

Evaluation of different gerbera varieties for vegetative growth under protected environment

ABSTRACT

The vegetative growth of gerbera varieties (Szogun, Kormoran, Salsa and Feliks) was studied at Agri-Tourism Centre, CCS Haryana Agricultural University, Hisar during the year 2019-20 under different growing conditions. Among the varieties Szogun recorded maximum plant spread (74.95 cm) and leaf length (37.38 cm). Whereas, Salsa showed maximum number of leaves per plant (21.47), plant height (32.73 cm) and leaf width (14.68). While, comparing growing conditions plants grown under polyhouse produced maximum plant spread (68.55 cm), number of leaves (22.67), leaf length (35.85 cm) and leaf width (13.68 cm), whereas, maximum plant height (30.11 cm) was recorded in plants grown under shade net followed by polyhouse (29.08 cm).

Keywords: Evaluation, growth, gerbera and protected environment.

1. INTRODUCTION

The Indian subcontinent is gifted with diverse agro-climatic conditions, which favours the production of flower crops throughout the year. At the times, when entire Europe remains covered with snow during winters, flower cultivation is possible only under controlled conditions. It is the best season for open field flower cultivation in India providing ample scope for flower exports from India. The present day, floral industry is a dynamic and fast growing industry.

In present day, floral industry is a dynamic and fast growing industry and has an immense potential for employment generation and to generate foreign exchange. India can possibly rise as notable player of the flora industry in future with expanding modernization. In India gerbera is distributed in temperate and tropical areas like J&K, Himachal Pradesh, Uttarakhand, Karnataka, Andhra Pradesh, Tamil Nadu, Maharashtra etc. In India, the cultivated area under cut flower is nearly 867 MT. Kerala is the leading state in the production of cut flowers (221.46 MT) with an area of 53.26 ha [1]. In Haryana, area under protected cultivation of gerbera is 9.8 ha and production of number of flowers sticks is 5461789 [2].

As the commercial cultivation of cut flowers have a good potential; introduction and popularization of high yielding cultivars of gerbera gain importance. Evaluation of gerbera for vegetative characters under polyhouse for commercial cultivation as cut flowers has a good potential [3]. However, very little information available in the past to identify the suitable cultivars of gerbera for cut flower production under polyhouse conditions in Haryana.

2. MATERIALS AND METHODS

Study on growth of gerbera varieties (*Gerbera jamesonii* Bolus) under different growing conditions was carried out at Agri-Tourism Centre, CCS Haryana Agricultural University, Hisar (Haryana) during the year 2019-20. For experimental purpose, healthy tissue cultured plants (3-4 leaf stage) of gerbera varieties namely Sozogun, Kormoran, Salsa and Feliks from Progreen Biotech Private Ltd., New Delhi. The planting was done on 2nd fortnight of October. Sixteen treatment combinations were studied with three replications /treatments. The treatments were:

T₁: Polyhouse

T₂: Shade net

T₃: Open field

T₄: Insect proof net

STATISTICAL ANALYSIS

The data were analysed according to the procedure for analysis of completely randomized design (CRD) as given by Panse and Sukhtme [4]. The overall significance of difference among the treatments was tested, using critical differences (C.D.) at 5% level of significance. The results were statistically analysed with the help of a windows based computer package OPSTAT [5].

3. RESULT AND DISCUSSION

Plant spread: Plant spread varied significantly with respect to different growing conditions (Table 1). Among the growing conditions maximum plant spread (68.55 cm) was recorded in plants grown under polyhouse followed by insect proof net house, while minimum spread (57.45 cm) was observed from the plants grown in open field condition. Polyhouse cultivation had shown more plant spread due to better growth conditions especially temperature, light, humidity, CO₂ concentration and insect-pest management. This results was also agrees with Bhargava *et al.* [6], who observed that the maximum plant spread (42.84 cm) in polyhouse condition as compared to open field in Snapdragon. The minimum plant spread under open field might be due to high temperature which is the major regulator of development processes [7]. This difference among the cultivars may be due to bigger sized leaves produced by respective cultivars. The results are in accordance with the findings of Singh and Ramachandran [8] and Thomas *et al.* [9] in gerbera crop.

Similarly, varieties also differed significantly with respect to plant spread. The highest plant spread was recorded in var. Szogun (74.95 cm) followed by Kormoran (67.68 cm) and minimum was observed in Feliks *i.e.*, 50.56 cm. This variation in plant spread may be due to the additive gene effects [10], who observed the maximum plant spread in Versace, while, minimum plant spread recorded in Khaise. Similar findings were observed by Singh and Ramachandran [8], who also observed difference in plant spread, might be due to varietal characters.

The interaction between different growing conditions and varieties with respect to plant spread was found non-significant.

Number of leaves: Leaves are the important functional unit for photosynthesis, which greatly influence the vegetative growth and flowering. The results indicated a significant influence of different growing conditions on number of leaves per plant in gerbera (Table 2). Among different varieties, maximum number of leaves per plant was observed in Salsa (21.47) followed by Szogun (18.58) and minimum number of leaves was recorded in Feliks (17.53). The difference in number of leaves per plant may be due to the genetic makeup of the cultivars [11]. Similar variations in number of leaves were also reported by Bhuyar and Sable [12], Gajanana *et al.* [13] and Mahanta and Paswan [14] in gerbera.

Growing conditions also had significant effect on number of leaves per plant. Maximum number of leaves (22.67) were observed in plants grown under polyhouse condition followed by Insect proof net house (18.47), while minimum number of leaves per plant was recorded from the plants grown in open field (15.15), which was statistically at par with shade net (16.85). The difference in number of leaves per plant may be due to favourable climatic condition for better growth in crop grown under polyhouse condition than open field.

The interaction was found non-significant between growing conditions and varieties with respect to number of leaves per plant.

Plant height: The data presented in Table 3 depicts that plant height varied significantly in different varieties. Among the varieties, maximum plant height was recorded in Salsa (32.73 cm) followed by Szogun (29.41 cm), whereas, minimum was recorded in Feliks (21.94 cm). Variation in plant height may be due to varietal/ genetical characters and similar observations were recorded by Singh and Ramchandran [8] and Sarkar and Ghimiray [15]. Biradar and Khan [16] also recorded similar results in plant height in ten cultivars of gerbera. A variation in plant height in different gerbera cultivars was also observed by Reddy *et al.* [17].

Growing conditions also had significant effect on plant height. Maximum plant height (30.11 cm) was recorded in plants grown under shade net which was statistically at par with polyhouse (29.08 cm) and minimum plant height (23.55 cm) was observed in open field condition. This may be due to effect of favourable environment inside shade net because variation in light intensity with changing season under shade net condition in plant growth. Similar variation in plant height was recorded in gerbera by Mandal and Biswas [18], who observed that shade net recorded better vegetative parameters as compared to polyhouse and open field condition in gerbera.

The interaction was found non-significant between different growing conditions and varieties with respect to leaf width.

Leaf length: The data pertaining to the leaf length in different varieties presented in Table 4. Leaf length varied significantly with different varieties, among different varieties, maximum leaf length was recorded in var. Szogun (37.38 cm) followed by Salsa (34.51 cm) and minimum was recorded in Feliks (29.18 cm). Similar findings were recorded by Naik *et al.* [19], who attributed it to the genetic makeup of the varieties and the growing conditions in gerbera.

Growing conditions also had significant effect on leaf length. Maximum leaf length (35.85 cm) was recorded under polyhouse which was statistically at par with shade net (34.72 cm) which was statistically at par with and minimum leaf length (27.95 cm) was observed in open field condition. This

may be due to CO₂, fluctuation in temperature range and high relative humidity in polyhouse than open field. Similar results were recorded by Sarkar and Sharma [20] in gladiolus.

The interaction was found non-significant between different growing conditions and varieties with respect to leaf length.

Leaf width: The data on leaf width of gerbera was influenced significantly by both different growing conditions and varieties as depicted in Table 5. Among the different growing conditions, polyhouse recorded maximum leaf width (13.68 cm) which was statistically at par with Insect proof net house (13.10 cm) and plants grown in open field produced minimum leaf width (10.43 cm), which may be due to better climatic conditions viz., temperature, relative humidity, and CO₂ concentration in polyhouse. Similar observations were recorded by Sarkar and Sharma [20] in gladiolus.

The data revealed that different varieties varied significantly with respect to leaf width. Maximum leaf width was recorded in Salsa (14.68 cm) followed by Szogun (13.13 cm) and minimum was observed in Feliks (10.04 cm). This may be due to different genetic makeup of varieties. Difference in leaf width may be attributed to inherent genetic characters of the cultivar Luna and Mahumita [21]. Similar results were observed by Anand *et al.* [22] in gerbera.

The interaction was found non-significant between different growing conditions and varieties with respect to leaf width.

Table 1: Effect of different growing conditions and varieties on plant spread (cm) in gerbera

Growing Conditions	Varieties				Mean
	Szogun	Kormoran	Salsa	Feliks	
Poly house	81.44	71.81	66.27	54.66	68.55
Shade net	73.43	67.44	65.17	49.12	63.79
Insect proof net	77.81	67.63	66.24	64.55	66.56
Open field	67.10	63.85	54.91	43.93	57.45
Mean	74.95	67.68	63.15	50.56	
CD (p=0.05)	Condition = 0.29		Varieties = 0.29	Condition x Varieties = N.S.	

Table 2: Effect of different growing conditions and varieties on number of leaves per plant in gerbera

Growing Conditions	Varieties				Mean
	Szogun	Kormoran	Salsa	Feliks	
Poly house	23.20	18.13	27.60	21.73	22.67
Shade net	17.40	14.40	19.33	16.27	16.85
Insect proof net	18.07	16.07	22.07	17.67	18.47
Open field	15.67	13.60	16.87	14.47	15.15
Mean	18.58	15.55	21.47	17.53	
CD (p=0.05)	Condition = 1.66		Varieties = 1.66	Condition x Varieties = N.S.	

Table 3: Effect of different growing conditions and varieties on plant height (cm) in gerbera

Growing Conditions	Varieties				Mean
	Szogun	Kormoran	Salsa	Feliks	
Poly house	31.30	27.57	34.13	23.30	29.08
Shade net	31.00	28.53	35.87	25.03	30.11
Insect proof net	29.30	25.40	32.80	20.57	27.02
Open field	26.03	21.17	28.13	18.87	23.55
Mean	29.41	25.67	32.73	21.94	
CD (p=0.05)	Condition = 2.56		Varieties = 2.56	Condition × Varieties = N.S.	

Table 4: Effect of different growing conditions and varieties on leaf length (cm) in gerbera

Growing Conditions	Varieties				Mean
	Szogun	Kormoran	Salsa	Feliks	
Poly house	38.53	32.80	36.37	35.70	35.85
Shade net	38.63	33.43	35.27	31.53	34.72
Insect proof net	37.83	30.53	36.23	26.77	32.84
Open field	34.53	24.40	30.17	22.70	27.95
Mean	37.38	30.29	34.51	29.18	
CD (p=0.05)	Condition = 2.56		Varieties = 2.56	Condition × Varieties = N.S.	

Table 5: Effect of different growing conditions and varieties on leaf width (cm) in gerbera

Growing Conditions	Varieties				Mean
	Szogun	Kormoran	Salsa	Feliks	
Poly house	14.50	12.87	16.23	11.10	13.68
Shade net	12.63	11.23	14.70	10.07	12.16
Insect proof net	14.30	11.70	15.73	10.67	13.10
Open field	11.07	10.23	12.07	8.33	10.43
Mean	13.13	11.51	14.68	10.04	
CD (p=0.05)	Condition = 1.05		Varieties = 1.05	Condition × Varieties = N.S.	

4. REFERENCES

- Anonymous. Area and production of horticulture crops for 2018 - 19. <http://nhb.gov.in/Statistics.aspx?enc=WkegdyuHokljEtehnJq0KWL79sOQCy+W4MfOk01GFOWQSEvtp9tNHHoiv3p49g>. 2020.
- Anonymous. Statistical Data, <http://hortharyana.gov.in/en>. 2019.
- Singh MK, Sindhu SS, Kumar S. Evaluation of gerbera (*Gerbera jamesonii* Bolus Ex. Hooker F.) under polyhouse conditions in mid hills of western Himalayas. IJTA. 2016; 34(3): 837-839.

- Panse VG, Sukatme, PV. *Statistical methods for agricultural workers*. Indian Council of Agricultural Research, New Delhi. 1967. pp.155.
- Sheoran OP, Tonk DS, Kaushik LS, Hasijaa RC, Pannu RS. *Statistical Software Package for Agricultural Research Workers*. Recent advances in information theory; statistics and computer application by D.S. Hooda and R.C. Hasija, Department of Mathematics Statistics, CCS HAU, Hisar. 1998. pp. 139-143.
- Bhargava B, Gupta YC, Sharma P. Performance of snapdragon (*Antirrhinum majus* L.) under protected and open field conditions in Himachal Pradesh. Proceedings of the National Academy of Sciences, India Section B: Biological Sciences. 2016; 86(1): 65-69.
- Fatmi U, Singh D, Bharti S. Growth and flowering of Asiatic lily cv. Pollyanna as influenced by different growing environments. Plant Archives. 2018; 18(1): 760-762.
- Singh KP, Ramachandran N.. Comparison of greenhouses having natural ventilation and fan and pad evaporative cooling systems for gerbera production. Journal of Ornamental Horticulture. 2002; 5(2): 15-19.
- Thomas DA, Sujatha K, Jayanthi R. Comparative performance of sucker and tissue culture propagated plants of gerbera under polyhouse. Journal of Ornamental Horticulture. 2004; 7(1): 31 -37.
- Nair SA, Medhi RP. Performance of gerbera cultivars in the Bay Islands. Indian Journal of Horticulture. 2002; 59(3): 322-325.
- Kandpal K, Kumar S, Srivastava R, Chandra R. Evaluation of gerbera (*Gerbera jamesonii*) cultivars under Tarai condition. Journal of Ornamental Horticulture. 2003; 6(3): 252-255.
- Bhuyar AR, Sable AS. Assessment of gerbera cultivars under fan and pad cooling system greenhouse. In Symposium on Recent Advances in Indian Floriculture. 2004. pp. 134-136.
- Gajanana TM, Singh PK, Subramanyam KV, Mandhar SC. Economic analysis of gerbera cultivation under protected cultivation. Indian Journal of Horticulture. 2003; 60(1): 104-107.
- Mahanta P, Paswan L. Assessment of comparative performance of some Gerbera (*Gerbera jamesonii* Bolus) cultivars under open condition and plastic rain shelter in Assam condition. Nation. Symp. Recent, Adv. in Indian Society of Ornamental Horticulture. 2003. pp: 154-165.
- Sarkar I, Ghimiray TS. Performance of gerbera under protected condition in hilly region of West Bengal. Journal of Ornamental Horticulture. 2004; 7(3&4): 230-234.
- Birdar MS, Khan MM. Performance of exotic gerbera varieties under low cost plastic greenhouse. The Lal Baugh. 1996; 41(3&4):46-52.
- Reddy BS, Kulkarni BS, Manjunath HK, Shiragur M. Performance of gerbera cultivars under naturally ventilated greenhouse. Paper Presented in All India Seminar on Potential and Prospects for Protective Cultivation. 2003. pp. 91 -92.
- Mandal T, Biswas B. Effect of different growing environments on growth and flowering of gerbera (*Gerbera jamesonii* L.). In National Symposium on Recent Advances in India Floriculture, Trichur. 2003. pp. 12-14.
- Naik BH, Chauhan N, Patil AA, Patil VS, Patil BC. Comparative performance of gerbera (*Gerbera jamesonii* Bolus ex Hooker F.) cultivar under naturally ventilated polyhouse. J. Ornam. Hortic. 2006; 9(3): 204-207.

Sarkar I, Sharma S. Comparison of performance of gladiolus cultivars under polyhouse and open conditions. *International Journal of Environment, Ecology*. 2016; 6(5): 41-46.

Luna B, Madhumita CT. Evaluation of different gerbera cultivars under agro-climatic conditions of Jorhat, Assam. *J. Orn. Hort*. 2009; 12: 106-110.

Anand M, Sankari A, Arulmozhiyan R. Evaluation of commercial cultivars of cut gerbera (*Gerbera jamesonii* Bolus) under polyhouse in Shevaroy condition of Eastern Ghats. *Journal of Horticultural Sciences*. 2013; 8(2): 199-203.

UNDER PEER REVIEW