

Augmentation of flowering in Jasmine (*Jasminum sambac*. Ait.) through growth hormones

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ABSTRACT

Jasmine is one of the oldest fragrant flowers and is specially appreciated in India, where most people have a love for the fragrant flowers. The word "Jasmine" has been derived from Persian word 'Yasmyn' meaning fragrance. This crop has a main flowering season during March to October and an off-season from November to February. During this off-season, flowering is very poor or there is no flowering at all. In recent years, growth regulators are valuable tools in floriculture for manipulating growth and flowering of many crops and hence an attempt has been made to induce flowering during off season using growth regulators in Jasmine in the department of Horticulture during November, 2016. The treatment comprises of two growth promoting substances viz., NAA and GA₃ and two growth retardants (Cycocel and Maleic Hydrazide). The data on vegetative parameters viz., plant height, number of primary shoots, number of nodes, internodal length, number of leaves and flowering parameters viz., days taken for flowering, duration of flowering, flower yield and hundred flower weight were recorded. Results of the experiment revealed significant differences among the treatments. Among the various treatments, application of NAA @ 75 ppm (T6) recorded the highest plant height (130.6 cm and 178.5 cm), number of primary shoots (21.68 and 35.68), number of nodes (9.86 and 15.89 cm) and number of leaves (1250.0 and 2689.5) at 90 and 180 DAP respectively. Earliness in flowering (26.38 DAP) and maximum duration of flowering (171.00 days) were noticed in T₃ (GA₃@ 150 ppm).

Key words: Jasmine, flower induction, growth hormones

INTRODUCTION

Jasmine (*Jasminum sambac* L.) is an important commercial flower crop occupying larger area among the traditional flower crops grown in Tamil Nadu. Recently, jasmine cultivation has received a fillip through research findings which indicated the potentiality of South Indian Jasmine. But one of the serious limiting factors which affects both jasmine flower growers and the consumers and which is likely to affect commercial production, is that the flowering of all the *Jasminum* species is seasonal. There are peak and lean productive seasons with consequent gluts and scarcity which affect the price trends greatly. Developments after the discovery of growth regulators and their application in horticulture are significant. Regulation of plant growth and development using natural plant hormones for greater production has received the utmost attention. Growth and flowering responses of flower crops to these chemical substances have been intensively studied with a view to have compact plants with greater number of flowers

and also to hasten or delay flowering according to the needs of the grower (Sridhar *et al.*, 2013). Regulation of flowering in jasmine has immense practical value. Timing of the peak flowering to coincide with the time of greatest demand and generally modifying the flowering sequence to avoid peak production at about the same time would confer great advantage to the grower and consumers. It is in this respect that the possibility of using plant growth regulators for regulation assumes significance. Keeping this in view, the present investigation was taken to study the effect of growth regulators at concentration on growth and flowering of Jasmine (*Jasminum sambac* Ait.).

MATERIALS AND METHODS

An experiment was formulated with two growth promoters (GA₃ and NAA) and two growth retardants (CCC, MH) at three concentrations each were taken up in the floriculture unit during November, 2016. Thirteen treatments comprising GA₃ at 50, 100 and 150 ppm, NAA at 25, 50, 75 ppm, Cycocel at 500,

1000 and 1500 ppm and Maleic hydrazide at 1000, 2000 and 3000 ppm concentration and a control was replicated thrice. Three year old jasmine plants were selected from the floriculture unit of the Department of Horticulture for the experiment. Four plants were maintained for each replication along with a control and conventional pruning during second fortnight of October, 2016. After pruning, when the new shoots appeared with sufficient number of leaves, the freshly prepared Gibberellic acid (GA₃), Naphthalene acetic acid (NAA), 2-chloroethyl-trimethyl ammonium chloride; Chlorocholine chloride (Cycocel CCC) and Maleic hydrazide (MH) were sprayed once as per the treatments. The data on vegetative parameters viz., plant height, number of primary shoots, number of nodes, intermodal length, number of leaves and flowering parameters viz., days taken for flowering, duration of flowering, flower yield and hundred flower weight were recorded. The statistical analysis of the data was done by adopting the standard procedure given by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

The results of the investigation undertaken with a view to study the effect of certain plant growth regulators on flowering and yield of Jasmine (*Jasminum sambac* Ait.) are presented in Table 1 and 2. Among the various treatments, application of NAA @ 75 ppm (T₆) recorded the highest plant height (130.6 cm and 178.5 cm) at 90 and 180 DAP, respectively and it was followed by T₃ (Gibberellic acid @150 ppm) which recorded the value of 127.8 cm and 175.5 cm at 90 and 180 DAP, respectively. The PGR'S when applied as foliar spray, were absorbed by the leaves and readily translocated in both xylem and phloem tissues resulting in distribution throughout the plant system. This might be the reason for the enhancement in plant height. The least plant height (98.9 cm and 142.1 cm at 90 and 180 DAP, respectively) was observed in T₈ (Cycocel @ 1000 ppm). Cycocel have the effective role to perform dwarfing process since it prevents the green growth and frustrates its length (Shobana, 2014). This causes the internodes to shorten and stems to harden due to thickness.

Table 1: Effect of growth regulators on vegetative parameters of Jasmine (*Jasminum sambac* Ait.)

Treatments	Plant height (cm)		No. of primary shoots		Number of nodes		Intermodal length		Number of Leaves per plant	
	90 DAP	180 DAP	90 DAP	180 DAP	90 DAP	180 DAP	90 DAP	180 DAP	90 DAP	180 DAP
T ₁ GA ₃ @ 50 ppm	117.1	165.3	15.68	27.38	13.88	35.59	6.06	10.87	1060.0	2425.8
T ₂ GA ₃ @ 100 ppm	124.2	171.4	17.58	29.98	14.66	37.39	7.86	13.17	1195.6	2598.8
T ₃ GA ₃ @ 150 ppm	124.8	175.5	18.08	30.58	17.98	43.59	8.96	14.59	1250.0	2689.5
T ₄ NAA@ 25 ppm	120.1	168.3	13.78	24.58	10.92	28.59	6.96	11.97	899.5	2212.2
T ₅ NAA@ 50 ppm	127.2	172.4	19.88	33.18	10.27	27.09	8.06	13.27	849.4	2144.2
T ₆ NAA@ 75 ppm	130.6	178.5	21.68	35.68	11.57	30.09	9.86	15.89	949.7	2280.2
T ₇ Cycocel@ 500 ppm	111.5	159.1	7.98	16.38	15.52	39.19	4.26	8.27	1159.0	2548.8
T ₈ Cycocel@ 1000 ppm	98.9	142.1	9.68	18.78	16.02	39.79	1.26	3.01	1229.0	2653.3
T ₉ Cycocel@ 1500 ppm	102.4	147.9	11.88	21.68	17.02	41.69	1.76	4.27	1204.5	2608.3
T ₁₀ MH@ 1000 ppm	110.5	157.0	4.58	11.78	12.22	31.59	4.16	8.17	999.9	2348.2
T ₁₁ MH@ 2000 ppm	105.0	150.9	6.28	14.28	12.32	32.19	2.36	5.57	1007.4	2357.8
T ₁₂ MH@ 3000 ppm	107.6	153.9	9.98	19.18	13.1	33.79	3.26	6.87	1110.3	2489.8
T ₁₃ Control (Water spray)	114.4	162.2	2.08	7.88	8.27	23.09	5.16	9.67	794.4	2070.2
S.E.D	0.96	1.23	0.34	0.81	0.33	0.83	0.42	0.58	5.98	14.63
C.D (P=0.05)	2.01		0.72	1.7	0.69	1.75	0.89	1.22	12.5	30.58

Among the various treatments, the maximum number of primary shoots (21.68 and 35.65) was registered in T₆ (NAA @ 75 ppm) at 90 and 180 DAP, respectively. This was followed

by the treatment T₅ (NAA @50 ppm) which recorded the value of 19.88 and 33.18 at 90 and 180 DAP, respectively. Significant differences were observed among the growth regulators

tried in Jasmine. Gibberellic acid (GA₃ @150 ppm (T₃) gave more number of internodes (17.98 and 43.59), which was followed by T₉ (Cycocel @1500 ppm (17.00 and 41.69). However least number of nodes was registered in Control with a value of 8.27 and 23.09 at 90 and 180 DAP respectively.

The data (Table 1) clearly showed that the length of internodes was significantly increased due to NAA @ 75 ppm (T₆). The maximum number of leaves (1250.0 and 2695.5) per plant was found in the treatment T₃ (GA₃ @150 ppm). This might be attributed to the enhanced vegetative growth in early phase attributed by exogenous application of GA₃ which would have favoured the increased photosynthesis and CO₂ fixation. The least number of leaves was registered in Control with a value of 794.4 and 2070.2 at 90 and 180 DAP respectively. The increased effect could be corroborated with the findings of Shobana (2014) in *Jasminum sambac* and Sridhar *et al.* (2013) in *Jasminum auriculatum*. The increased effect of NAA @ 75 ppm for the above characters might be due to the fact that NAA would have promoted vegetative growth by inducing active cell division in the apical meristem. Increase in growth attributes due to

the application of the NAA in the present study is in consonance with the findings of Sridhar *et al.* (2013). Similar results were also derived by Pal *et al.*, (1980) in Jasmine and Grisha *et al.* (2012) in Daisy. Earliness in flowering (26.38 DAP) was noticed in T₃ (GA₃@ 150 ppm) followed by T₂ (GA₃ @100 ppm) which took about 30.38 days. This might be attributed to the enhanced vegetative growth in early phase attributed by exogenous application of GA₃ which would have favoured the increased photo synthesis and CO₂ fixation. Further, it would have favoured convenience of factors influencing floral initiation *ie.*, carbohydrate pathway and photo periodic pathway with GA₃ pathway. These results are in accordance with the findings of Baskaran *et al.* (2007) and Devadanam *et al.* (2007) in *Gladiolus*. Delayed flowering was recorded in T₁₂ (MH @ 3000 ppm (60.58 days). This might be due to lesser mitotic activity and preservation of bio-synthesis of gibberellic acid like substances. These results are in agreement with the findings of Dutta *et al.* (1993) in *Chrysanthemum*. Dalal *et al.* (2009) stated that the delayed flowering might be due to influence of growth retardants in reducing the partition of carbohydrates to floral organ when compared to control.

Table 2: Effect of growth regulators on flowering parameters of Jasmine (*Jasminum sambac* Ait.)

Treatments	Days taken for first flower initiation (up to pruning)	Total duration of flowering (days) (After for flower emergence)	Flower yield per plant (g)		Mean hundred flower weight (g)
			90 DAP	120 DAP	
T ₁ GA ₃ @ 50 ppm	36.48	152.90	384.14	526.32	588.96
T ₂ GA ₃ @ 100 ppm	30.38	168.50	443.34	594.52	595.66
T ₃ GA ₃ @ 150 ppm	26.38	171.00	460.34	615.72	600.76
T ₄ NAA@ 25 ppm	43.98	142.30	364.64	478.32	563.66
T ₅ NAA@ 50 ppm	47.08	141.10	366.14	501.32	565.16
T ₆ NAA@ 75 ppm	39.68	164.90	402.14	547.32	582.36
T ₇ Cycocel@ 500 ppm	40.88	159.60	420.14	568.32	576.76
T ₈ Cycocel@ 1000 ppm	33.38	165.90	425.34	573.52	587.46
T ₉ Cycocel@ 1500 ppm	50.18	147.60	359.54	473.22	571.06
T ₁₀ MH@ 1000 ppm	54.28	135.50	341.54	451.22	557.96
T ₁₁ MH@ 2000 ppm	57.48	133.40	323.04	429.22	550.16
T ₁₂ MH@ 3000 ppm	60.58	127.70	304.54	407.22	543.96
T ₁₃ Control (Water spray)	53.28	120.20	282.54	382.22	533.96
S.E.D	1.32	1.18	7.58	9.89	0.91
C.D (P=0.05)	2.76	3.18	15.85	19.68	1.92

Maximum flowering duration was in T₃ (GA₃ @150 ppm,) which was recorded 171.00 days, followed by treatment T₂ (GA₃ @ 100 ppm) with 168.5 days. This might be attributed to the

enhanced vegetative growth in early phase attributed by exogenous application of GA₃ would have favoured carbohydrate pathway. The longevity of flowering was also observed by

Sridhar *et al.* (2013) in *Jasminum auriculatum* and Dalal *et al.* (2009) in *Chrysanthemum*. The minimum duration of flowering was recorded in the treatment T₁₃ with 120.20 days. Among the various treatments significant increase in flower yield per plant was recorded in T₃ (GA₃ @ 150 ppm) with a value of 460.34 and 615.72 g plant⁻¹ at 90 and 120 DAP respectively. This was followed by T₂ (GA₃ @ 100 ppm) 443.34 and 594.52 g plant⁻¹ at 90 and 120 DAP respectively. The increase in weight of flowers might be due to the production of more number of secondary shoots at early stage, which then had sufficient time to accumulate reserve carbohydrates for proper flower bud differentiation. The lowest yield (282.54 and 382.22 g/plant) was observed in T₁₃ (Control) at 90 and 180 DAP. Among the treatments, T₃ (GA₃ @ 150 ppm) recorded the highest value of 600.76 g followed by T₂ (GA₃ @ 100 ppm) (595.66g). The lowest hundred bud weight was

recorded in T₁₃(Control) (533.96 g). This might be attributed to the enhanced vegetative growth in early phase attributed by exogenous application of GA₃ which would have favoured the increased photosynthesis and CO₂ fixation. In the present study, the data on extended duration of flowering and hundred bud weight due to the application of GA₃ @ 150 ppm might also be a cause for increase in yield. Earlier reports indicated that the growth and yield of *Jasminum grandiflorum* was enhanced by application of GA₃ (Bhattarcharjee (1983) ; Narayana Gowda (1985) and Sridhar *et al.*, 2013)). Similar findings were also recorded by Amith kumar *et al.*, (2011) in African marigold, Shinde *et al.*, (2010) in *Chrysanthemum*.

From the above studies, it is inferred that application of GA₃ @ 150 ppm or NAA @ 75 ppm could be recommended for enhanced growth and higher flower yield in *Jasminum sambac*.

REFERENCES

- Amit Kumar, Jitendar Kumar, Braj Mohan, Singh, J.P., Rajbeer and Nathi Ram. (2011) Effect of plant growth regulators on growth, flowering and yield of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda. *Asian Journal of Horticulture* 6(2): 418-422.
- Baskaran, V., Misra, R.L. and Abirami, K. (2007) Effect of plant growth regulators of corm production in gladiolus. *Journal of Ornamental Horticulture* 4(1): 78-80.
- Bhattarcharjee, S. K. (1983) Growth and flowering of *Jasminum grandiflorum* L. as influenced by growth regulating chemicals. *Singapore Journal of Primary Industries* 11(1): 34-38.
- Cathey, M. H. (1980) Phosphon and CCC for controlling height of chrysanthemum. *Floriculture Ex.* 135: 12-13.
- Devadanam, A., Shinde, B.N., Sable, P.B. and Vedpathak, S.G. (2007) Effect of foliar spray of plant growth regulators on flowering and vase life of Tuberose (*Polyanthus tuberosa* L.). *Journal of Soil and Crops* 17(1): 86-88.
- Dutta, J.P., Seemandhini, R. and Khader, R.A. (1993) Regulation of flowering in chrysanthemum (*Chrysanthemum indicum* L.) Cv.CO-1 by use of growth regulators. *South Indian Horticulture* 41(5):293-299
- Dalal, S.R., Karale, G.D. and Kikame CH Momin. (2009) Effect of growth regulators on growth, yield and quality of *Chrysanthemum* under net house conditions. *Asian Journal of Horticulture* 4(1):161-163.
- Grisha, R., Shirol, A.M., Kulkarni, B.S., Reddy, B.S. and Anupa, T. (2012) Studies on effect of different plant growth regulators on growth, flowering and quality of Daisy (*Aster amellus* L.) cv. Dwarf Pink. *International Journal of Agriculture Environment and Biotechnology* 5(2): 127-131.
- Leetham, D.S., Goodwing, P.B. and Higgins. T.J.V. (1978) *Phytohormones and related components, A comprehensive treatise* Vol. 2, Elsevier, Amsterdam.
- Narayana Gowda, J. V. (1985) Effect of gibberellic acid on growth and flowering of rose cv. Superstar. *The Indian Rose Annual* IV: 185-188.
- Panse, V.G. and Sukhatme, P.V. (1967) *Statistical methods for Agricultural workers*, ICAR, New Delhi.

- Pal, P., Maity, R.G. and Bose, T.K. (1980) Effect of growth regulators on *Jasminum sambac* var. Double. *National Seminar on Production Technology for Commercial Flower Crops*, 20 and 30 August, Tamil Nadu Agricultural University, Coimbatore, pp. 35-38.
- Pappaiah, C. M. and Muthuswamy, S. (1978) Effect of growth regulators on growth, flowering and quality and essential oil content of *Jasminum auriculatum* var. Parimullai. *South Indian Horticulture* 26: 66-71
- Sen, S.K. and Maharana, T. (1971) Growth and flowering response of Chrysanthemum to growth regulator treatments. *Punjab Horticulture Journal* 11:276-279.
- Shinde, K.H., Praekh, N.S., Upadhyay, N.V. and Patel, H.C. (2010) Investigation of different levels of gibberellic acid (GA₃) and pinching treatments on growth, flowering and yield of chrysanthemum (*Chrysanthemum morifolium* Ramat.) cv. IIHR-6 under middle Gujarat conditions. *Asian Journal of Horticulture* 5(2): 416-419.
- Shobana, A. (2014) Effect of bioregulators and cow's urine on flower production of Jasmine (*Jasminum sambac*). *Asian Journal of Horticulture* 9(1): 160-163.
- Sridhar, P., Angadi, S.G., Sandhya Kiranmai and Anil Kumar. (2013) Effect of growth promoters and growth retardants on different growth parameters in jasmine (*Jasminum auriculatum* vahl.). *Plant Archives* 13(1): 569-571.