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Neha Chopde
Horticulture Section, College of Agriculture, Amravati Road, Nagpur, Maharashtra, India

Amruta Pawar
Horticulture Section, College of Agriculture, Amravati Road, Nagpur, Maharashtra, India

VU Raut
Horticulture Section, College of Agriculture, Amravati Road, Nagpur, Maharashtra, India

Bhavishya Nikam
Horticulture Section, College of Agriculture, Amravati Road, Nagpur, Maharashtra, India

Correspondence
Neha Chopde
Horticulture Section, College of Agriculture, Amravati Road, Nagpur, Maharashtra, India

Response of *Jasminum sambac* L. to plant growth retardants

Neha Chopde, Amruta Pawar, VU Raut and Bhavishya Nikam

Abstract
A field experiment was carried out to study the response of *Jasminum sambac* L. to various growth retardants at Satpuda Botanic Garden, College of Agriculture, Nagpur from December, 2016 to August, 2017 in randomised block design with ten treatments of different levels of growth retardants *viz*., T_1 – 250 ppm cycocel, T_2 - 500 ppm cycocel, T_3 - 750 ppm cycocel, T_4 - 250 ppm malic hydrazide, T_5 - 500 ppm malic hydrazide, T_6 - 750 ppm malic hydrazide, T_7 - 250 ppm ethrel, T_8 - 500 ppm ethrel, T_9 - 750 ppm ethrel and T_{10} – control replicated thrice. The treatments were imposed on five year old plants of *Jasminum sambac* (L). The results revealed that, significantly maximum secondary laterals primary shoot^{-1}, number of flower buds plant^{-1}, flower yield plant^{-1}, diameter of flower bud and shelf life of flower and significantly earliest first flower bud initiation in *Jasminum sambac* L. were registered with the plants treated with 750 ppm cycocel which was closely followed by 500 ppm cycocel.

Keywords: Jasmine, growth retardants, growth, flower yield, quality

Introduction
Jasmine (*Jasminum sambac* L.*)* is a tropical or subtropical plant which belongs to the family O*leaceae*. It is an extremely fragrant and evergreen shrub grown on a large scale in different states for loose flower production. *Jasminum sambac* finds a very important place in the perfume industry. Jasmine oils are used extensively in the manufacture of cosmetics, soaps, confectionary perfumes, perfumed tobacco, syrups, aerated water, ointments, disinfectants and detergents. Flowers are used for making garlands, hair adornment of women and religious and social functions.

Regulation of flowering through growth retardants has immense practical value. Growth retardants are mostly synthetic compounds that either slow down the cell division or inhibit the cell elongation. These are mainly used in crop production because of their retarding effects on shoot growth and breaking of apical dominance which induce dwarf and bushy plant and increase the number of lateral branches in plants as reported by Bose and Hore (1967) [1]. The investigation was taken with the objective to find out the most suitable treatment of growth retardant for plant growth, flower yield and quality of *Jasminum sambac* L.

Materials and Methods
The present experiment was carried out at Satpuda Botanic Garden, College of Agriculture, Nagpur from December, 2016 to August, 2017 in randomised block design to find out the most suitable growth retardant for increasing growth, flower yield and quality of *Jasminum sambac* L. with ten treatments *viz*., T_1 –250 ppm cycocel, T_2 - 500 ppm cycocel, T_3 - 750 ppm cycocel, T_4 - 250 ppm malic hydrazide, T_5 - 500 ppm malic hydrazide, T_6 - 750 ppm malic hydrazide, T_7 - 250 ppm ethrel, T_8 - 500 ppm ethrel, T_9 - 750 ppm ethrel and T_{10} –control replicated thrice. The treatments were imposed on five year old plants of *Jasminum sambac* L.

The bushes of jasmine were pruned to a level of 30 cm length above the ground during first week of January, 2017. Recommended dose of nitrogen (120 kg ha^{-1}), phosphorus (240 kg ha^{-1}) and potassium (120 kg ha^{-1}) was then applied uniformly through chemical fertilizers to each treatment plot 15 cm deep in rings and 30 cm away from the main stem immediately after pruning. Half dose of nitrogen was applied immediately after pruning of the plants and the remaining half dose of nitrogen was applied at the stage of flower bud initiation. The solutions of various growth retardants as per the treatment were prepared and sprayed on the plants of jasmine in respective treatment plots one month after pruning.

All the cultural operations *viz*., weeding, irrigation, pest control etc. were carried out as and when required. Observations on various vegetative characters *viz.*, diameter of primary shoot, leaves primary shoot^{-1}, leaf area, productive shoots plant^{-1} and flowering parameters like days for 50 per cent flowering, flower yield ha^{-1} and quality parameters *viz*., diameter of flower bud and mean corolla tube length were recorded at proper stages and analysed statistically by the method suggested by Panse and Sukhatme (1995) [2].

Results and Discussion

Growth

The data presented in Table 1 revealed that, different treatments of growth retardants had significant effect on secondary shoots primary shoot^{-1} in jasmine, however, it was non-significant in respect of days for sprouting and number of sprouts plant^{-1}.

Total number of secondary laterals primary shoot^{-1} in jasmine was counted significantly highest with the plants treated with the treatment T_3 i.e. 750 ppm cycocel (8.14) which was followed by the treatment T_2 i.e. 500 ppm cycocel (7.49), however, the control treatment recorded minimum secondary laterals primary shoot^{-1} (5.50). The highest secondary laterals primary shoot^{-1} in jasmine were noted due to the treatment of cycocel 750 ppm followed by cycocel 500 ppm. Cycocel is known to restrict GA_3 synthesis process and also acts as an anti-auxin substance. Similarly, it breaks the apical dominance and increases the lateral branches in plants which in turn might have enhanced the number of secondary shoots primary shoot^{-1} in jasmine. Vasoya *et al*. (2015) [6] also registered the similar findings in gaillardia.

Flowering

There was significant effect of growth retardents on days required for first flower bud initiation. Significantly the earliest first flower bud initiation (78.67 days) was noticed with the treatment T_3 i.e.750 ppm cycocel and it was found to be at par with the treatments T_2 i.e. 500 ppm cycocel (80.00 days) and T_1 i.e. 250 ppm cycocel (80.33 days), whereas, the control treatment took maximum days for first flower bud initiation (87.00 days) in jasmine. These results are in concurrence with the findings of Sinha *et al.* (2014) [5] who also recorded the minimum number of days required for flower bud initiation and 50 per cent flowering in gaillardia due to application of CCC 750 ppm followed by 1000 ppm.

Flower yield

The effect of growth retardants on flower yield parameters viz., flower buds and flower yield plant^{-1} was statistically significant (Table 1)). The treatment T_3 i.e. 750 ppm cycocel recorded significantly maximum flower buds plant^{-1} (535.00) and flower yield plant^{-1} (212.67 g) which was closely followed by the treatment T_2 i.e. 500 ppm cycocel (516.00 and 212.67 g, respectively), whereas, minimum flower buds and flower yield plant^{-1} (485.33 and 188.00 g, respectively) were noted with the treatment T_{10} (control). This increase yield of jasmine flowers plant^{-1} might be due to production of higher number of flowers as a result of production of higher number of branches at early stage which had sufficient time to accumulate reserve carbohydrates for proper bud differentiation. The similar results on effect of cycocel on flower yield was observed by Rajyalakshmi and Rajasekhar (2014) [3] in marigold. They concluded that cycocel spray at 500 ppm ultimately helps to get higher flower yield in marigold.

Flower quality

The effect of growth retardants on length of flower bud in jasmine was found to be non-significant, however, it was significant in respect of diameter of flower bud and shelf life of flower.

The jasmine plants treated with the treatment T_3 i.e. 750 ppm cycocel recorded significantly maximum diameter of flower bud (9.60 mm) and shelf life of flower (40.80 hrs.) which were statistically at par with the treatment T_2 (9.27 mm and 39.03 hrs., respectively), whereas, the treatment T_{10} (control) noted minimum diameter of flower bud (8.61 mm) and shelf life of flower (30.27 hrs.). The flower buds harvested from the jasmine plants treated with cycocel were better in quality and remained fresh for longer time as compared to other treatments. This might be due to the fact that, cycocel increased number of lateral branches and ultimately leaves primary shoot^{-1} causing more utilization of photosynthetic products that would have produced better quality flowers and increased their turgidity which helped them to last longer after harvesting. The results are supported by Saiyed *et al*. (2010) [4] in gaillardia and Sinha *et al.* (2014) [5] in gerbera.

Table 1: Effect of growth retardants on growth, yield and quality of *Jasminum sambac* L.

Treatments	Days for sprouting (days)	Sprouts plant^{-1}	Secondary laterals primary shoot^{-1}	Days for first flower bud initiation (days)	Flower buds plant^{-1}	Flower yield plant^{-1} (g)	Length of flower bud (cm)	Dia-meter of flower bud (mm)	Shelf life of flower (hrs.)
T_1- Cycocel 250 ppm	10.83	36.76	7.15	80.33	500.33	200.67	1.79	9.03	36.89
T_2- Cycocel 500 ppm	11.50	41.45	7.49	80.00	516.00	206.00	1.88	9.27	39.03
T_3- Cycocel 750 ppm	10.50	39.70	8.14	78.67	535.00	212.67	1.93	9.60	40.80
T_4- Malic Hydrazide 250 ppm	11.67	36.69	7.08	84.67	499.67	200.33	1.99	8.74	35.83
T_5- Malic Hydrazide 500 ppm	11.87	36.74	6.92	86.33	497.33	193.67	1.85	8.77	35.12
T_6- Malic Hydrazide 750 ppm	10.83	39.63	7.09	83.33	501.67	201.33	2.00	9.00	34.43
T_7- Ehtrel 250 ppm	11.83	39.10	6.95	83.33	495.67	198.33	1.76	8.98	36.08
T_8- Ethrel 500 ppm	11.50	36.77	7.07	84.00	504.00	201.33	1.96	8.92	36.40
T_9- Ethrel 750 ppm	11.00	38.14	7.33	83.00	503.33	203.33	1.95	9.01	37.53
T_{10}- Control	11.50	42.01	5.50	87.00	485.33	188.00	2.01	8.61	30.27
F test	NS	NS	Sig	Sig	Sig.	Sig.	NS	Sig	Sig
SE(m)±	0.34	1.97	0.19	0.69	5.45	1.67	0.12	0.11	0.90
CD at 5%	-	-	0.58	2.06	16.20	4.95	-	0.33	2.67

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