Original Research Article

Studies on the effect of dosage and application schedule of gibberellic acid and benzyl adenine on Vase life of Gypsophila (*Gypsophila paniculata L.*) cv. Star World

ABSTRACT

The effect of dosage and application schedule of gibberellic acid (GA_3) and benzyl adenine (BA) of gypsophila on vase life was investigated. Freshly cut gypsophila cut flower stalks with pre harvest sprays with GA_3 and BA at 150 ppm, 300 ppm, 450 ppm are harvested from the experimental plot early in the morning when 30 to 40% of flowers in the stalk open and held in the vases containing 3% sucrose solution flower stalks are harvested from the experimental plot early in the morning when 30 to 40% of flowers in the stalk open. Data were recorded on water uptake, fresh weight change, transpirational loss of water, physiological loss in weight, 50 percent discolouration and vase life. Among all the treatments, the flowers sprayed with GA_3 at 450 ppm and single spray recorded maximum water uptake (13.19 g), transpirational loss of water (6.19), fresh weight change (62.51 %), dry weight of flowers (2.09), 50 per cent discolouration (13.41 days), Vase life (14 days) amd minimum physiological loss in weight (1.78 g).

Key words : Gypsophila, GA_3-Gibberellic acid, BA- Benzyl adenine, Vase life

Introduction

Flowers have been considered as the symbol of purity, grace and elegance. Flowers are the most natural way to celebrate as they themselves are nature's perfect celebration In India flowers are cultivated in an area of approximately 313 lakh ha and production of 2865 MT (Anonymous, 2018-19). In present scenario flower cultivation is taken as commercial venture due to enormous increase in demand of flowers. Nearly, 30 to 50 % losses of cut flowers occur due to improper post harvest handling during entire market chain (Singh et al. 2000). There are frequent price gluts and fluctuations in the Indian flower market. Physiological, ultra structural and biochemical changes that occur during post harvest life influence the quality of cut flowers (Farangher et al. 1986). Gypsophila is an extremely hardy perennial plant and it can substitute many other cut flowers during off season and has enormous potential as a cut flower crop. Post harvest research in cut flowers is conducted world wide yet feasibility of appropriate post harvest handling is lacking. Hence vase life of cut flowers can be achieved through by adapting improved production technology, harvesting at proper stage and by using different chemicals. These chemicals control bacteria and fungi in vase water, which may other wise cause rot of the stem however

information on chemicals at effective concentrations are still lacking for cut flowers. Herefore keeping in mind on above discussed factors, present investigation was planned.

Materials and methods

The lab experiment was laid out as Completely Randomized Design (CRD) with factorial concept and replicated two times which was conducted at Floricultural Research Station, ARI, Hyderabad. For the experiment flowers of gypsophila cv. Star world were collected from an experimental plot with flower stalk, immediately after harvest, the flowers were brought to the laboratory and flower stalks were cut to a uniform length. After recording the fresh weight, each flower was placed in a 600 ml conical flask containing 250 ml of three percent sucrose solution.

Observations recorded:

Water uptake (WU) (g/f)

The difference between consecutive measurements of container + solution (with out flower) recorded once in two days to measure the water uptake with in that particular duration of period and represented as gram per spike. (Venkatarayappa *et al*., 1981).

$$\text{Water uptake (WU)} = \frac{\text{Initial wt. of container with out flower} - \text{Final wt. of container without flower}}{\text{No. of flower stalks in the conical flask}}$$

Transpirational loss of water (TLW) (g/f)

Flasks are weighed daily along with solution and spikes and the consecutive difference in the weights represents the water loss from the spikes for that particular period and expressed in grams per stalk. (Venkatarayappa *et al*., 1981)

$$\text{(TLW)} = \frac{\text{Initial wt. of container with flower} - \text{Final wt. of container with flower}}{\text{No. of flower stalks in the conical flask}}$$

Fresh weight change of stalk (FWC % of initial weight)

The difference between the weight of container + solution+ flower stalk and weight of the container + solution decreased at every alternate day represents the fresh weight of the stalks in grams on that particular day. The fresh weight gain or loss is converted into percentage considering the first days fresh weight as 100 per cent. (Venkatarayappa *et al*., 1981).

Physiological loss in weight (%)

The difference between in the consecutive fresh weights of cut flowers was calculated and expressed in percentage as physiological loss in weight.

$$\% \text{ PLW} = \frac{\text{Initial weight of container - weight after storage}}{\text{Initial weight}} \times 100$$

Dry weight of the flower (g/f)

The flowers with stalk were selected for fresh weight was dried under shade condition after drying, weight of these dried flowers with peduncle was recorded and average weight of flower with stalk was worked out

50 per cent discolouration:

It was recorded when 50 percent of the flowers in the stalk show discolouration when kept in Vase solution

Vase life (days)

Flower stalks are discarded when 50 percent of the flowers show discolouration. This stage is considered to be the end of potential useful longevity of Gypsophila and the number of days taken from placing the flower stalks in vase solution to 50 percent flower discolouration was considered as termination of vase life and expressed in days.

The data collected was subjected to statistical analysis as per the procedure obtained by Panse and Sukhatme (1985).

Results and Discussion

Up take of water (g/f)

The interaction effects between pre harvest application of growth regulators and application schedule showed that the flowers collected from the plot treated with growth regulator GA_3 at 450 ppm + single spray (G_3S_1) recorded highest water up take) on 2nd day (13.19 g), 4th day (12.23 g), 6th day (10.66 g), 8th day (8.77 g), 10th day (5.03 g), 12th day (4.79 g) while the lowest water uptake was recorded in (G_7S_1- Control).

The reason for maximum water uptake in flower stalks under treatment with GA_3 may be due to negative osmotic potential in cell and increase water uptake by hydrolysis of starch and sucrose. Similar findings have been earlier reported by Singh *et al*. (2008) in gladiolus, Sunitha *et al*. (2017) in lilly.

Transpirational loss of water (g/f)

The interaction effects between pre harvest application of growth regulators and application schedule on transpirational loss of water were presented in table 2. It was observed that the flowers collected from the plot treated with growth regulator GA_3 at 450 ppm + single spray (G_3S_1) recorded highest transpirational loss on 2^{nd} day (7.69 g), 4^{th} day (7.59 g), 6^{th} day (7.26 g), 8^{th} day (6.19 g), 10^{th} day (2.93 g), 12^{th} day (2.63 g) while the lowest transpirational loss of water was recorded in control (G_7S_1) with single spray of water on 2^{nd} day (2.83 g), 4^{th} day (2.32 g), 6^{th} day (2.29 g) after which there is no transpirational loss of water observed. whereas, all other treatments recorded intermediate values.

Fresh weight change (%)

Fresh weight change (FWC) denotes the amount of weight loss from the flowers during storage in vase solution and thus it has direct impact on the vase life of the flowers.

It was observed that the fresh weight change was recorded highest in the flowers collected from treatment GA_3 450 ppm + single spray (G_3S_1) on 2^{nd} day (62.51 %), 4^{th} day (50.00 %), 6^{th} day (42.63 %), 8^{th} day (33.00 %), 10^{th} day (22.00 %), 12^{th} day (18.79 %) while the lowest fresh weight change was recorded in Control (G_7S_1) with single spray of water on 2^{nd} day (16.08 %), 4^{th} day (12.37 %), 6^{th} day (10.18 %), from 8^{th} day onwards there is no change in fresh weight was recorded in the flowers collected from the control terminated vase life. The increase in the weight was observed over control which may be attributed to the fact of increased plant growth parameters due to GA_3 application.

Physiological loss in weight (%)

Physiological loss in weight (PLW) denotes the amount of moisture loss from the flowers during storage in vase solution and thus it has direct impact on the vase life of the flowers.

During the interaction there is significant effect of pre harvest application of growth regulators and application schedule on physiological loss in weight. Among the interaction minimum percentage of physiological loss in weight was recorded in the flowers collected from the plot treated with GA_3 450 ppm + single spray (G_3S_1) on 2^{nd} day (1.78 %), 4^{th} day (2.93 %), 6^{th} day (3.19 %), 8^{th} day (3.31 %), while the highest percentage of physiological loss in weight was recorded with control (G_7S_2) on 2^{nd} day (4.23 %), 4^{th} day (7.37 %), 6^{th} day (8.07 %) and after which there is no physiological loss in weight was observed.

Dry weight (g/f)

Interaction between growth regulators and application schedule was significant. The maximum dry weight of flowers (2.09 g) was reported in the flowers collected from the plot treated with GA_3 at 450 ppm + single spray (G_3S_1) followed by BA at 150 ppm + single spray (G_4S_1-2.03 g) while minimum dry weight was recorded in control (G_7S_1-0.84 g) with single spray of water. The increase in dry weight of flowers may be attributed to the increase in fresh weight and also due to more accumulation from carbon compounds sucrose which resulted in more dry weight after drying. Similar findings have been reported by Aparna *et al.* (2018) in chrysanthemum, Mohammad (2017) in china aster, Muhammad *et al*. (2018) in chrysanthemum, Pragnya *et al.* (2018) in china aster.

50 percent flower discolouration (days)

The maximum number of days for 50 percent discolouration (13.41 days) was reported in the flowers collected from the treatment GA_3 at 450 ppm + single spray (G_3S_1) followed by BA at 150 ppm + single spray (G_4S_1-12.51 days) while early discolouration was seen in control (G_7S_1- 5.01 days).

Vase life (days)

Maximum days of vase life of (14.00 days) was recorded in the flowers collected from the treatment GA_3 450 ppm + single spray (G_3S_1) followed by BA 150 ppm + single spray (G_4S_1-13.00 days) while lowest vase life was recorded in control (G_7S_1-5.01 days) this is due to GA_3 has beneficial effects on flower longevity by enhancing vase solution uptake, keeping membrane stability and increasing the antioxidant enzymes activity (Hunter *et al*., 2004) and also vase life extension by GA_3 could be attributed to hindering the protein degradation by promoting protein synthesis and hampering protease activity (Su *et al*. 2001).

Conclusion

It is concluded from the above experiment that the flowers with pre harvest spray with GA_3 at 450 ppm and with single spray recorded the maximum transpirational loss of water, water uptake, minimum Physiological loss in weight, Fresh weight change, days for fifty percent discolouration, dry weight and with a vase life of 14 days.

Table. 1 Effect of pre harvest application of GA_3 and BA on water uptake and transpirational loss of water in gypsophila cv. Star world

Treatments	Water uptake (g/f)						Transpirational loss of water (g/f)					
	2nd day	4th day	6th day	8th day	10th day	12th day	2nd day	4th day	6th day	8th day	10th day	12th day
G_1S_1	5.19	4.60	4.31	3.56	2.70	2.22	2.89	2.65	2.58	2.60	1.37	0.97
G_1S_2	4.85	4.80	4.89	4.17	2.11	1.76	3.11	2.89	2.83	2.79	1.39	1.29
G_2S_1	5.27	4.81	4.67	4.32	2.09	1.58	2.89	2.65	2.53	2.56	1.43	1.26
G_2S_2	7.19	4.73	4.32	3.72	2.81	0.99	3.32	2.91	2.83	2.51	1.44	1.35
G_3S_1	13.19	12.23	10.66	8.77	5.03	4.79	7.69	7.59	7.26	6.19	2.93	2.63
G_3S_2	8.45	8.24	7.89	7.88	4.80	2.24	5.65	4.84	4.69	3.96	2.95	2.75
G_4S_1	7.83	7.32	7.18	6.41	4.07	2.04	4.03	4.14	3.82	3.70	2.65	2.58
G_4S_2	7.50	7.32	6.67	5.38	3.07	0.14	3.94	3.82	3.38	2.63	1.84	1.54
G_5S_1	6.97	6.21	5.87	4.91	3.34	1.05	4.97	4.69	4.59	3.84	2.68	2.48
G_5S_2	5.61	5.07	4.91	4.11	2.73	0.74	3.69	3.42	3.37	3.70	2.26	1.66
G_6S_1	4.61	3.87	3.72	2.74	2.31	1.27	3.58	2.92	2.47	3.69	2.27	1.59
G_6S_2	5.21	4.63	4.36	3.82	1.92	1.63	4.49	3.63	3.40	1.69	1.25	1.08
G_7S_1	4.43	3.34	3.28	-	-	-	2.83	2.32	2.29	-	-	-
G_7S_2	5.00	4.47	3.88	-	-	-	3.14	2.79	2.62	-	-	-
S.E m±	0.06	0.20	0.17	0.11	0.07	0.05	0.11	0.12	0.09	0.10	0.04	0.05
C.D	0.18	0.62	0.54	0.34	0.21	0.15	0.35	0.38	0.28	0.33	0.14	0.16

Table.2 Effect of pre harvest application of GA_3 and BA on fresh weight and physiological loss in weight in gypsophila cv. Star world

Treatments	Fresh weight change (%)						Physiological loss in weight (g/f)					
	2nd day	4th day	6th day	8th day	10th day	12th day	2nd day	4th day	6th day	8th day	10th day	12th day
G_1S_1	23.76	21.22	18.14	13.95	12.83	10.66	2.03	3.34	3.88	4.11	4.54	5.14
G_1S_2	21.51	18.00	15.93	14.47	13.28	11.18	2.22	3.04	3.64	3.90	4.65	5.41
G_2S_1	26.87	21.51	19.76	17.00	16.23	15.97	2.65	3.28	3.78	4.47	4.84	5.00
G_2S_2	20.44	16.90	14.97	14.09	12.90	11.85	2.42	3.37	3.65	3.88	4.78	5.63
G_3S_1	62.51	50.00	42.63	33.00	22.00	18.79	1.78	2.93	3.19	3.31	4.14	4.66
G_3S_2	55.26	38.50	31.50	27.43	18.67	17.60	2.12	2.57	3.09	382	4.21	4.99
G_4S_1	45.37	34.51	26.18	20.26	14.51	13.58	4.01	4.77	4.78	5.94	7.07	7.89
G_4S_2	37.50	31.76	27.26	24.26	17.56	15.82	3.21	5.73	5.99	5.10	5.56	5.91
G_5S_1	27.86	25.35	20.03	17.65	12.50	10.76	2.51	3.44	4.19	4.10	4.45	5.18
G_5S_2	22.00	20.67	17.50	13.70	8.12	7.08	2.85	3.31	3.88	4.60	5.05	5.55
G_6S_1	22.87	18.66	15.26	10.13	8.73	7.88	2.88	4.74	4.96	5.47	5.63	6.06
G_6S_2	22.00	20.00	16.63	13.22	9.98	7.26	3.61	3.86	5.35	5.82	6.37	6.69
G_7S_1	16.08	12.37	10.18	-	-	-	3.66	4.92	6.43	-	-	-
G_7S_2	19.90	16.90	14.16	-	-	-	4.23	7.37	0.07	-	-	-
S.E m±	1.01	0.81	0.54	1.51	1.31	0.36	0.05	0.07	0.05	0.11	0.07	0.11
C.D	3.11	2.48	0.76	4.62	4.03	1.10	0.16	0.22	0.17	0.35	0.23	0.37

Table. 3 Effect of pre harvest application of GA_3 and BA on dry weight (g), 50 percent discolouration and vase life in gypsophila cv. Star world

Treatments	Dry weight (g/f)	50 percent discolouration (days)	Vase life (days)
G_1S_1	1.15	11.00	11.51
G_1S_2	1.39	10.51	12.51
G_2S_1	1.93	10.76	11.00
G_2S_2	1.51	11.56	12.00
G_3S_1	2.09	13.41	14.00
G_3S_2	1.82	12.00	12.27
G_4S_1	2.03	12.56	13.00
G_4S_2	1.03	9.26	10.24
G_5S_1	1.59	12.51	13.00
G_5S_2	1.09	10.00	11.51
G_6S_1	1.84	10.00	10.06
G_6S_2	1.56	11.51	11.51
G_7S_1	0.94	5.01	6.00
G_7S_2	0.83	5.91	7.26
S.E m±	0.03	0.34	0.23
C.D	0.11	1.06	0.70

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