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Response of growing condition and chemicals on vase life of gerbera

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Abstract
The vase life of gerbera varieties (Szogun, Salsa, Kormoran and Feliks) under different growing conditions (polyhouse, insect proof net house, shade net house and open field)" was studied at Department of Horticulture, CCS Haryana Agricultural University, Hisar during the year 2019-2020. The results showed that both growing conditions and varieties have significant effect on almost all the post-harvest parameters including vase life. The polyhouse grown Szogun flowers had more water uptake (199.65 ml) maximum days taken to flower drooping (13.81 days), days taken for petal discoloration (8.50 days), days taken for petal shrivelling (10.43 days) and vase life (10.25 days). While, among chemicals, cut flower placed in 8-HQC 200 ppm uptake more water (221.51 ml), maximum days taken to flower drooping (15.47 days), days taken for petal discoloration (9.06 days), days taken for petal shrivelling (12.50 days) and vase life (11.25 days).

Keywords: Gerbera, growing conditions, varieties, vase life

Introduction
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. With expanding modernization, India can possibly rise as notable player of the flora industry in future. In India gerbera is distributed in temperate and tropical areas like J&K, Himachal Pradesh Uttrakhand, 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 (Anon., 2020) [1]. In Haryana, area under protected cultivation of gerbera is 9.8 ha and production of number of flowers sticks is 5461789 (Anon., 2019) [2].

In addition of chemical preservatives to the holding solution is recommended to prolong the vase- life of cut flowers. Several preservatives are available to increase the longevity. Most floral preservatives contain carbohydrates, germicides, ethylene inhibitors, growth regulators and some mineral compounds (Nowak and Rudnicki, 1990) [3]. The present investigation was done to study influence of growing condition and chemicals on vase life of gerbera.

Materials and Methods
The vase life study experiment was carried out in the post-harvest laboratory of Department of Horticulture, CCS Haryana Agricultural University, Hisar (Haryana) during the year 2019-20. The cut flowers of gerbera cv. Szogun took from the plants were grown in four different conditions *i.e.* polyhouse with fan and pad cooling system, shade net (50%), insect proof net house and open field condition. Sixteen treatment combinations were studied with five replications /treatments. The treatments were:

T_1: Control (Distilled water)
T_2: Salicylic acid (250 ppm)
T_3: 8-HQC (200 ppm)
T_4: Sucrose (3%)

General view of Lab experiment

The data were analysed according to the procedure for analysis of completely randomized design (CRD) as given by Panse and Sukhtme (1967) [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 (Sheoran *et al.*, 1998) [5].

Results and Discussion

The post-harvest parameters such as water uptake, days taken to flower drooping, days taken for petal discoloration, days taken for petal shriveling and vase life were studied to compared different growing conditions and chemicals. It is revealed from the data presented in Table 1, that water uptake by flowers varied significantly with respect to different growing conditions and chemicals. In different chemical solutions, the highest water uptake (221.51 ml) was observed by flowers in T_3 (HQC 200 ppm) and lowest water uptake (132.73 ml) was recorded by flowers in T_1 (control). This is may be due to the declining of water uptake by flowers when they placed in water due to vascular blockage particularly at the stem base (Soad *et al.*, 2011) [6]. The decrease in water uptake of cut flowers during vase life period may be due to growth of microbes which caused vascular blockage at base of stem in gerbera. Similar findings were also observed by Anjum *et al.* (2001) [7] in tuberose.

The interaction between different growing conditions and chemicals with respect to water uptake was found non-significant.

Table 1: Effect of different growing conditions and chemicals on water uptake (ml) in gerbera

Treatment	Chemicals	Growing Conditions				Mean
		Polyhouse	Shade net	Open field	Insect proof	
T_1	Control (distilled)	144.53	127.77	123.57	135.07	132.73
T_2	Salicyclic acid (250 PPM)	220.65	195.50	180.33	198.07	198.63
T_3	HQC (200 ppm)	238.03	217.87	200.17	182.67	170.42
T_4	Sucrose 3%	195.37	147.10	156.50	182.67	170.42
	Mean	199.65	172.06	165.14	186.45	
	CD (p=0.05)	Condition = 9.14, Treatment = 9.14, Condition × Treatment = N.S.				

It is apparent from the data presented in Table 2, that different growing condition and chemicals influenced significantly days taken to flower drooping. Among the different chemicals maximum days taken to flower drooping (15.67 days) was recorded in T_3 (HQC 200 ppm) and minimum days taken to flower drooping (9.18 days) was observed in T_1 (control). However, among different growing conditions maximum days taken to flower drooping (13.81 days) was recorded in flowers grown under polyhouse and minimum days taken to flower drooping (11.73 days) was observed by flowers grown in open field condition. The interaction was found non-significant between different growing conditions and chemicals with respect to days taken to flower drooping.

Table 2: Effect of different growing conditions and chemicals on days taken for flower dropping in gerbera

Treatment	Chemicals	Growing Conditions				Mean
		Polyhouse	Shade net	Open field	Insect proof	
T_1	Control (distilled)	9.85	9.15	8.45	9.30	9.18
T_2	Salicyclic acid (250 PPM)	15.60	14.00	12.10	14.80	14.12
T_3	HQC (200 ppm)	16.45	15.45	14.80	16.00	15.67
T_4	Sucrose 3%	13.35	11.10	11.55	13.20	12.30
	Mean	13.81	12.43	11.73	13.33	
	CD (p=0.05)	Condition = 0.44, Treatment = 0.44, Condition × Treatment = N.S.				

The days taken for petal discoloration in flower influenced significantly by both different growing conditions and chemicals (Table 3). Among the growing conditions, maximum days taken for petal discoloration (8.50 days) was recorded in flowers grown under polyhouse, while minimum days taken for petal discoloration (7.25 days) was observed

from flowers grown in open field condition, which was statistically at par with shade net (7.56 days). Different chemicals also significantly influence the days taken for petal discoloration. The maximum days taken for petal discoloration (9.06 days) was observed by flowers in T_3 (HQC 200 ppm) and minimum days taken to petal discoloration (6.12 days) was recorded by flowers in T_1 (control).

The interaction was found non-significant between different growing conditions and chemicals with respect to days taken to petal discoloration.

The main factors affect vase life and bud opening were temperature, light level, CO_2 level, and relative humidity (Slootweg *et al.*, 2003) [8]. The difference between the days taken to petal discoloration due to plants grown under polyhouse have better water uptake and higher reserved food in plants cells as well as in petals of flowers which was provided better quality flower and vase life. Similar findings were observed by Wankhede and Gajbhiye (2012) [9] and Deka *et al.* (2015) [10].

Table 3: Effect of different growing conditions and chemicals on days taken for petal discoloration in gerbera

Treatment	Chemicals	Growing Conditions				Mean
		Polyhouse	Shade net	Open field	Insect proof	
T_1	Control (distilled)	7.00	5.75	5.00	6.75	6.12
T_2	Salicyclic acid (250 PPM)	9.00	8.50	8.00	8.50	8.50
T_3	HQC (200 ppm)	9.75	8.75	8.50	9.25	9.06
T_4	Sucrose 3%	8.25	7.25	7.50	8.00	7.75
	Mean	8.50	7.56	7.25	8.12	
	CD (p=0.05)	Condition = 0.59, Treatment = 0.59, Condition × Treatment = N.S.				

It is noticeable form data presented in Table 4 that the days taken for petal shriveling in flower influenced significantly by different chemicals and growing conditions. Among different chemical solution, maximum days taken for petal shriveling (11.50 days) was observed by flowers in T_3 (HQC 200 ppm), whereas, minimum days taken to petal shriveling (7.68 days) was recorded by flowers in T_1 (control). Among different growing conditions maximum days taken for petal shriveling (10.43 days) was recorded in flowers grown under polyhouse, which was statistically at par with insect proof net house (10.06 days), while minimum days taken for petal shriveling (9.06 days) was observed by flowers grown in open field condition, which was statistically at par with shade net (9.31 days) and insect proof net (10.06 days). The flowers harvested from polyhouse took maximum days for petal shriveling may be due to difference in temperature, light intensity and relative humidity under polyhouse crop performed better quality of flowers (Babita and Srivastva, 2008) [11].

The interaction was found non-significant between different growing conditions and chemicals with respect to days taken to petal shriveling.

Table 4: Effect of different growing conditions and chemicals on days taken for petal shrivelling in gerbera

Treatment	Chemicals	Growing Conditions				Mean
		Polyhouse	Shade net	Open field	Insect proof	
T_1	Control (distilled)	8.25	7.25	7.00	8.25	7.68
T_2	Salicyclic acid (250 PPM)	11.25	10.50	9.25	10.75	10.43
T_3	HQC (200 ppm)	12.50	11.00	11.00	11.50	11.50
T_4	Sucrose 3%	9.75	8.50	9.00	9.75	9.25
	Mean	10.43	9.31	9.06	10.06	
	CD (p=0.05)	Condition = 0.69, Treatment = 0.69, Condition × Treatment = N.S.				

It is revealed from the data presented in Table 5 that vase life in flowers influenced significantly by both different growing conditions and chemicals (Fig 1). Among the growing conditions, maximum vase life (10.25 days) was recorded in flowers grown under polyhouse, while minimum vase life (8.43 days) was observed by flowers grown in open field condition which is statistically at par with shade net (9.0 days). The increment in the vase life of flowers grown under polyhouse might be due to plants grown under polyhouse attained better quality of vase life because more favorable environmental conditions such as temperature, relative humidity and CO_2 concentration was found best results on crop. More vase life was recorded in variety grown under polyhouse as compared to open field similar findings were reported by Babita and Srivastva (2008) [11] in gerbera.

Whereas, in different chemicals maximum vase life (11.25 days) was observed by flowers in T_3 (HQC 200 ppm) and minimum vase life (6.99 days) was recorded by flowers in T_1 (control), which may be due to more water uptake by flower stalk and prevented vascular blockage which improved the vase life of flower (Dineshbabu *et al.*, 2002) [12]. Similarly, solutions containing 8-HQC + sucrose increased longevity life of dendrobium flowers and improved flower quality. Chemicals like salicylic acid, 8-HQC 200 ppm might have also decreased microbial growth and prevented vascular blockage, thereby helped in increasing vase life and improving turgidity of flower stalk and other characteristics recorded. Similar findings were observed by Mashhadian *et al.* (2012) [13] that pathogens affect water uptake and caused vascular blockage of flower stem.

The interaction was found non-significant between different growing conditions and chemicals with respect to vase life.

Table 5: Effect of different growing conditions and chemicals on vase life (days) in gerbera

Treatment	Chemicals	Growing Conditions				Mean
		Polyhouse	Shade net	Open field	Insect proof	
T_1	Control (distilled)	8.00	7.23	5.50	7.23	6.99
T_2	Salicyclic acid (250 PPM)	11.00	9.75	9.23	10.00	9.99
T_3	HQC (200 ppm)	12.25	10.75	10.50	11.50	11.25
T_4	Sucrose 3%	9.75	8.27	8.50	9.50	9.00
	Mean	10.25	9.00	8.43	9.55	
	CD (p=0.05)	Condition = 0.72, Treatment = 0.72, Condition × Treatment = N.S.				

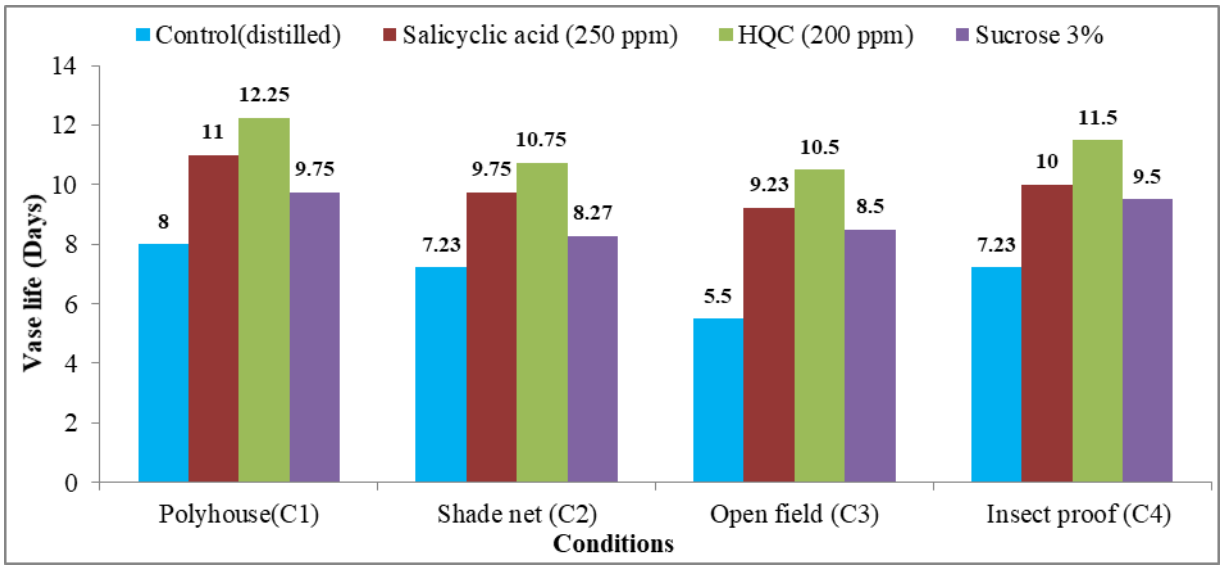

Fig 1: Flower Vase life as effected by different growing conditions and Chemicals in gerbera

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