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EFFECT OF PLANT GROWTH REGULATORS ON GROWTH OF CHILLI (*CAPSICUM ANNUUM* L.)

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Abstract

Plant growth regulators have profound effect on growth of chilli. The present investigation was carried out during *Rabi* 2018 at Department of Horticulture, Faculty of Agriculture, Annamalai University, Chidambaram, Tamil Nadu. The study was carried out with six different treatments involving two growth regulators (NAA @0.022 % (10 ppm) and Triacontanol@ 0.05 %(1.25 ppm) and three levels of Sodium Para-Nitro phenolate 0.4 % (12 ppm), 0.8 % (24 ppm) and 1.6 % (48 ppm) sprayed at 25th, 50th and 70th DAP, along with control (Water spray). The experiment was laid out in a randomized block design with four replications. The result revealed that the maximum values for growth characters *viz.,* plant height (114.7 cm at 120 DAP) and number of primary branches (18.5 at 120 DAP) were recorded in the treatment which was sprayed with 0.4 % Sodium Para-nitrophenolate.

Key words: Growth regulator, triacontanol, sodium para nitrophenolate, growth, chilli.

Introduction

Chilli (*Capsicum annuum* L.) is the most important vegetable cum spice crop in Indian subcontinent. It belongs to the family Solanaceae. It has originated in Mexico, Southern Peru and Bolivia (Villalon, 1981). India produced 21, 49, 000 tonnes of dry chilli from an area of 7, 52, 000 hectare and the productivity is 2.85 t/ha. (Anon, 2018). Ramnathapuram district is the leading producer of chilli in Tamil Nadu, to 31% of the state's production. It seems that the genetic potentiality of the varieties to increase their production has already been reached to saturation. There are scopes for augmenting yield through changes of hormonal behaviours. In this connection, use of plant growth regulators (PGRs) might be a useful alternative to increase crop production. Now a days, many plant growth regulators used for increasing the productivity and marketability of many vegetable crops, and also reduce the plant stress, tolerance to abiotic stress etc., Sodium Para-nitrophenolate, a novel synthetic chemical compound, which has a plant growth regulating properties. Sodium para-nitrophenolate (PNP 0.3%) has been used successfully for many years in the cultivation of most important crops worldwide. Its positive effect on yield is already well proven (Michalski *et al.,* 2008). Naphthalene Acetic Acid induces early flowering and prevents flower and fruit drop. Increased fruit set from 12 to 40 per cent has been observed in chilli with the application of all NAA containing compounds. Similarly Triacontanol has also been reported to increase fruit set and yield in chillies. This compound contains amino acids, carbohydrates and vitamins. (Mayura Srivastava, 2007). However, information regarding the effectiveness of plant growth regulators on growth of chilli is meagre in coastal plains of Tamilnadu. In view of the above facts the present investigation on the effect of plant growth regulators on growth of chilli (*Capsicum annuum* L.) *cv.* K2 was carried out.

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Materials and Methods

The present investigation was carried out during *Rabi* 2018 at Department of Horticulture, Faculty of Agriculture, Annamalai University, Chidambaram, Tamil Nadu. The experiment was laid out in a randomized block design (RBD) with four replications. The study was carried out with six different treatments involving two growth regulators (NAA @ 0.022 % (10 ppm) and Triacontanol@ 0.05 % (1.25 ppm)) and three levels of Sodium Para-Nitro Phenolate (0.4 % (12 ppm), 0.8 %

(24 ppm) and 1.6% (48 ppm)). The treatments were imposed as foliar spray on 25th, 50th and 70th days after transplanting at respective concentration during early morning.

The test chemical sodium-para nitrophenolate was supplied by M/s Nagarjuna Chemicals Pvt. Ltd., Hyderabad. The formulations were mixed with water as per the treatment schedule and used as foliar spray. Similarly, Triacontanol treatment was given using the formulation VIPUL (0.1% EW) marketed by Godrej company and NAA treatment was given using the formulation PLANOFIX (4.5% w/w) marketed by Bayer company.

Seeds of variety K2 were sown in raised beds along the rows at a spacing of 5cm across the beds and at a depth of 0.25cm. The beds were mulched with paddy straw and watered using rose can. Necessary plant protection and cultural operations were carried out from time to time to get healthy seedlings. The main field was ploughed to a fine tilth. Farm yard manure was applied at the rate of 25 t ha^{-1} a week prior to transplanting and mixed well with the soil. Forty two days old, healthy seedlings of uniform size and growth were transplanted at rate of one seedling per hill at a spacing of 60 × 45cm. Gap filling was done one week later to maintain the optimum plant population. Fertilizers at the rate of 120:60:30 kg NPK per ha was applied in the form of urea (130 kg), superphosphate (375 kg) and muriate of potash (50 kg) as sources of nitrogen, phosphorus and potash respectively. The full dose of phosphatic and potassic fertilizers and half dose of nitrogenous fertilizer was applied at the time of transplanting and the remaining half dose of nitrogen was applied in three equal splits on 30, 60 and 90 days after transplanting. Observations on the growth parameters *viz.,* plant height and number of primary branches, were recorded and statistically analysed.

Results and Discussion

The result of the experiment are presented in table 1and 2.

Effect of sodium para-nitrophenolate (PNP)

Among the three levels of PNP tried in the experiment, T_1 - Sodium Para - Nitrophenolate - 0.4 % (12 ppm) exhibited about (114 %) more plant height over control (T_6) at 150 DAP. The same treatment was also ranked superior in number of primary branches per plant which exhibited an increase of (130 %) over control.

Table 1: Effect of plant growth regulators and biostimulants in chillies on plant height at 90, 120 and 150 DAT.

Treat-ments	Treatment Details	Plant height (cm)		
		90DAT	120DAT	150DAT
T_1	Sodium Para -Nitrophenolate 0.4% (12 ppm)	70.9	105.3	114.7
T_2	Sodium Para -Nitrophenolate 0.8 % (24 ppm)	69.2	97.6	112.9
T_3	Sodium Para -Nitrophenolate 1.6 % (48 ppm)	71.5	101.2	107.6
T_4	Triacontanol 0.25 % (1.25 ppm)	66.5	100.3	109.4
T_5	Alpha Naphthyl acetic acid 0.022 % (10 ppm)	64.6	96.6	105.9
T_6	Untreated control	63.8	88.7	99.9
Mean	67.7	98.3	90.5	
	S.Ed.	1.2	2.0	2.1
	CD(p=0.05)	2.6	4.3	4.4

Table 2: Effect of plant growth regulators and biostimulants in chillies on number of primary branches at 90, 120 and 150 DAT.

Treat-ments	Treatment Details	Number of primary branches		
		90DAT	120DAT	150DAT
ssT_1	Sodium Para - Nitrophenolate 0.4% (12 ppm)	10.8	17.1	18.5
T_2	Sodium Para - Nitrophenolate 0.8 % (24 ppm)	10.7	16.5	17.6
T_3	Sodium Para - Nitrophenolate 1.6 % (48 ppm)	10.6	16.4	16.6
T_4	Triacontanol 0.25 % (1.25 ppm)	10.3	15.7	16.5
T_5	Alpha Naphthyl acetic acid 0.022 % (10 ppm)	9.4	16.3	16.5
T_6	Untreated control	8.5	13.7	14.2
	Mean	10.1	15.9	16.6
	S.Ed.	0.3	0.24	0.4
	CD(p=0.05)	0.6	0.5	0.4

Results on plant height and number of primary branches recorded at maturity showed that nitrophenol can increase the morphological traits in Chillies. The positive effect of PNP on plant height and number of primary branches has been reported by Djanaguiraman *et al.,* (2005a) and Kozak *et al.,* (2008b). This can be explained by the fact that phenolic compounds, interact with gibberellins, which promote cell elongation (Taiz and Zeiger, 2002).

The stimulation of elongative growth, as a result of the application of PNP, might be attributed to the greater concentration and /or activity of auxins (Djanaguiraman *et al.,* 2004a, 2005b).

Effect of Triacontanol

Among the six treatments tried in the experiment,, T_4 - Triacontanol 0.05 % (1.25 ppm) exhibited more plant height (113 %) and primary branches (114%) over control (T_6). Triacontanol increased the growth characters by increase in photosynthesis as TRIA has been reported to be involved in the up regulation of many genes which involved in the photosynthesis process (Chen *et al.,* 2003).

Effect of Alpha Napthyl Acitic acid (NAA)

Among the six treatments tried in the experiment, T_5 - Alpha napthyl acetic acid - 0.022 % (10 ppm) exhibited more plant height (106%) and primary branches (114 %) over control (T_6). The significant influence of NAA observed in this experiment might be attributed to the increase in auxin in plants that induces cell division and cell elongation resulting in increased plant growth. Further, the exogenous application of NAA might have reduced the flower abscission resulting increased fruit set. In the present investigation NAA was sprayed at the rate of 10ppm on the contrary Shill and Nath (2016) observed that application of 20 ppm of NAA resulted in increased plant height, number of branches per plant, number of fruits and highest yield in chilli. Higher concentrations of NAA with significant influence in Chillies have been reported by Singh *et al.,* (2015), Natesh *et al.,* (2005) and Balraj *et al.,* (2002). This goes in agreement with the findings of Oosterhuis (2008) who also opined that optimum dosage depends on the cultivar, season, soil and application methods.

Based on the results it might be concluded that application of sodium para nitrophenolate 0.4 % (12 ppm) on 25th, 50th and 70th days after transplanting would increase plant growth and yield of chillies.

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