samridhi (8.86 cm). The increased flower head diameter may be related to the optimum growing conditions of the medium i.e. lower bulk density, high porosity, high water holding capacity as well as better nutrient uptake.

It is evident from the table that the highest flower stalk length (59.20 cm) was recorded in medium amended with Samridhi followed by control (58.15 cm). The lowest flower stalk length was observed in medium amended with soil + FYM + vermicompost + Samridhi + sawdust (52.72 cm). Rodriguez *et al.* (2000) reported that incorporation of vermicompost at 20 %, with or without chemical fertilizer, increased the plant length, chlorophyll content, and number, length and diameter of inflorescence in gerbera.

This increase in flower stalk diameter may be attributed to overall good growth of plants in these medium due to its favorable physical and chemical properties. Aswath and Padmanabha reported that in gerbera electrical conductivity in medium had significant influence on stalk length, stalk thickness and flower diameter.

The total number of flowers produced per plant over

the entire span of the experiment was found to be significant in different substrate medium. Medium amended with Samridhi recorded the highest number of flowers per plant (10.03 flowers) followed by control (9.78 flowers) and medium amended with vermicompost (9.70 flowers). The medium amended with soil + FYM + vermicompost + Samridhi + sawdust recorded minimum number of flowers per plant (7.99 flowers). The results were found to be in synchrony with those for plant dry matter, number of leaves and plant height. Nowak and Strojny 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. Sonneveld *et al*.(10) reported that the pH strongly affected the number of flowers harvested in gerbera.

The statistical analysis showed a significant effect of the medium amendments on the average vase life of flowers in tap water. The medium amended with Samridhi recorded maximum vase life (13.17 days) followed by control (11.58 days) and medium amended with vermicompost (11.50 days). The least vase life (9.42 days) was recorded in the medium amended with soil + FYM + vermicompost. The vase life is directly related to dry matter production as well as size of flowers. De Jong (4) 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.

On the basis of results, it appears that the growth and flowering of gerbera is better in soilless medium comprised of cocopeat: vermiculite: perlite (4:1:1), gives added advantage in terms of growth and flowering if the medium is amended with samridhi.

REFERENCES

1. Aswath, C. and Padmanabha, P. 2004. Effect of cocopeat medium and electrical conductivity on production of gerbera. *J. Orna. Hort.* **7**: 15-22.
2. Bailey, D.A. and Hammer, P.A. 1986. Growth and nutritional status of petunia and tomato seedlings with acidified irrigation water. *Hort. Sci.* **21**: 423-25.
3. Barreto, M.S. and Jagtap, K.B. 2002. Studies on polyhouse gerbera substrate *Floriculture Research Trend in India;* ISOH, New Delhi. pp.173-76.
4. De Jong, J. 1978. Dry storage and subsequent recovery of cut gerbera flowers as an aid in selection for longevity. *Scientia Horticulturae,* **9**: 389-97.
5. Leffring L. 1975. Effect of day length and temperature on shoot and flower production of gerbera. *Acta Horiculturae,* **51**: 263-65.
6. Nowak, J. 2001. The effect of P nutrition on growth, flowering and leaf nutrient concentration of *osteospermum*. *Acta Horiculturae,* **548**: 557-60.
7. Nowak, J.S. and Strojny, Z. 2004. The effect of physical properties of organic growing medium on cut flower yield of gerbera. *Folia Universitatis Agriculturae Stetinensis, Agricultura,* **94**: 133-38.
8. Papafotiou, M., Chronopoulos. J., Kargas, G., Voreakou, M., Leodaritis, N., Lagogian, O. and Gazi, S. 2001. Cotton gin trash compost and rice hulls as growing medium components for ornamentals. *J. Hort. Sci. Biotech.* **76**: 431-35.
9. Rodriguez Navarro, J.A., Zavaleta Mejia, E., Sanchez Garcia, P. and Gonzalez Rosas, H. 2000. The effect of vermicompost on plant nutrition, yield and incidence of root and crown rot of gerbera (*Gerbera jamesonii* H. Bolus). *Fitopatologia,* **35**: 66-79.
10. Sonneveld, C., Voogt, W. and Roeber, R.U. 1997. Effects of pH value and Mn application on yield and nutrient absorption with rockwool grown gerbera. *Acta Horticulturae,* **450**: 139-47.

Received: July, 2008; Revised: June, 2010
Accepted: August, 2010