

Original Research Article

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Effect of Plant Growth Regulators on Growth and Flower Yield of Jasmine (*Jasminum nitidum*) c.v CO-1 (Star Jasmine)

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ABSTRACT

A study was conducted in Floriculture Unit of the Department of Horticulture, Naini Agriculture Institute, SHUATS, Prayagraj during 2019-20 to evaluate the growth, flowering and yield of *Jasminum nitidum* c.v CO-1 (Star Jasmine) with the effects of four growth regulators namely Naphthalene acetic acid (NAA), Gibberellic acid (GA₃), Cycocel and Maleic hydrazide (MH) each at 3 concentrations. The experiment comprised of 13 treatments, T1-Control (water spray), T2-NAA(25ppm), T3-NAA(50ppm), T4-NAA (75 ppm), T5-GA₃ (25ppm), T6-GA₃ (50ppm), T7-GA₃ (75ppm), T8-CCC (500ppm), T9-CCC (750ppm), T10-CCC (1000ppm), T11-MH (100ppm), T12-MH (200ppm), T13-MH(250ppm), and was laid out in Randomized Block Design and replicated thrice. The results were revealed that plant height with 80cm was superior at GA₃ 75ppm concentration over rest of the treatments. Cycocel at 750ppm and MH at 250ppm were equally effective in increasing the plant spread in N-S (47.7cm) and E-W (46.3 cm) and closely followed by NAA at 75ppm (47.7 cm and 41.7cm). MH at 250ppm increased number of primary branches per plant (5.7) followed by NAA at 75ppm. MH at 200ppm significantly increased secondary branches per plant (11.3) followed by GA₃ at 75ppm. Cycocel at 1000 ppm induced early flowering (78.67 days) followed by GA₃ at 75ppm and MH at 250 ppm with 80 days. MH significantly increased flower yield (2.03kg/plant/year) at 250ppm. Based on these studies, it can be recommended that primary branches and flower yield can be increased by spraying of MH at 250ppm in *Jasminum nitidum* c.v CO-1 (star jasmine).

Keywords

Cycocel, GA₃, MH,
NAA, Star Jasmine

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Introduction

Jasmine is one of the oldest of 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 since time immemorial, it

is considered as a spiritual flower of India. Jasmine is considered as the "King of Oils" (Rose is the "Queen") especially for its flowers and sweet fragrance. A single jasmine vine can perfume an entire room or garden. India is one of the centers of origin of jasmine. For the past many centuries jasmines have adorned the gardens of Central

and South East Asia, Afghanistan, Iran, Nepal and many other tropical and sub-tropical countries and many of the jasmine species are native of India and have their origin in the Southern Foothills of the Himalayas.

The jasmine belongs to family 'Oleaceae' and the Genus *Jasminum* comprises of about 500 species, which are dispersed in the warmer parts of Europe, Asia, Africa and the Pacific region (Bhattacharjee, 1980). A critical analysis of these species, however, has revealed the number of true species to be only 89, of which 40 inhabit the Indian sub-continent.

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.

Tamil Nadu Agriculture University (TNAU) newly-released CO-1 Star jasmine (*Jasminum nitidum*), which promises flower throughout the year as an alternate to the traditional jathi malli. A main stay in temple rituals, jathi malli becomes expensive and unavailable during winter (between November and February) because it is off season for the variety. To address the issue, TNAU developed the new variety of jasmine, which will flower throughout the year especially in the lean season (Nov-Feb). *Jasminum nitidum* c.v CO-1 (star jasmine) is an evergreen and bears dual characteristics, it acts like a shrub when planted alone and can be pruned to desired shape to act like a ground cover, as well as like a twining vine

(semi-climber) and climbs using tendrils or twines when planted near a support, reaching up to 3-4 feet as shrub alone and can climb up to 20 feet as a vine. It has a fast-growing habit and can be used as indoor plant too.

The plants, have long woody stem and bold buds with pinkish tinge, which blooms into snow white star shaped flower with 10 petals which are leaner, longer and spread out. The flower bears a mild pleasing scent and appears in cluster forms (inflorescence) with slaver form shape (tubular base and open flat petals). The flowers bloom at night and easy to pluck, with its long stem and bold buds, it is easier to string them too. The flowers will not droop for four to five hours. The buds, after plucking and even stringing, remain unopened for 12 hours under room temperature and could remain so for 60 hours under refrigeration. Leaves are smooth, leathery, simple (not divided), lanceolate (broad at center) with opposite arrangement and dark glossy green which in addition makes the plant attractive.

Developments after the discovery of growth regulators and their application in agriculture and more especially in horticulture are significant. Regulation of plant growth and development using natural plant hormones for greater production have received the utmost attention (Leetham *et al.*, 1978). Growth and flowering responses of ornamental plant 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 (Cathey, 1980).

The term "Plant Growth Regulators" was proposed by Tukey *et al.*, (1954) to include natural and artificial compounds. They are defined as organic compounds other than nutrients, which in small amounts promote,

inhibit or otherwise modify any physiological process in plants. The key uses of plant growth regulators in ornamental horticulture and floriculture include regulation of plant height, profusion of branching, propagation of cuttings, control of flowering, enhancing stress tolerance, increasing post-harvest longevity during shipping, storing and marketing besides increasing the display of flowers and potted plants. These hormones are defined as organic compounds, other than nutrients, produced by plants in minute quantities, which in low concentration regulate namely, promote, inhibit or otherwise modify different phases of plant growth and development.

Hence the paper deals with the effect of plant growth regulators on growth and flower yield of jasmine (*Jasminum nitidum*) c.v co-1 (Star jasmine) with the aim to include foliar application of those on a new variety of jasmine in order to know its positive effect on productive and economical yield aspects.

Materials and Methods

The present investigation was carried out in form of a field experiment in the garden of the Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India during 2019-20. This area is situated on the right side of the Yamuna River by the side of Prayagraj-Rewa road about 12 km from the city. Prayagraj has a subtropical and semi-arid climatic condition, south-eastern part of Uttar Pradesh prevails with both extremes of temperature, *i.e.* in winter, during December and January temperatures sometime fall very low up to 3°C, while the weather becomes very hot in summer with the temperatures sometimes soaring to a high of over 48°C in May and June.

The soils were characterized as sandy loam in texture with pH 7.3 analyzed using glass electrode pH meter, electrical conductivity 0.30 dS/m analyzed using conductivity meter (Jackson, 1973), organic carbon 0.55% Walkley and Black method (Nelson and Sommer, 1982), available N 261.725 kg/ha Alkaline potassium permanganate method for nitrogen (Subbiah and Assija, 1956), available P 18.4 kg/ha analyzed by Olsen's method (Nelson and Sommer, 1982) , available K 251.6 kg/ha analyzed by Flame photometry (Jackson, 1973).

The experiment was laid out in Randomized Block Design. There were 13 treatments and each replicated thrice. Treatments were allocated randomly to each replication. T1-Control (water spray), T2-NAA (25ppm), T3-NAA (50ppm), T4-NAA (75 ppm), T5- GA₃ (25ppm), T6- GA₃ (50ppm), T7-GA₃ (75ppm), T8-CCC (500ppm), T9-CCC (750ppm), T10-CCC (1000ppm), T11-MH (100ppm), T12-MH (200ppm), T13-MH (250ppm).

For growth attributes, the height of plant was measured from the base of the plant to the highest point of the uppermost leaf and expressed in centimeter, Number of primary branches and secondary branches per plant are counted, Plant spread from north to south and east to west are measured and expressed in centimeters. The observations were recorded at 30 days intervals from planting to harvesting of flower buds.

For yield attributes, the number of days taken for flower bud initiation was recorded by counting the days, the number of flower buds per plant was counted and average numbers of flower buds were recorded, the yield of flowers per plant is weighed daily and calculated per year and converted it into tonnes/hectare per year.

The data from the experiments were analyzed statistically, wherever treatment differences were found significant, the critical differences were worked out at 5% level of probability ($P=0.05$).

Results and Discussion

Growth parameters

The highest plant height was observed with the application of GA₃ - 75 PPM (80.00 cm) which was significantly superior over control (32.70 cm) (Table 1). 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. GA₃ can affect plant growth by its effect on cell growth and cell elongation leading to bigger plants.

The number of primary branches were found to be significant among the treatment. The maximum numbers of primary branches (5.7) were recorded in treatment with MH 250 ppm. The highest secondary branches were observed with the application MH 200ppm (11.30 cm) which was significantly superior over control (6.00 cm) (Table 1). Effect of MH significantly decreased plant height and internodal length, increased plant spread, number of branches. MH probably interfered with metabolic activities of the plant by intercepting nutrient assimilation and growth.

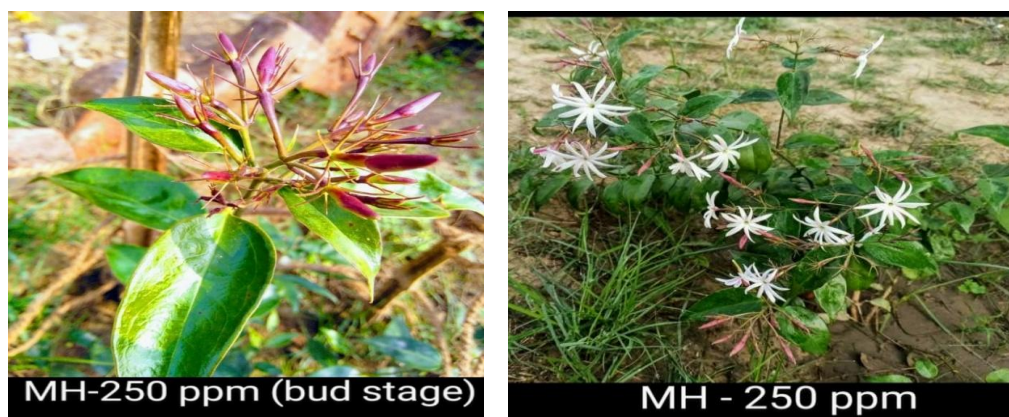
Table.1 Effect of Plant Growth Regulators on Growth Parameters of Jasmine (*Jasminum nitidum*) c.v CO-1 (Star Jasmine)

TREATMENTS	PLANT HEIGHT (cm)	PRIMARY BRANCHES (no.)	SECONDARY BRANCHES (no.)	PLANT SPREAD (N-S) (cm)	PLANT SPREAD (E-W) (cm)
CONTROL	32.7	2.7	6.0	24.3	26.0
NAA - 25 PPM	26.7	2.3	4.7	41.3	40.7
NAA - 50 PPM	44.8	3.7	7.3	36.7	36.0
NAA - 75 PPM	47.9	5.0	6.0	47.7	41.7
GA ₃ - 25 PPM	27.0	1.7	1.7	17.7	29.0
GA ₃ - 50 PPM	52.0	4.7	7.7	42.0	37.3
GA ₃ - 75 PPM	80.0	4.3	11.0	38.3	30.7
CCC - 500 PPM	33.7	4.7	6.7	35.0	31.8
CCC - 750 PPM	53.3	4.3	8.3	47.7	45.7
CCC - 1000 PPM	36.0	2.7	6.7	30.7	34.7
MH - 100 PPM	41.0	4.0	11.0	42.0	32.7
MH - 200 PPM	29.3	4.0	11.3	28.7	32.7
MH - 250 PPM	53.3	5.7	10.7	47.3	46.3
F-test	S	S	S	S	S
S.Em ±	8.51	0.78	1.86	6.06	4.18
CD (0.05)	24.85	2.27	5.42	17.68	12.21

Table.2 Effect of Plant Growth Regulators on Yield Parameters of Jasmine (*Jasminum nitidum*) c.v CO-1 (Star Jasmine)

TREATMENTS	DAYS TO BUD APPEARANCE	NUMBER OF FLOWERS PER PLANT	Kg/Plant/Year	T/ha/year
CONTROL	118.00	354.09	0.85	3.78
NAA - 25 PPM	91.67	476.63	1.14	5.08
NAA - 50 PPM	92.67	569.47	1.37	6.07
NAA - 75 PPM	86.67	577.67	1.39	6.16
GA ₃ - 25 PPM	91.67	388.53	0.93	4.14
GA ₃ - 50 PPM	96.00	436.56	1.05	4.66
GA ₃ - 75 PPM	80.00	811.20	1.95	8.65
CCC - 500 PPM	88.00	464.51	1.11	4.95
CCC - 750 PPM	89.67	463.32	1.11	4.94
CCC - 1000 PPM	78.67	671.69	1.61	7.16
MH - 100 PPM	98.33	451.39	1.08	4.81
MH - 200 PPM	88.00	608.35	1.46	6.49
MH - 250 PPM	80.00	847.72	2.03	9.04
F-test	S	S	S	S
S.Em ±	6.80	80.83	0.19	0.86
CD (0.05)	19.84	235.91	0.57	2.52

Fig.1



The highest plant spread (N-S) was observed with the application of NAA- 75 ppm and CCC 750 ppm (47.7 cm) which was significantly superior over control (24.3 cm) by 96.2 % (Table 1). Auxin is probably investigated plant hormone and to be involve in virtually in every aspect of plant growth

and development. Auxin group NAA increases the growth of the plants by cell division, cell elongation apical dominance. The highest plant spread (E-W) was observed with the application of MH 250ppm (46.3) which was significantly superior over control (26.00 cm) by 78% (Table 1).

Yield parameters

Early flowering was observed with CCC 1000 ppm (78.67 days) that is 39.33 days earlier than control which obtained flowering at 118 days, this might be due to anti-gibberellin action of CCC.

Highest number of flowers (847.72) and yield per plant (2.03 kg/plant/year), per hectare (9.04 t/ha/year) was observed in MH 250ppm which is superiorly higher over control by 139.4% (354.09, 0.85kg/plant/year, 3.78t/ha/year) (Table 2). This might be due to more number of branching.

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