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The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(6): 2064-2067

www.thepharmajournal.com
Received: 17-04-2022
Accepted: 29-05-2022

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Response of different growth retardants on the bulb and postharvest life of Tuberose (*P. tuberosa*) cv. Prajwal

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Abstract
An experimental study was conducted at the Department of Horticulture, Rajasthan College of Agriculture, MPUAT, Udaipur. The experiment comprised three replications with four chemical treatments; MH @ 100, 200, and 300 ppm, SADH @ 100, 200, and 300 ppm, CCC @ 100, 200, and 300 ppm, and ethrel @ 100, 200, and 300 ppm (Water spray). The lower SADH concentration of 100 ppm resulted in better results in terms of bulb per plant, bulb weight/plant, clump weight per plant, durability of spike, duration of flowering, longevity of 2nd floret and vase life. After result of the present experiment we concluded that, the growth retardant SADH @ 100 ppm concentration is recommended for application in tuberose for bulb yield and quality spike with extended vase life after harvest.

Keywords: Bulb, SADH, vase life and spike durability

Introduction
Flowers are an integral part of human life due to their diversity in beauty, form, texture, colour and fragrance. Floriculture in India has a long tradition. It has served the purpose of meeting our socio-cultural requirements since time immemorial. However, with rapid commercialization of agriculture and graduation of farming from subsistence level to commercial level, exposure to newer markets and opportunities have resulted in market segmentation and evolution of niche markets. Flowers are no more seen as commodities for specific purposes but as products or messengers to convey specific meanings on specific occasions. There is a vast awareness and improvement in packaging of flowers as well. As a result, today cut flower segment in floriculture is not only an attractive segment but also a profitable one if approached rationally the world over. Cut flowers are an industry by itself with its own specialities and nuances. Among the cut flowers, Tuberose (*Polianthes tuberosa* L.) is an important bulbous ornamental crop belongs to the family Amaryllidaceae. It is believed to be native of Mexico, commonly called as "Nelasampangi" or "Sandharaga" (Anonymous, 1982) [1] in vernacular in Andhra Pradesh. It is a potential money spinner for the aesthetic world. Hence, with this view in mind it was proposed to conduct the experiment to find out effect of plant growth retardant on bulb yield and post–harvest life of Tuberose (*P. tuberosa*).

Materials and Methods
The research was carried out in the Department of Horticulture, Rajasthan College of Agriculture, Udaipur, during the 2018-2019 growing season. To study the effect on tuberose growth, flowering, and yield, the experiment was set up in a factorial Randomized Block Design (RBD) with three replications and four treatments: MH @ 100, 200, and 300 ppm, SADH @ 100, 200, and 300 ppm, CCC @ 100, 200, and 300 ppm, and ethrel @ 100, 200, and 300 ppm, as well as a control (Water spray). The pre-socking bulb treatment and foliar sprays of growth regulators in the concentrations as per treatments were done once. The experiment was performed on cv. Prajwal on level beds with a 30 cm × 30 cm spacing. Before the experiment began, the recommended amount of chemical fertilizers was sprayed at a rate of 200:300:200 kg NPK ha^{-1}, along with FYM @ 15 t ha^{-1} on June 1, 2008, and the full dosages of P_2O5 and K_2O, as well as 1/4th dose of N as a basal, were administered, with the remaining doses of N given in three equal splits after 30, 60, and 90 days.

After planting, bulb per plant,bulb weight/plant, clump weight per plant, the durability of spike, duration of flowering, longevity of 2nd floret, and vase life were recorded. The data was examined using the method proposed by Gomez & Gomez (1984).

Result and Discussion

Effect of growth retardant and application method on bulb yield, of tuberose

A perusal of data in Table reported that number of bulbs per clump, bulb weight, bulb diameter and clump weight were significantly influenced by the plant growth retardants, method of application and their combinations. The maximum value for the above characters was observed in pre-socking bulb treatment, while minimum was found in foliar spray treatments during both the years. In the present study, number of bulbs per clump (15.04), bulb diameter (3.35 cm) and clump weight (462.90 gm) was found maximum in SADH 300 ppm, whereas ethrel 200 ppm gave maximum mean bulb weight (28.57 g) while, minimum mean number of bulbs (12.25), bulb diameter (2.82 cm) and clump weight (342.71 gm) and bulb weight (24.60 gm) was found in MH 300 ppm, MH 100 ppm, CCC 100 ppm and MH 300 ppm, respectively. Suma and Philipose (1994) reported that the greatest tuber production was obtained with 4000 ppm alar. However, the greatest tuber length (7.93 cm) and diameter (1.88 cm) were obtained with spray of 1000 and 4000 ppm alar, respectively in dahlia cv. Formal Decorative. similar results was also reported by Beura and Maharana (1990) [2] in dahlia (Dahlia variabilis, Desf.) cv. Black Out reported that the lowest shoot-root ratio (0.88) and highest number of tubers/plant (10.75), tuber yield (233.75 g), tuber length (10.88 cm) and tuber diameter (2.95 cm) were obtained with spray of 2500 ppm alar. The increasing bulb, bulb diameter and clumb weight in SADH 300 ppm treated plants might be due to increased number of leaves and plant height which might have led to overall improved rate of photosynthesis and nutrient and water uptake. As a result of this, increased availability of metabolites to the developing bulbs and bulblets led to improved number of bulbs and bulblets.

Effect of growth retardant on spike quality, durability and vase life of tuberose

In the present study, the vase life of spikes, durability of spike, longevity of 2nd floret and flowering duration were found to be significantly influenced by growth retardant treatments and different methods of application. SADH 300ppm (T7) treatment recorded significantly longest vase life (8.85 days) followed by SADH 200 ppm and shortest vase life was observed with MH 100 ppm compared to control (8.40 days). The highest durability of spike (9.75), flowering duration (29.95) and longevity of 2nd floret (6.05) was observed in SADH 200 ppm, SADH 300ppm and SADH 100ppm, respectively. The Extended vase life of flowers with higher concentration of SADH might be due to increased fresh weight and reduced water loss uptake ratio. SADH is known to involve in the synthesis of mRNA and proteins and alteration of liposomal membrane fluidity. A decrease in fluidity of membrane is a characteristic sign for flower senescence (Borochov *et al.* 1982). A decrease of phospholipids in membranes of petals might be inhibited by SADH treatment. The results of EL-Sallami (1997) [4] and Bhattacharjee (1972) [3] on Narcissus plant and bougainvillea are similar to the present findings. There was an improvement in vase life with CCC and MH applications too compared to control and this might be due to inhibition of ethylene production and higher carbohydrate reserves in flowers due to higher photosynthetic activity (Halevy *et al*., 1966).

In the present study it was observed that among the two methods of application of growth retardant, pre-soaking of bulbs with growth retardant solutions recorded superior results in terms of increased growth, flowering and yield parameters compared to foliar spray and hence pre-soaking treatment is promising. When bulbs are dipped in growth retardant solution and it may result in maximum absorption of chemical, which may cause proper retardation or promotion of growth from the initial stages of plant growth. The bulb treatment also would be economical and easier for application compared to foliar applications. In this study, the interaction effects studied between various growth retardant concentrations and methods of application were found to be significant. From the consideration of the above results and also keeping in view the net returns (BCR) it can be concluded that application of T9M2 at SADH 300 ppp as pre-socking bulb treatment was found promising and these treatments can be recommended to the farmers of tuberose in Udaipur region with pre-planting bulb treatment method for obtaining higher flower yield and monitory returns.

Table 1: Effect of growth retardants and method of application on days to first floret opening, days to last floret opening, durability of spike (days), and spike length (cm) at flowering stage of tuberose

Treatments	Days to first floret opening			Days to last floret opening			Durability of spike (days)			Spike length (cm)		
	2018	2019	Pooled	2018	2019	Pooled	2018	2019	Pooled	2018	2019	Pooled
Control	139.50	136.50	138.00	147.07	144.59	145.83	9.18	9.40	9.29	76.43	78.69	77.56
Rest	140.88	141.02	140.95	149.61	147.86	148.73	9.34	9.23	9.29	74.74	75.56	75.15
F test	*	**	NS	*	**	**	NS	NS	*	**	**	**
Growth Retardants (ppm)												
T_1 – MH 100	142.50	142.17	142.33	150.83	149.17	150.00	9.53	9.33	9.43	74.83	75.93	75.38
T_2– MH 200	143.83	143.17	143.50	152.67	150.17	151.42	8.97	9.00	8.98	74.68	75.70	75.19
T_3– MH 300	144.00	144.17	144.08	153.50	151.90	152.70	8.83	8.83	8.83	74.58	75.18	74.88
T_4– CCC 100	139.17	140.33	139.75	147.83	147.00	147.42	9.57	9.43	9.50	74.98	75.80	75.39
T_5– CCC 200	140.50	140.67	140.58	149.17	147.38	148.28	9.57	9.30	9.43	74.80	75.73	75.27
T_6– CCC 300	141.00	140.50	140.75	149.67	146.83	148.25	9.10	9.00	9.05	74.73	75.55	75.14
T_7– SADH 100	138.00	138.38	138.19	146.67	145.00	146.25	9.63	9.60	9.62	75.10	75.98	75.54
T_8– SADH 200	138.33	138.83	138.58	147.00	145.49	146.29	9.83	9.67	9.75	74.53	75.28	74.91
T_9– SADH 300	139.83	139.33	139.58	148.67	146.17	147.42	9.53	9.33	9.43	74.44	74.95	74.69
T_{10}– Ethrel 100	140.33	141.17	140.75	149.17	148.00	148.58	9.40	9.27	9.33	75.02	75.75	75.38
T_{11}– Ethrel 200	141.50	141.67	141.58	150.00	148.33	149.17	9.20	9.07	9.13	74.67	75.28	74.98

T_{12}– Ethrel 300	141.50	141.83	141.67	150.17	148.83	149.50	8.93	8.93	8.93	74.55	75.60	75.08
S.Em±	0.472	0.644	0.399	0.534	0.693	0.437	0.097	0.111	0.074	0.171	0.178	0.124
CD (P = 0.05)	1.341	1.832	1.120	1.518	1.970	1.227	0.275	0.317	0.207	NS	0.508	0.347
Methods of application												
(M_1) Bulb treatment	140.58	140.54	129.75	149.22	147.28	136.85	9.42	9.32	8.65	74.60	75.38	69.22
(M_2) Foliar spray	141.17	141.50	130.46	150.00	148.43	137.74	9.26	9.14	8.49	74.89	75.74	69.52
S.Em±	0.192	0.263	0.157	0.218	0.283	0.171	0.040	0.045	0.029	0.070	0.073	0.049
CD (P=0.05)	0.547	0.748	0.439	0.620	0.804	0.481	0.112	0.129	0.081	0.199	0.207	0.136
CV (%)	0.82	1.12	0.98	0.87	1.15	1.02	2.54	2.95	2.75	0.56	0.58	0.57

Table 2: Effect of growth retardants and method of application on Flowering duration, bulbs/clumps, bulb weight (g), and clump weight (g) of tuberose

Treatments	Flowering duration			Bulbs/clumps			Bulb weight (g)			clump weight (g)		
	2018	2019	Pooled	2018	2019	Pooled	2018	2019	Pooled	2018	2019	Pooled
Control	24.03	31.29	27.66	5.03	20.10	12.56	20.28	30.26	25.27	104.15	608.24	356.20
Rest	25.69	32.60	29.15	6.39	20.50	13.44	20.94	31.04	25.99	136.90	634.71	385.81
F test	**	**	**	**	NS	**	**	*	**	**	**	**
Growth Retardants (ppm)												
T_1 – MH 100	25.55	32.73	29.14	6.44	20.25	13.34	19.64	29.56	24.60	126.51	598.69	362.60
T_2– MH 200	25.94	32.94	29.44	6.05	21.12	13.59	20.11	30.03	25.07	129.07	619.49	374.28
T_3– MH 300	26.41	33.05	29.73	5.68	18.82	12.25	20.60	30.46	25.53	116.52	574.09	345.30
T_4– CCC 100	25.50	31.49	28.49	6.83	18.29	12.56	20.01	29.90	24.95	138.53	546.89	342.71
T_5– CCC 200	24.82	32.00	28.41	5.96	18.81	12.38	20.14	30.40	25.27	121.95	571.88	346.91
T_6– CCC 300	25.02	32.25	28.63	5.06	20.30	12.68	20.30	31.01	25.66	104.41	629.53	366.97
T_7– SADH 100	25.65	33.15	29.40	7.25	21.03	14.14	20.54	30.54	25.54	149.93	641.73	395.83
T_8– SADH 200	26.19	33.32	29.75	7.25	21.08	14.16	21.40	31.35	26.38	157.20	685.08	421.14
T_9– SADH 300	26.36	33.54	29.95	7.55	22.52	15.04	22.03	32.40	27.22	174.03	751.78	462.90
T_{10}– Ethrel 100	25.69	31.70	28.69	6.15	21.58	13.86	21.10	31.11	26.11	131.64	623.76	377.70
T_{11}– Ethrel 200	25.46	32.34	28.90	6.17	20.63	13.40	21.66	32.31	26.99	135.92	666.76	401.34
T_{12}– Ethrel 300	25.71	32.74	29.23	6.34	21.53	13.93	23.79	33.34	28.57	157.10	706.91	432.01
S.Em±	0.130	0.147	0.098	0.077	0.177	0.097	0.146	0.254	0.147	0.903	4.076	2.088
CD (P = 0.05)	0.370	0.419	0.276	0.218	0.504	0.271	0.416	0.724	0.412	2.568	11.591	5.860
Methods of application												
(M_1) Bulb treatment	25.43	32.49	26.73	6.44	20.76	12.55	21.18	31.20	24.17	138.44	646.77	362.41
(M_2) Foliar spray	25.96	32.71	27.08	6.34	20.23	12.27	20.71	30.87	23.81	135.36	622.65	349.85
S.Em±	0.053	0.060	0.039	0.031	0.072	0.038	0.060	0.104	0.058	0.369	1.664	0.819
CD (P=0.05)	0.151	0.171	0.108	0.089	0.206	0.106	0.170	0.295	0.162	1.048	4.732	2.299
CV (%)	1.24	1.11	1.17	2.97	2.12	2.50	1.71	2.01	1.96	1.63	1.58	1.88

Table 3: Effect of growth retardants and method of application on bulb diameter, vase life (days), and longevity of 2nd floret at a time of tuberose

Treatments	Bulb diameter (cm)			Vase life (days)			Longevity of 2nd floret		
	2018	2019	Pooled	2018	2019	Pooled	2018	2019	Pooled
Control	2.46	3.46	2.96	7.90	8.89	8.40	5.50	5.83	5.66
Rest	2.50	3.55	3.02	8.22	9.12	8.67	5.07	5.38	5.23
F test	NS	NS	**	**	*	**	NS	NS	**
Growth Retardants (ppm)									
T_1 – MH 100	2.34	3.31	2.82	8.05	9.12	8.58	5.36	5.50	5.43
T_2– MH 200	2.37	3.35	2.86	8.12	9.19	8.65	5.05	5.17	5.11
T_3– MH 300	2.43	3.37	2.90	8.25	9.29	8.77	4.33	5.00	4.67
T_4– CCC 100	2.41	3.46	2.93	8.12	9.16	8.64	5.50	6.00	5.75
T_5– CCC 200	2.46	3.48	2.97	8.16	9.23	8.69	5.17	5.50	5.33
T_6– CCC 300	2.51	3.48	2.99	8.32	9.35	8.83	4.83	5.17	5.00
T_7– SADH 100	2.55	3.70	3.12	8.16	9.12	8.64	5.83	6.27	6.05
T_8– SADH 200	2.58	3.79	3.19	8.32	9.21	8.76	5.50	5.83	5.67
T_9– SADH 300	2.79	3.91	3.35	8.40	9.29	8.85	4.94	5.50	5.22
T_{10}– Ethrel 100	2.47	3.50	2.98	8.40	9.12	8.76	5.50	5.17	5.33
T_{11}– Ethrel 200	2.50	3.59	3.04	8.20	8.76	8.48	4.33	4.83	4.58
T_{12}– Ethrel 300	2.57	3.66	3.11	8.17	8.66	8.41	4.50	4.67	4.58
S.Em±	0.034	0.038	0.025	0.070	0.068	0.049	0.216	0.204	0.149
CD (P = 0.05)	0.097	0.107	0.071	0.200	0.193	0.137	0.615	0.579	0.417
(M_1) Bulb treatment	2.55	3.59	2.83	8.07	9.11	7.93	5.21	5.56	4.97
(M_2) Foliar spray	2.44	3.51	2.75	8.37	9.14	8.08	4.93	5.21	4.68
S.Em±	0.014	0.015	0.010	0.029	0.028	0.019	0.088	0.083	0.058
CD (P=0.05)	0.039	0.044	0.028	0.082	NS	0.054	0.251	0.237	0.164
CV (%)	3.34	2.60	2.91	2.10	1.83	1.96	10.41	9.24	9.81

Conclusion

Result of the present concluded that SADH 100 ppm and SADH 300 ppm as pre-socking and foliar spray was found best as it gives maximum spike and bulb yield and quality spikes during growing season of 2018, 2019 and pooled analysis. Further, this treatment was recommended to the farmers of tuberose in Udaipur region with pre-planting bulb treatment method for obtaining higher flower yield and monitory returns.

References

1. Anonymous. The wealth of India- A dictionary of Indian raw materials and industrial products. New Delhi, India: CSIR, 1982, 8.
2. Beura S, Maharana T. Effect of growth regulators on tuber production of dahlia (Dahlia variabilis Desf.) cv. Black Out. Orissa Journal of Horticulture. 1990;18:48-51.
3. Bhattacharjee SK. Effect of growth retardants on several varieties of Bougainvillea. Indian Agriculturist. 1972;16:85-90.
4. EL-Sallami IH. Effect of bulb soaking and foliar application of some growth regulators on growth, flowering, bulb production and certain chemical content in Narcissus plant. Asian Journal of Agricultural Sciences. 1997;28:37-57.
5. Puglisi S. The use of plant growth regulators enhances branching of Clematis spp. Thesis Master of Science, Department of Horticultural Science, Virginia Polytechnic Institute and State University, Blacksburg, 2002.
6. Singh JN, Singh DK, Sharma KK. Effect of regulation of flowering in African marigold (*Tagetuserecta*L.) by the application of GA3, Etheral and MH. Journal of Ornamental Horticulture. 1994;7:168-170.
7. Wan CK. Rooting cuttings of Gardenia jasminoides, Duranta repens and Bougainvillea glabra with growth retardants. *Pertanika*, 1982;5:25-29.