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EFFECT OF GROWTH REGULATORS ON GROWTH AND FLOWERING OF JASMINE (*JASMINUM SAMBAC*.AIT)

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ABSTRACT

Jasmine is an important commercial flower crop occupying larger area among the traditional flower crops grown in Tamil Nadu. 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 and attempt has been made to induce flowering during off season using growth regulators in Jasmine. The treatment comprises of both two growth promoting substances *viz.,* NAA and GA_3 and two growth retardants (Cycocel and Maleic Hydrazide). 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. Results of the experiment revealed significant differences among the growth regulator 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 T_3(GA_3@ 150 ppm). From the above studies, it is inferred that application of GA3 @ 150 ppm or NAA @ 75 ppm enhanced growth and higher flower yield in *Jasminum sambac.*

Key words:

INTRODUCTION

Jasmine is one of the oldest fragrant flowers and is specially appreciated in India, where most people have a love for the fragrant flowers. 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. Regulation of plant growth and development using natural plant hormones for greater production has received the utmost attention (Singh, 2001). 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 (Sreelatha *et al*., 1991). 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.

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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 under taken to study the effect of growth regulators at various concentrations on growth and flowering of Jasmine (*Jasminum sambac* Ait.).

MATERIALS AND METHODS

Two growth promoters (GA_3 and NAA) and two growth retardants (CCC, MH) at three concentrations each with three replications were taken up in randomized block design. Four plants were maintained for each replication along with a control and conventional pruning. After pruning, when the new shoots appeared with sufficient number of leaves, the freshly prepared Gibberellic acid (GA_3), Naphthalene acetic acid (NAA), 2-chloroethyl–trimethyl ammonium chloride; CCC and Maleic hydrazide (MH) were sprayed at different concentrations. 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.

RESULTS AND DISCUSSION

The results of the investigation undertaken with a view to study the effect of certain plant growth regulators on growth and flowering of Jasmine (*Jasminum sambac* Ait.) are

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		Internodal length (cm)		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	127.2	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	124.8	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	2.47	0.72	1.7	0.69	1.75	0.89	1.22	12.5	30.58

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 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

presented in Table1 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 Gibberllic acid @150 ppm (T3) which recorded the value of 127.8 cm and 175.5 cm at 90 and 180 DAP respectively. Among the various treatments, the maximum number of primary shoots was registered in NAA @ 75 ppm (T_6) which recorded the highest values (21.68 and 35.68) at 90 and 180 DAP respectively. This was followed by NAA @50 ppm (T_5) which produced 19.88 and 33.18 primary shoots 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 has the effective role to perform dwarfing process since it prevents the green growth and frustrates its length (Dole and Wilkins, 1999). This causes the internodes to shorten and stems to harden due to thickness. Significant differences were observed among the growth regulators tried in Jasmine. Gibberellic acid @150 ppm (T3) gave more number of internodes (17.98 and 43.59), which is followed by Cycocel @1500 ppm (T_9) (17.02 and 41.69). However least number of nodes was registered in T_{13} (Control) with 8.27 and 23.09 at 90 and 180 DAP respectively. The data on the length of internodes was significantly increased due to NAA @ 75 ppm (T6) (9.86 and 15.89 cm) which was followed by Gibberellic acid @150 ppm (T_3) with 8.96 and 14.59 resectively. 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. The maximum number of leaves per plant was found in the treatment GA_3 @150 ppm T_3 (1250.0 and 2689.5). This might be attributed to the enhanced vegetative growth in early phase attributed by exogenous application of GA_3 which would have favoured the increased photosynthesis and Co_2 fixation. The least number of leaves was registered in T_{13} (Control) a value of 794.4 and 2070.2 at 90 and 180 DAP respectively. This increased effect could be corroborated with the findings of Sridhar *et al.,* (2013) in *Jasminum auriculatum* and Thakor *et al*., (2017) in *Jasminum sambac*. Earliness in flowering (26.38 DAP) was noticed in T_3 (GA_3@ 150 ppm) followed by T_2 (GA_3 @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 GA_3 which would have favoured the increased photo synthesis and CO_2 fixation. Further, it would have favoured convenience of factors influencing floral initiation *ie.*, carbohydrate pathway and photo periodic pathway with GA_3 pathway. These results are in accordance with findings of Baskaran *et al.,*(2007) and Devadanam *et al.,* (2007) in Gladiolus. Delayed flowering was recorded in T_{12} 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 Sen and Maharana (1971) and 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. Maximum flowering duration was in T_3GA_3 @150 ppm, which recorded 171.00 days, followed by treatment T_2GA_3 @ 100 ppm with168.5 days. This might be attributed to the enhanced vegetative growth in early phase attributed by exogenous application of GA_3 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.

Among the various treatments significant increase in flower yield per plant was recorded in T_3 (GA_3 @ 150 ppm) with 460.34 and 615.72 g plant^{-1} at 90 and 120 DAP respectively. This is followed by T_2 (GA_3 @ 100 ppm) with 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 was observed in T_{13} (Control) (282.54 and 382.22 g plant^{-1}) (at 90 and 180 DAP). Among the treatments, T_3 (GA_3 @ 150 ppm) recorded the highest hundred flower weight of 600.76 g followed by T_2 (GA_3 @100 ppm) (595.66g). This might be attributed to the enhanced vegetative growth in early phase attributed by exogenous application of GA_3 which would have favoured the increased photosynthesis and CO_2 fixation. In the present study, the data on extended duration of flowering and hundred bud weight due to the application of GA_3 @ 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 GA_3 (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*.

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