Original Research Article

Effect of different plant growth regulators applied as foliar sprays on the growth and flowering of Brinjal (*Solanum melongena* L.) under agro-climatic conditions of Chhattisgarh plains

ABSTRACT

Present investigation "Effect of different plant growth regulators applied as foliar sprays on the growth and flowering of Brinjal (*Solanum melongena* L.) under agro-climatic conditions of Chhattisgarh plains" in *var.* Kashi Taru is located at the farm of KVK (Raipur) affiliated with IGKV, Raipur,(C.G.) in *Rabi* season 2022-23.The experiment was conducted in RBD (Randomized Block Design) with 3 replications, consisting of 10 treatments of 3 plant growth regulators with different concentrations, including GA_3 (25, 50 and 75 ppm); IAA (25, 50 and 75 ppm) and NAA (25, 50 and 75 ppm) along with controlas foliar application at pre flowering stage (30 DAT) and pre fruiting stage (45 DAT).Among the different treatments, the findings indicated that the application of Treatment T_3 i.e. GA_3@75 ppm gave the maximum plant height (89.96 cm), primary branches (11.76) and secondarybranches (25.17) per plant over control. The least days taken to 50% flowering wererecorded (51.62 days) with GA_3@ 75 ppm and maximum days taken to 50% flowering were found with control (58.87 days). The highest number of flowers per cluster was recorded in GA_3@ 75 ppm (4.01), followed by NAA@75 ppm (3.97). Thus, a suitable level i.e., 75 ppm of GA_3, is effective in enhancing brinjal growth and floweringin the agro-climatic conditions of the Chhattisgarh plains**.**

Keywords: Brinjal, Growth, NAA, GA_3, IAA.

1. INTRODUCTION

Brinjal, or eggplant, is a popular vegetable crop. It belongs to the family Solanaceae and is widely distributed in subtropical and tropical countries. According to Whitaker and Stommel (2003) [16], brinjal has all the essential vitamins, minerals, nutritional fibre, proteins, and antioxidants. It also contains certain phytochemicals that have scavenging properties. In India, Brinjal covered 7.47 lakh thousand ha with 12.982 million thousand MT of production and productivity of 17.36 thousand MT/ha (Anon., 2021) [2], instead of Chhattisgarh, which has a production area of 37.768 thousand ha and a productivity rate of 18.21 thousand MT/ha, which produces 6.91245 lakh thousand MT (Anon., 2020) [1].

PGR is a broad category of organic substances (other than vitamins and nutrients) that, in very small quantities, alter physiological processes (Wareing and Phillips, 1978) [14]. Growth regulators are organic compounds other than nutrients, a small amount of which is capable of modifying growth (Leopold, 1963) [6].

Gibberellic acid (GA_3), a plant hormone stimulating plant growth and development, is a tetracyclic diterpenoid compound. Gibberellins have been reported to affect almost all plant organs, but their spectacular effects are still on stem elongation (Low, 1975) [7].

Indole-3-acetic acid (IAA) is produced in the apical region and meristematic tissues of plants, primarily in young leaves. It is a plant bio regulator that controls one or more specific physiological processes within a plant (Waheed *et al.*, 2014) [15]. Indole acetic acid (IAA) has been reported to increase the percentage of long-style flowers in *Solanum khasianum* (Ravindran, 1981) [11].

The synthetic plant hormone NAA is from the auxin family. NAA iscommonly used in horticulture crops. The higher concentration of NAA inhibits growth and exerts toxic effects on the plant. So, the optimum concentration is the required for the beneficial effect of NAA. (Basnet *et al.*2021) [5]. Therefore, the present investigation was designed to find out the suitable plant growth regulators for increasing the growth and floweringattributes in brinjal.

2. MATERIAL AND METHODS

The present investigation entitled “Effect of different plant growth regulators applied as foliar sprays on the growth and flowering of Brinjal (*Solanum melongena* L.) under agro-climatic conditions of Chhattisgarh Plains” in *var.* Kashi Taru was conducted at the farm of Krishi Vigyan Kendra, Raipur, during the *rabi* season of 2022-2023 under Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.).The seeds of Brinjal variety Kashi Taru sown in nursery were obtained from Krishi Vigyan Kendra, Raipur. The seeds of brinjal after treating with carbendazim @ 3 g/kg were sown in pro-trays on 15 October 2022, which contained coco peat and vermiculite, with water sprinkled on a daily basis. On November 17, 2022, experimental material was transplanted. The number of plants cultivated in the field for each plot is 20, and the total number of plots is 30. Five competitive plants were chosen at random from each plot to be observed on various characteristics. The growth and flowering parameters were recorded, i.e. plant height (cm) at 30, 60 and 90 days after transplanting, number of primary branches per plant and number of secondary branches per plant at harvest,Number of flowers per cluster,days to first, and 50% flowering. The experimental material consisted of ten Brinjal treatments planted in a Randomized Block Design with three replications. The plant growth regulators *i.e.*, GA_3, IAA and NAA were used at different concentrations by using foliar sprays (at 30 and 45 DAT). The plants were transplanted in the field at 75 cm row to row and 60 cm plant to plant spacing, with a plot size of 3.5 x 3.2 m. The details of treatment comprised of GA_3 (25, 50 and 75 ppm), IAA (25, 50 and 75 ppm), NAA (25, 50 and 75 ppm) and control (distilled water).The experimental site is the farm of Krishi Vigyan Kendra, Raipur. Raipur is located in the central part of the Chhattisgarh, agro-climatologically known as the Chhattisgarh plains, at an altitude of 289.56 meters above mean sea level (MSL) between 21.25° N latitude and 81.62° E longitude. Raipur is characterized as a slightly moist-hot zone with an average annual rainfall of 1200-1400 mm mainly concentrated between June and September, with occasional light showers during the winter and summer season. Southwestern monsoon receives the largest part of rainfall. May and December are, respectively, the hottest and coolest months of the year. Overall, the highest daily temperature in the summer season runs as high as 46°C and in the winter at

least as high as 10°C. The RH is high from July to October and wind velocity is high from May to month of August. In Raipur, the average amount of annual precipitation is 1290 mm.

3. RESULTS AND DISCUSSION

3.1. Plant height (cm)

Result showed that at 30 days after transplanting, the maximum plant height was recorded in treatment T_3 i.e. GA_3@75 ppm (29.15 cm), followed by T_9 i.e. NAA@75 ppm (28.98 cm) as compared to other treatments. The minimum plant height was observed in treatment T_{10} (20.30 cm) under control. At 60 days after transplanting, significantly maximum plant height was registered in treatment T_3 (61.58 cm), followed by treatment T_9 (60.79 cm). However, minimum plant height was observed in treatment T_{10} (46.93 cm) as control. While at 90 days after transplanting, the treatments T_3 (89.96 cm) showed maximum plant height followed by T_9 (88.13 cm) as compared to other treatments. However, treatment T_{10} (62.26 cm) as control was recorded with minimum plant height.This may be due to foliar application of GA3 influence stimulating plant growth and development which ultimately helped in improving the plant height. Similar findings have been reported by Sahu *and Choudhary*(2022) [12] in brinjal and Baby *et.al.* (2018) [4] in tomato.

3.2. Number of primary branches per plant

At harvest, the number of primary branches plant^{-1} ranged from 8.56 in treatment T_{10} (control) to 11.76 in treatment T_3(GA_3 @ 75 ppm). Therefore, the maximum number of primary branches per plant is seen in Treatment T_3(GA_3 @ 75 ppm). Similar findings were also observed by Singh *et al.* (2018) [13] in brinjal and Prasad *et al.* (2013) [9] in tomato.

3.3. Number of secondary branches per plant

The data showed that at harvest, significantly maximum numbers of secondary branches per plant were recorded at harvest in treatment T_3 i.e. GA_3 @75 ppm (25.17) followed by treatment T_9 i.e. NAA @75 ppm (24.80) as compared to other treatments. While, minimum number of secondary branches per plant observed in treatment T_{10} (20.25) as control. Similar findings were also observed by Singh *et al.* (2018) [13] in brinjal and Prasad *et al.* (2013) [9] in tomato.

3.4. Days to first flower initiation

The days to first flower initiation was significantly influenced by different treatments. The first flower initiation was recorded under treatment T_3 i.e. GA_3@ 75 ppm (36.23 days) followed by treatment T_9 i.e. NAA@75 ppm (36.89 days) as compared to other treatments. While, the late flowering was recorded days in treatment T_{10}i.e. control (40.28 days). The earliness in the flowering might be due to the fact that GA_3 application enhanced the translocation of food for development of floral primordial, which leads to the early flowering. The above results were in conformity with the application of GA_3 by Patel *et al.* (2022) [8] in Brinjal.

3.5. Days to 50 percent flowering

The minimum days to 50 percent flowering was noted under treatment T_3i.e. GA_3@75 ppm (51.62) followed by treatment T_9 i.e. NAA@75 ppm (52.44) as compared to other treatments. While, the maximum days to 50 percent flowering was recorded in control in treatment T_{10} (58.87). This may be due to GA_3 controls a variety of plant growth and development

processes including flower initiation and flower and fruit development. The above results were in conformity with the application of GA_3 by Patel *et al.* (2022) [8] in Brinjal.

3.6. Number of flowers per cluster

A significantly highest number of flowers per cluster was noted in treatment T_3 i.e. GA_3@ 75 ppm (4.01) followed by treatment T_9 i.e. NAA@ 75 ppm (3.97) and lowest was observed under the treatment T_{10} (2.50) as control. Similar results were found by Ranjeet *et al.* (2014) [10]in tomato and Arivazhagan *et al.* (2018) [3] in brinjal.

Table 1.Effect of plant growth regulators on plant height in brinjal *var.* Kashi Taru

Treatments	Plant Height (cm)		
	30 DAT	**60 DAT**	**90 DAT**
GA_3 @25 ppm	26.38	56.87	22.85
GA_3 @50 ppm	28.26	58.57	23.53
GA_3 @75 ppm	29.15	61.59	25.17
IAA @25 ppm	21.76	50.60	20.64
IAA @50 ppm	22.89	51.97	21.28
IAA @75 ppm	23.63	53.73	21.33
NAA @25 ppm	25.42	54.56	22.48
NAA @50 ppm	27.09	57.67	23.07
NAA @75 ppm	28.98	60.79	24.80
Control	*20.30*	*46.93*	*20.25*
SE(m)±	*0.60*	*0.59*	*0.89*
C.D (p=0.05)	*1.81*	*1.78*	*2.68*

*C.D. = Critical Difference, SE(m) = Standard Error of Mean

Table 2. Effect of plant growth regulators on growth in brinjal *var.* Kashi Taru

Treatments	No. of Primary branches per plant	No. of Secondary branches per plant
GA_3 @25 ppm	10.40	22.85
GA_3 @50 ppm	11.03	23.53
GA_3 @75 ppm	11.76	25.17
IAA @25 ppm	8.80	20.64
IAA @50 ppm	9.03	21.28
IAA @75 ppm	9.53	21.33
NAA @25 ppm	9.23	22.48

NAA @50 ppm	10.16	23.07
NAA @75 ppm	11.13	24.80
Control	8.56	20.25
SE(m)±	0.37	0.26
C.D (p=0.05)	1.13	0.79

*C.D. = Critical Difference, SE(m) = Standard Error of Mean

Table 3. Effect of plant growth regulators on flowering parameters in brinjal *var.* Kashi Taru

Treatments	Days to 1st flowering	Days to 50% flowering	No. of flowers per cluster
GA_3 @25 ppm	37.29	52.78	3.52
GA_3 @50 ppm	37.54	53.45	3.92
GA_3 @75 ppm	36.23	5˚.62	4.01
IAA @25 ppm	40.69	58.32	2.56
IAA @50 ppm	39.56	57.08	2.73
IAA @75 ppm	39.07	55.87	2.88
NAA @25 ppm	38.21	54.66	3.22
NAA @50 ppm	38.33	53.80	3.84
NAA @75 ppm	36.89	52.44	3.97
Control	40.28	58.87	2.50
SE(m)±	1.23	0.63	0.49
C.D (p=0.05)	3.70	1.90	1.47

*C.D. = Critical Difference, SE(m) = Standard Error of Mean

Fig. 1. General view of experimental plot.

Fig. 2 Field view of Brinjal experiment during Rabi 2022-23.

4. CONCLUSION

In light of the present experimental findings summarized above, it may be concluded that the application of three plant growth regulators i.e. GA_3, IAA and NAA, GA_3@ 75 ppm application is very effective for enhancement of growth and flowering traits of brinjal *var.* Kashi Taru followed by NAA@ 75 ppm. Based on the finding, it is concluded that application of foliar spray of GA_3 @ 75 ppm at 30 DAT and 40 DAT in Brinjal produce significantly higher plant height, number of primary and secondary branches per plant, number of flowers per cluster and gives early flowering.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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