

## Evaluation of Gerbera Cultivars for Yield and Quality under Various Growing Conditions

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**ABSTRACT:** Four gerbera cultivars, Szogun, Salsa, Kormoran, and Feliks, were tested to see how well they performed in terms of production and floral quality under different cultivating environments (polyhouse, insect proof net house, shade net house and open field). The present investigation was carried out during 2019-20 at the Department of Horticulture, CCS Haryana Agricultural University, Hisar. In Haryana, gerbera cultivation, like any other agricultural activity influenced by various factors that impact the growth and yield of the plants. There are many excellent varieties of gerbera with magnificent flowers in exhaustive range of colours, different shades, size and wide range of keeping quality. It is very much necessary to evaluate gerbera cultivars under different growing conditions. There were notable differences in yield and floral quality traits between the cultivars examined. With the exception of the number of flowers at fortnightly intervals, the interacting values of growth conditions and cultivars were determined to be non-significant. In flowering parameters, minimum number of days taken for bud initiation to harvest (32.15 days), maximum stalk diameter (6.99 cm), flower disc diameter (2.37 cm), number of ray floret per flower (62.33), number of flowers (8.7) and length of ray floret (5.15 cm) was reported from the plants grown under polyhouse. Szogun outperformed than other varieties in terms of days from bud opening to harvest, stalk diameter, quantity of flowers, and ray floret length, while Feliks had the longest ray florets.

**Keywords:** *Gerbera jamesonii*, Growing Conditions, Varieties, Yield and Quality, Ray Florets.

### INTRODUCTION

One of the most popular flowers, gerberas can be used as both cut flowers and potted plants in the floral industry. It is a significant commercial flower (Sujatha *et al.*, 2002) that is grown all over the world in a variety of climatic regions, from tropical Asia and South America to Madagascar and Africa (Pattanashetti *et al.*, 2012). Because it has a long vase life and a variety of colours, this flowering plant is appealing for use as garden décor and interior decoration (Chung *et al.*, 2005). Gerberas are found in temperate and tropical regions of India, including J&K, Himachal Pradesh, Uttarakhand, Karnataka, Tamil Nadu, Maharashtra, etc. with the annual production of 867 MT cut flowers. With an area of 53.26 hectares, Kerala produces the most cut flowers (221.46 MT) of gerbera (Anon., 2020). In Haryana, 9.8 hectares of gerbera is cultivated under protected in structures with an annual production of 5461789 flower sticks (Anon., 2019).

There are numerous top-notch gerbera cultivars with stunning blooms that come in a vast array of colours, tints, sizes, and keeping qualities. Consumers desire characteristics such as good blooming quality and a long vase life since they enhance value and are more likely to make a good and lasting impression on the gift recipient (Vijayalaxmi *et al.*, 2020). Gerbera cultivars must be thoroughly examined in protected settings.

Gerbera cultivars can also be introduced and assessed in order to maximize their marketing potential. The shape, size, and colour of gerbera flowers can be found in a vast variety. The cultivars have a direct impact on the plant's annual yield of flower sticks (Singh and Mandhar 2002). Additionally, Thangam *et al.* (2009) stated that the gerbera variety Rosalin recorded maximum fresh and dry weight of leaves and flower stalk circumference, while Savannah reported the highest values for leaf length and breadth, flower stalk length, and number of petals per flower. Dalma had the largest blossom diameter, followed by Dana Ellen, Rosalin, and Savannah. With 70.24 flowers per plant each year, Dalma was the most prolific bearer followed by Savannah and Rosalin. There is a huge market for cut gerbera flowers both domestically and abroad. Although there are numerous gerbera cultivars growing in Haryana and none have been formally introduced. Therefore, it is necessary to assess varieties for their yield and quality characteristics before recommending the best variety for Haryana conditions.

### MATERIALS AND METHODS

In order to evaluate four gerbera varieties under different growing conditions (polyhouse with fan and pad cooling system, 50% shade net, insect proof net house and open field condition), the current experiment was conducted in 2019-20 at Agri-Tourism Centre,

CCS Haryana Agricultural University, Hisar (Haryana). Healthy tissue cultured plants (3-4 leaf stage) of gerbera varieties namely Szogun, Kormoran, Salsa and Feliks used in the experiment were purchased from Progreen Biotech Private Ltd, New Delhi. The planting was done on 2<sup>nd</sup> fortnight of October. Sixteen treatment combinations were studied with five replications /treatments. The treatments were:

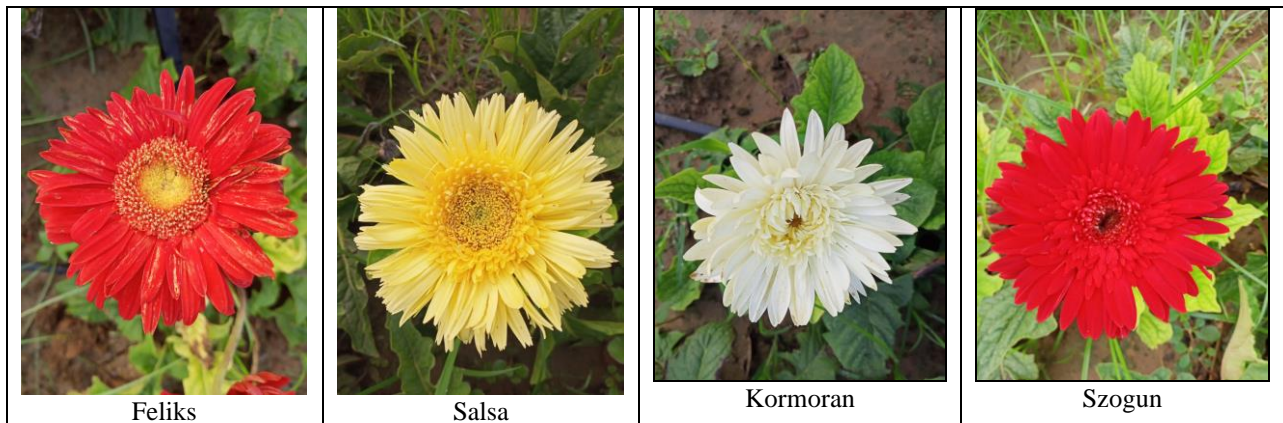
T<sub>1</sub>: Polyhouse

T<sub>2</sub>: Shade net

T<sub>3</sub>: Open field

T<sub>4</sub>: Insect proof net

The data were examined in accordance with the steps outlined by Panse and Sukhtme (1967) for the study of completely randomised designs (CRD). Using critical differences (C.D.) at a 5% level of significance, the overall significance of differences between the treatments was examined with the help of a windows-based computer programme called OPSTAT to statistically assess the results (Sheoran *et al.*, 1998).



## RESULT AND DISCUSSION

### A. Days taken for flower bud initiation to harvest

The days from the flower bud initiation to harvest differ significantly with respect to different growing conditions and varieties. However, the interaction between the treatment combinations for days taken to flower bud initiation to harvest was found non-significant (Table 1). The minimum days taken for flower bud initiation to harvest were observed from the flower plants grown in poly house (32.35 days) followed by insect proof net house (33.45 days), which was statistically at par with shade net (33.88 days). However, the maximum days taken for flower bud

initiation to harvest were recorded in open field conditions (35.43 days). Among the varieties the minimum days taken for flower bud initiation to harvest was recorded in Szogun (33.31 days), which were statistically at par with Salsa (33.50 days) and Feliks (33.79), while maximum days were observed in Kormoran (34.50 days) may be due to different genetic makeup or inheritance characters of the individual varieties. These findings were also in accordance with the results of Singh and Ramachandran (2002); Birdar and Khan (1996), who had reported difference in yield and quality parameters among gerbera cultivars.

**Table 1: Effect of different growing conditions and varieties on number of days taken for flower bud initiation to harvest in gerbera.**

Growing conditions	Varieties				Mean
	Szogun	Kormoran	Salsa	Feliks	
Poly house	31.80	32.87	32.07	32.67	<b>32.35</b>
Shade net	33.50	34.07	33.93	34.00	<b>33.88</b>
Insect proof net	33.27	33.67	33.40	33.47	<b>33.45</b>
Open field	34.67	37.40	34.60	35.03	<b>35.43</b>
<b>Mean</b>	<b>33.31</b>	<b>34.50</b>	<b>33.50</b>	<b>33.79</b>	
<b>CD (p=0.05)</b>	<b>Condition = 0.74</b>		<b>Varieties = 0.74</b>		<b>Condition × Varieties = N.S.</b>

### B. Stalk diameter (mm)

The perusal of data regarding the stalk diameter showed that different growing conditions had significant effect on stalk diameter; however, the interactive values of treatments were found non-significant (Table 2). Among the different growing conditions, maximum stalk diameter (6.99 mm) was observed in plants grown under polyhouse followed by insect proof net (6.67 mm), whereas, minimum stalk diameter (6.15 mm) was

recorded in open field; which was statistically at par with shade net (6.06 mm). Among different varieties, maximum stalk diameter was observed in Szogun (7.04 mm), which was statistically at par with Salsa (6.90 mm) and minimum stalk diameter was recorded in Felix (5.40 mm). Similar findings were recorded by Bhuyar and Sable (2004); Anuradha and Gowda (2002) in gerbera.

**Table 2: Effect of different growing conditions and varieties on stalk diameter (mm) in gerbera.**

Growing conditions	Varieties				Mean
	Szogun	Kormoran	Salsa	Feliks	
Poly house	7.54	7.13	7.32	5.96	<b>6.99</b>
Shade net	6.68	5.98	6.56	5.02	<b>6.06</b>
Insect proof net	7.25	6.78	7.14	5.51	<b>6.67</b>
Open field	6.70	6.20	6.58	5.10	<b>6.15</b>
<b>Mean</b>	<b>7.04</b>	<b>6.52</b>	<b>6.90</b>	<b>5.40</b>	
<b>CD (p=0.05)</b>	<b>Condition = 0.29</b>		<b>Varieties = 0.29</b>		<b>Condition × Varieties = N.S.</b>

**C. Diameter of flower disc (cm)**

The perusal of data regarding the diameter of flower disc presented in Table 3 showed that different growing conditions had significant effect on diameter of flower disc. The maximum diameter of flower disc (2.37 cm) was recorded in crop planted under polyhouse condition followed by insect proof net (2.07 cm), which was statistically at par with shade net (1.87 cm) and the minimum diameter of flower disc (1.61 cm) was observed in open field. Among the growing varieties, maximum diameter of flower disc was observed in Feliks (2.29 cm), which was statistically at par with variety Salsa (2.18 cm), whereas, minimum diameter of flower disc was recorded in Kormoran (1.44 cm). The interaction was found non-significant between different growing conditions and varieties with respect to diameter of flower disc. The differences in various floral characters may be due to inherent genetic characters of the varieties. Similar findings were made on gerbera by Mantur and Patil (2010), who noted that

all the evaluated cultivars had variable flower yield and quality.

**D. Number of ray florets per flower**

The data depicted in Table 4 shows that different varieties had significant effect on number of ray florets per flower. The maximum number of ray florets per flower was recorded in variety Salsa (65.63) which was statistically at par with Szogun (61.63). Whereas, the minimum number of ray florets per flower were observed in Kormoran (51.95) which was statistically at par with Feliks (54.93). Among the growing conditions, maximum number of ray florets (62.33) were recorded plants grown under polyhouse which was statistically at par with insect proof net house (60.65) and shade net (58.52). However, the minimum number of ray florets (52.65) was observed in open field conditions. The interaction was found non-significant between different growing conditions and varieties with respect to number of ray florets per flower.

**Table 3: Effect of different growing conditions and varieties on diameter of flower disc (cm) in gerbera.**

Growing conditions	Varieties				Mean
	Szogun	Kormoran	Salsa	Feliks	
Poly house	2.47	1.57	2.67	2.75	<b>2.37</b>
Shade net	1.98	1.42	2.03	2.05	<b>1.87</b>
Insect proof net	2.07	1.41	2.35	2.45	<b>2.07</b>
Open field	1.49	1.35	1.68	1.93	<b>1.61</b>
<b>Mean</b>	<b>2.00</b>	<b>1.44</b>	<b>2.18</b>	<b>2.29</b>	
<b>CD (p=0.05)</b>	<b>Condition = 0.21</b>		<b>Varieties = 0.21</b>		<b>Condition × Varieties = N.S.</b>

**Table 4: Effect of different growing conditions and varieties on number of ray florets per flower in gerbera.**

Growing conditions	Varieties				Mean
	Szogun	Kormoran	Salsa	Feliks	
Poly house	65.73	55.60	70.33	57.67	<b>62.33</b>
Shade net	61.93	51.87	66.53	53.73	<b>58.52</b>
Insect proof net	64.33	52.00	69.87	56.40	<b>60.65</b>
Open field	54.53	48.33	55.80	51.93	<b>52.65</b>
<b>Mean</b>	<b>61.63</b>	<b>51.95</b>	<b>65.63</b>	<b>54.93</b>	
<b>CD (p=0.05)</b>	<b>Condition = 4.04</b>		<b>Varieties = 4.04</b>		<b>Condition × Varieties = N.S.</b>

**E. Number of flowers fortnightly**

The perusal of data regarding the number of flowers fortnightly of gerbera is presented in Table 5. Among the growing conditions differed significantly with respect to number of flowers fortnightly. Maximum number of flowers at fortnightly interval (8.7) were observed in plants grown under polyhouse followed by insect proof net house (7.3) and minimum number of flowers fortnightly (5.3) were recorded in open field. Among the varieties evaluated, the maximum number of flowers fortnightly were recorded in Szogun (11.2) in the month of March (15<sup>th</sup>- 30<sup>th</sup> March) which was

statistically at par with Salsa (10.0) and minimum number of flowers fortnightly were observed in Kormoran (3.7) in the month March (1<sup>st</sup>- 15<sup>th</sup> March). Interaction between varieties and growing conditions was observed significant effect on number of flowers fortnightly. Whereas, interaction between growing conditions, month and varieties had found non-significant.

The perusal of data regarding the number of flowers fortnightly is presented in Table 6 observed that Maximum number of flowers were observed in variety. Szogun (8.3) and minimum were recorded in Feliks

(6.3) varied significantly with respect to number of flowers. Among growing conditions, maximum number of flowers fortnightly (8.7) were observed in plants grown under polyhouse followed by insect proof net house (7.3) and minimum number of flowers fortnightly (5.3) were recorded in open field. The interaction was found non-significant between different growing conditions and varieties with respect to number of flowers. The increased flower yield in polyhouse as compared to open field may be due to a greater number of leaves and accumulation of more photosynthates such as sucrose which was used by plants for

contributing a greater number of flowers per plant per square meter and increase the total yield of flower per plant. The results were also accordance with the findings of Loeser (1986); Nair *et al.* (2002) in gerbera under protected condition. The increased in flower yield might be attributed to the maximum leaf area index and more number of leaves per plant as well as plant spread resulted more production and accumulation of maximum photosynthates, resulting the production of more number of flowers per plant with bigger size. The results were also accordance with the findings of Nair and Medhi (2002) in gerbera.

**Table 5: Effect of growing conditions and varieties on number of flower fortnightly in gerbera.**

Growing Conditions	Month (1 <sup>st</sup> March -15 <sup>th</sup> March)				Month (15 <sup>th</sup> March -30 <sup>th</sup> March)				Month (1 <sup>st</sup> April -15 <sup>th</sup> April)				Month (15 <sup>th</sup> April -30 <sup>th</sup> April)				Mean
	V <sub>1</sub>	V <sub>2</sub>	V <sub>3</sub>	V <sub>4</sub>	V <sub>1</sub>	V <sub>2</sub>	V <sub>3</sub>	V <sub>4</sub>	V <sub>1</sub>	V <sub>2</sub>	V <sub>3</sub>	V <sub>4</sub>	V <sub>1</sub>	V <sub>2</sub>	V <sub>3</sub>	V <sub>4</sub>	
Polyhouse	7.00	5.60	6.80	6.00	13.00	10.40	12.60	11.10	10.47	7.73	9.77	8.43	8.57	6.33	8.00	6.90	<b>8.7</b>
Shadenet	5.50	3.07	5.37	4.10	10.20	5.67	9.97	7.60	7.90	5.70	7.90	5.90	6.47	4.67	6.47	4.83	<b>6.3</b>
Insect proof net	6.80	3.77	5.50	4.10	12.60	6.97	10.20	7.60	9.77	7.00	8.10	7.70	8.00	5.73	6.63	6.30	<b>7.3</b>
Open field	4.80	2.50	3.87	3.90	8.90	4.60	7.17	7.20	7.00	4.80	5.70	5.17	5.73	3.93	4.67	4.23	<b>5.3</b>
<b>Mean</b>	<b>6.0</b>	<b>3.7</b>	<b>5.4</b>	<b>4.5</b>	<b>11.2</b>	<b>6.9</b>	<b>10.0</b>	<b>8.4</b>	<b>8.8</b>	<b>6.3</b>	<b>7.9</b>	<b>6.8</b>	<b>7.2</b>	<b>5.2</b>	<b>6.4</b>	<b>5.6</b>	
CD (p=0.05)	Condition = 1.12								Varieties = 0.56				Month = N.S.				
	Condition × Month = N.S.				Varieties × Month = N.S.				Condition × Varieties × Month = N.S.								

V<sub>1</sub>: Szogun; V<sub>2</sub>: Kormoran; V<sub>3</sub>: Salsa; V<sub>4</sub>: Feliks

**Table 6: Effect of growing conditions on number of flowers fortnightly in different varieties of gerbera.**

Growing Conditions	Varieties				Mean
	Szogun	Kormoran	Salsa	Feliks	
Poly house	9.8	7.5	9.3	8.1	<b>8.7</b>
Shade net	7.5	4.8	7.4	5.6	<b>6.3</b>
Insect proof net	9.3	5.9	7.6	6.4	<b>7.3</b>
Open field	6.6	4.0	5.4	5.1	<b>5.3</b>
<b>Mean</b>	<b>8.3</b>	<b>5.5</b>	<b>7.4</b>	<b>6.3</b>	
CD (p=0.05)	Condition = 0.56		Varieties = 0.56		Condition × Varieties = 1.12

#### F. Length of ray florets (cm)

The perusal of data regarding the length of ray florets is presented in Table 7 observed that different growing conditions and varieties significant effect on length of ray florets. The maximum length of ray florets was recorded in variety Feliks (5.14 cm) which was statistically at par with Salsa (4.96 cm) and minimum was observed in Kormoran (4.54 cm). Among the different growing conditions, maximum length of ray florets (5.15 cm) was recorded plants grown under polyhouse which was statistically at par with insect proof net house (5.02 cm) and the minimum number of ray florets (4.43 cm) was observed in open field. The interaction was found non-significant between different growing conditions and varieties with respect to length

of ray florets. Different growing conditions significantly improved the yield and quality of the flowers grown under different protected structures than open field. This might be due to better light and temperature conditions inside the polyhouse coupled with leaf area which enabled the accumulation of more amount of photosynthates thus resulting in more flower yield and better-quality flower Fatmi *et al.* (2018). Similar results also reported by Mahmood *et al.* (2013) in gerbera. Additive effects of genes determine productivity in gerbera plants also reported by Luna and Madhumita (2009). The results are also in accordance with the findings of Sarmah *et al.* (2014); Jangde *et al.* (2019) in gerbera under protected conditions.

**Table 7: Effect of different growing conditions and varieties on length of ray florets (cm) in gerbera.**

Growing conditions	Varieties				Mean
	Szogun	Kormoran	Salsa	Feliks	
Poly house	5.11	4.79	5.28	5.40	<b>5.15</b>
Shade net	4.94	4.50	4.92	5.29	<b>4.91</b>
Insect proof net	4.93	4.63	5.17	5.34	<b>5.02</b>
Open field	4.47	4.23	4.48	4.53	<b>4.43</b>
<b>Mean</b>	<b>4.86</b>	<b>4.54</b>	<b>4.96</b>	<b>5.14</b>	
CD (p=0.05)	Condition = 0.21		Varieties = 0.21		Condition × Varieties = N.S.



## CONCLUSIONS

From the present investigation, it has been concluded that the variety Szogun performed better with respect to all flowering parameters as compared to other varieties viz. Kormoran, Salsa and Feliks. However, no of ray florets per flower were recorded in variety Salsa and disc diameter was maximum in variety Feliks. All the flowering was found best in polyhouse condition followed by insect proof net house and open field condition.

## FUTURE SCOPE

Ultimately, the successful evaluation and cultivation of gerbera varieties in Haryana will depend on a holistic approach that combines local expertise, market understanding, technological advancements, and an adaptive mind-set to changing agricultural dynamics.

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**Conflict of Interests.** None.

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