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Priyanka Kunjam
Research Scholar, Department of Floriculture and Landscape Architecture, Pt. Kishori Lal Shukla College of Horticulture and Research Station, IGKV, Raipur, Chhattisgarh, India

Neelima Netam
Assistant Professor, Department of Floriculture and Landscape Architecture, Pt. Kishori Lal Shukla College of Horticulture and Research Station, IGKV, Raipur, Chhattisgarh, India

Toran Lal Sahu
Assistant Professor, Department of Floriculture and Landscape Architecture CHRS, Sankara, Patan, Durg, Chhattisgarh, India

Dikeshwar Nishad
Assistant Professor, Department of Agricultural Statistics and Social Science, Pt. Shiv Kumar Shastri College of Agriculture and Research Station, IGKV, Raipur, Chhattisgarh, India

Sushila
Assistant Professor, Department of Agricultural Economics, CARS, Marra, Patan, Durg, Chhattisgarh, India

Kaushal Kumar
Research Scholar, Department of Floriculture and Landscape Architecture, Pt. Kishori Lal Shukla College of Horticulture and Research Station, IGKV, Raipur Chhattisgarh, India

Garima Mandavi
Research Scholar, Department of Floriculture and Landscape Architecture, Pt. Kishori Lal Shukla College of Horticulture and Research Station, IGKV, Raipur Chhattisgarh, India

Corresponding Author:
Priyanka Kunjam
Research Scholar, Department of Floriculture and Landscape Architecture, Pt. Kishori Lal Shukla College of Horticulture and Research Station, IGKV, Raipur Chhattisgarh, India

Effect of plant growth regulators on flowering, yield and quality of jasmine (*Jasminum Sambac* L.)

Priyanka Kunjam, Neelima Netam, Toran Lal Sahu, Dikeshwar Nishad, Sushila, Kaushal Kumar and Garima Mandavi

Abstract
A field experimentation was carried out on "Effect of plant growth regulators on growth and yield of Jasmine (*Jasminum Sambac* L.)'' at Department of Floriculture and Landscape Architecture, Pt KLS College of Horticulture & Research Station, Rajnandgaon Chhattisgarh, during the year 2021-22. The investigation of research was to find out the reaction of Jasmine plant to the use of PGRs in different concentrations ie. Cycocel (500, 1000, 1500 ppm) and Maleic hydrazide (500, 1000, 1500 ppm). The result revealed that Minimum number of days taken for first bud initiation (60.33 days) and minimum days to flower opening from bud initiation(16.07days) were noted in CCC @1500 ppm and also CCC @ 1500 ppm gives maximum flowering duration, flower weight, flower diameter and Shelf life of flower (47.00 days, 0.093 g, 24.94 mm and 2.50 days respectively). Maximum number of flower per plant (102.87) was observed under MH @1500 ppm. The yield attributes *viz*. yield/plant (15.16 g), yield/plot (0.30 kg), yield/ha (3.03 t) was maximum under MH @1500 ppm. These research reported minimum for every traits in control under different concentration of PGRs taken in the experiment.

Keywords: Jasmine, MH, CCC, flowering, yield and quality parameters

Introduction
Jasmine (*Jasminum sambac* L.) is a tropical and subtropical flower plant which belongs to the Oleaceae family. Its native habitat is South East Asia. *Jasminum sambac* commonly known as Mogra is an evergreen most important traditional commercial flower crops and it is widely grown for its fragrant attractive flowers. Propagation of Jasmine is generally done by cutting and layering. Jasmine is grown as shrubs and climber for its beautiful evergreen foliage and produce flowers generally around the summer to the rainy days. However, certain Mogra plants can bloom during the month of March to June. Mogra (*Jasminum sambac* L.) is an evergreen plant that reaches up to 1 to 3 m in height. The leaves are opposite or in whorls of three, simple, ovate, 4 to 12.5 cm long and 2 to 7.5 cm broad. The flowers are produced in clusters of 3 to 12 together, strongly scented, with a corolla 2-3 cm diameter with 5 to 9 lobes. The Plant growth regulators (PGRs) consist of organic molecules produced synthetically and used to alter the growth of plants or plants parts. Plant growth regulators 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. Capable to regulate of plant growth and development. Growth and flowering responses of ornamental plant to these chemical substances havebeen intensively studied with a view to have compact plants with greater number of flowers.

The effect of MH is to inhibit mitosis in the meristematic region and plant metabolic studies have shown that, besides its many physiological side activities, MH acts as an antagonist of pyrimidine bases (Appleton *et al.* 1981) [27]. MH is incorporated into RNA of cells where it substituted for cytosine rather than for uracil, its structural isomer. Incorporation was found to take place in the undifferentiated RNA fraction, as well as in t-RNA. The mode of action of MH with regard to its ability to interfere with protein biosynthesis and cell growth With
regard to plant metabolism, it has been stated that MH becomes fixed within the plant and is not metabolized, however the conversion of MH to its β-D- glucoside as the predominant soluble metabolite, with a yield of between 2 and 15%, was reported by Komossa and Sandermann (1995) [28]

The Cycocel is a synthetic growth retarding chemicals extensively used for dwarfing of plants or plant parts (Clark and Fedac, 1977) [29].

Materials and Methods

The present investigation was carried out during Rabi season of the year 2021-22 at the Horticultural Research cum Institutional Farm, Pt. K.L.S. College of Horticulture and Research Station, Pendri, Rajnandgaon, I.G.K.V. Raipur, Chhattisgarh. The reason is located at about 21.100 N latitude and 81.030 E longitudes with an average altitude of 307 m above the mean sea level. A field experiment was laid out in Randomized Block Design (RBD) with ten treatments and replicated three *viz*., Control (T1), GA3 100 ppm (T2), GA3 150 ppm (T3), GA3 200 ppm (T4), MH 500 ppm (T5), MH 1000 ppm (T6), MH 1500 ppm (T7), CCC 500
ppm (T8), CCC 1000 ppm (T9), CCC 1500 ppm (T10). Pit with dimension 30 cm2 were
prepared at a spacing of 1 x 1 m2 on October 2021 in Pt. K.L.S. Collage of Horticulture and Research Station Rajnandgaon. The experimental plot on transplanting dated 26th October and spray date 23 December 2021 at the spacing of row x plant, 5 m x 5 m. The three growth regulators like GA3, MH, and CCC were taken. The plant growth regulators of the respective concentration were foliar spraying twice at 60 DAS with the help of hand sprayer.

Observations on flowering parameters *viz*., Number of Days taken for flower bud initiation, Days from flower bud initiation to flower opening, Duration of flowering (days), Number of flower plant-1, flower yield plant-1(g), flower yield plot-1 (kg), flower yield hectare-1 (t), also quality parameters *viz*., flower weight (gm), Flower diameter, shelf life (days).

Result and Discussion

Flowering parameters

The data presented in table 1 revealed that, significantly the minimum number of day taken for first bud initiation was recorded by CCC @ 1500 ppm (60.33 days) (T10) treatment and it was followed by (T6) MH @ 1000 ppm (61.27 days). Maximum days taken for first bud initiation were observed in control which was statistically highest among the different concentration of PGRs treatment (66.80 days). Our results are in agreement with the reports of Sathyanarayana Reddy *et al.* (1997) [15] in tuberose. Reduced level of endogenous gibberellins might be a prerequisite for floral induction which was achieved by the retardants sprays. Early flowering in CCC treated Jasmine plant because of the anti-gibberellin action of CCC. Early visibility of bud and flowering early bud initiation and flowering with Cycocel treated plants might be due to the fact such plants have built up sufficient food reserves at initial stages due to reduction in plant height and increase number of branches. This reserve food has been utilized for reproductive purpose with a restriction on vegetative growth and also due to gibberellins action of Cycocel (Ramesh *et al*., 2001) [14]. The minimum days to flower opening from bud initiation was recorded by (T10) CCC @ 1500 ppm (16.07 days) and it was followed by (T8) @ CCC 500 ppm. It was noted that, control treatment take maximum days to flower opening from bud initiation (22.61 days) among the all treatment. Cycocel improve in carbohydrate accumulation, changes in morphogenesis, photosynthetic capacity and phytohormonal balance, as well as, promoting the sucrose content in leaves by a considerable coefficient during the full blossoming period (Zheng *et al*., 2012) [26]. CCC @ 1500 ppm (T10) recorded maximum duration of flowering (47.00 days) which was at par with @ 1000 ppm
(44.20 days) (T9). Whereas control (T1) reported minimum flowering duration. Cycocel increased the flower duration by maintaining the levels of chlorophyll, protein and RNA content of leaves at a higher level for a longer duration suppressing the senescence (Kar *et al*., 1989) [5].

Yield parameters

The maximum number of flower per plant (g) (102.87) was recorded in (T7) in @ MH 1500 ppm (T7) and it was par with MH @ 500 ppm (T5) (96.13), MH @ 1000 ppm (T6) (100.07) and CCC @ (T10) (95.87). In research, control was reported minimum number of flower per plant (31.27) among the all treatment of plant growth regulators. MH gives more number of flowers might be due to more number of branches. As the apical dominance of the plant was suppressed, it allowed the lateral branches to grow more, resulting in increased number of flowers per plant. Similar results were also obtained by Narayana and Jayanti (1991) [4] in African Marigold and also CCC gives more number of flowers might be due to more number of branches. As the apical dominance of the plant was suppressed, it allowed the lateral branches to grow more, resulting in increased number of flowers per plant. Similar results were also obtained by Narayana and Jayanti (1991) [4] in African marigold. The maximum flower yield plant-1 (15.16 g) was recorded in MH @ 1500 ppm (T7) treatment and it was at par with CCC @ 1500 ppm (T10) (15.01 g). In research, control was reported minimum flower yield plant-1 (2.61 g) in all treatment of plant growth regulators. MH resulted in reduction in plant height by suppressing the role of auxin and gibberillin which ultimately increased the number of main and secondary branches, thereby increasing flowers yield (Sharma *et al.*, 1995; Dutta *et al*., 1998; Navale M U *et al*.) [18, 3, 11]. Due to increased rate of photosynthesis and ultimately higher manufacture of photosynthesis increased the flower yield per ha. These results confirmed with the finding of Shah *et al*. (1994) [17], who observed CCC 5000 ppm concentration produced maximum yield of flowers. CCC produced maximum yield of flowers. Similar facts were observed by Dahiya and Rana (2001) [1]. The maximum flower yield per plot (0.30 kg) was recorded in (T7) MH @ 1500 ppm and it was at par with MH @ 1000 ppm (T6) (0.27 kg) and (T10) CCC @ 1500 ppm (0.30 kg). Control treatment was reported minimum flower yield per plot (0.05 kg) from the all plant growth regulators taken in research. Increase in flower yield might be due to reduced plant height by suppressing the apical dominance. The results are in conformity with the findings of Navale *et al.* (2010) [11], Dutta and Ramdas (1998) [3], Sharma *et al.* (1995) [18], Sen and Maharana *et al.* (1971) [16] and Meher *et al.* (1999) [8] in Chrysanthemum. The results of the present study are in agreement with the findings of Meera Manjusha in gerbera and Patil *et al.* in golden rod. It is a well- known fact that all the growth retardants can suppress apical dominance, resulting in increased biometric characters like more number of branches and leaves ultimately leading to maximum leaf area compared to the control. This may lead to the production of more photosynthates that were diverted to the sink (flower) and thereby increased number of flowers with better size, weight and ultimately the yield (Sujatha *et al* 2009) [23]. The maximum flower yield per hectare (3.03 tonnes) was examined in MH @ 1500 ppm (T7) treatment and it was at par with (T10) CCC @ 1500 ppm (3.00 tones). Control

treatment was reported minimum flower yield per hectare (0.52 tones) from the all plant growth regulators taken in research. The results of the present study are in agreement with the findings of Varma and Arha (2004) [25] in African marigold and Patil *et al*., (2004) [13] in golden rod with MH spray. Due to increased rate of photosynthesis and ultimately higher manufacture of photosynthesis increased the flower yield per ha. These results confirmed with the finding of Shah *et al.* (1994) [17], who observed CCC 5000 ppm concentration produced maximum yield of flowers. CCC produced maximum yield of flowers. Similar facts were observed by Dahiya and Rana (2001) [1]

Quality Parameters

The data presented in table 1 revealed that, the treatment significantly the maximum flower weight was recorded in CCC @ 1500 ppm (T10) (0.093 g) and it was followed by MH @ 1500 ppm (T7) (0.078 g). Significantly minimum weight of flower (0.054 g) obtained in control. The weight of flowers increased due to in addition rate of photosynthesis is also accelerated by earlier formation of flower buds with cycocel, which provides the sink for accepting the surplus assimilates and avoids the accumulation of photosynthetic. Mohariya *et al.* (2003) [9] was recorded the same view in chrysanthemum, who found that the use of CCC for improving the flower weight in Chrysanthemum. The maximum flower diameter was observed in (T10) @ 1500 ppm (24.94 mm) and it was followed by (T4) GA3 @ 200 ppm
(24.88 mm), while minimum diameter of flower (21.12 mm) was noted in control. The production of big sized flowers due to growth retardants might be due to the indirect effect of more number of laterals, increased number of leaves with thick texture as stimulated and developed by the influence of such chemicals. However, the flower diameter was not influenced by the application of growth retardants in *J. grandiflorum*. The results of the present study are in confirmation with the earlier findings of Kumar and Haripriya in nerium. The maximum shelf life of flower was recorded in CCC (T10) @ 1500 ppm (2.50 days) and it was at par with (T8) CCC @ 500 ppm (2.17 days) and (T9) CCC 1000 ppm (2.33 days) while minimum shelf life of flower (0.50 days) was noted in control. The shelf life of flowers increased by CCC application due to greater accumulation of photosynthetic; utilization of minerals and translocation of assimilates. The findings are in accordance with the finding of Rakesh *et al.* (2006) [10].

Table 1: Effect of plant growth regulators on flowering, yield and quality parameters of Jasmine. (DAS)

Treatment	Treatment Combinations	Number of days taken for flower bud initiation	Days taken from flower bud initiation to flower opening	Duration of flowering (days)	Number of flowers plant-1	Flower yield plant-1 (g)	flower yield plot-1 (kg)	Flower yield hactare-1 (t)	flower weight (g)	flower diameter (mm)	Shelf life (days)
T1	Control	66.80	22.61	36.40	31.27	2.61	0.05	0.52	0.054	21.12	0.50
T2	GA3 100	66.00	20.61	37.47	91.67	10.61	0.21	2.12	0.066	22.27	1.00
T3	GA3 150	66.53	19.26	36.67	87.27	10.49	0.21	2.10	0.067	22.62	1.33
T4	GA3 200	64.93	16.73	36.87	82.87	9.91	0.20	1.98	0.067	24.88	1.50
T5	MH 500	62.00	17.09	41.93	96.13	9.69	0.19	1.94	0.058	22.05	1.67
T6	MH1000	61.27	17.71	37.33	100.07	13.31	0.27	2.66	0.066	23.57	1.83
T7	MH1500	64.67	18.53	37.33	102.87	15.16	0.30	3.03	0.078	23.29	2.00
T8	CCC 500	63.60	16.53	40.20	85.27	9.88	0.20	1.98	0.057	22.95	2.17
T9	CCC 1000	64.80	18.09	44.20	92.20	12.62	0.25	2.52	0.068	23.17	2.33
T10	CCC 1500	60.33	16.07	47.00	95.87	15.01	0.30	3.00	0.093	24.94	2.50
	SEm±	0.32	0.21	1.46	3.05	0.45	0.01	0.11	0.003	0.01	0.12
	C.D. at 5%	0.96	0.64	4.33	9.07	1.35	0.04	0.34	0.009	0.03	0.34
	C.V.	0.88	2.03	6.39	6.11	7.19	10.63	9.01	7.63	0.06	11.85

Conclusion

Based on the findings of the present experiment results it is concluded that the treatment T10 were found to be the most superiors for flowering parameter *viz.* number of days taken for flower bud initiation, days taken from flower bud initiation to flower opening and duration of flowering, weight of flower, flower diameter and shelf life were noticed to be significant in application of CCC 1500 ppm. The application of MH 1500 ppm were noted to be superior for number of flower per plant, flower yield per plant (gm), flower yield per plot (kg), Flower yield per hectare (t). In research, amongst all treatment control was found inferior for the use of different concentration of PGRs.

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