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Use of Plant Growth Regulators in Tomato (*Solanum lycopersicum* L.) under Tarai Conditions of Uttarkhand

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ABSTRACT

Under Uttarakhand conditions a field experiment was conducted at vegetable research centre, Patherchatta during winter season to find out the most suitable plant growth regulators and their appropriate concentration to increase the production of tomato. The trial was carried out in R.B.D with three replications. Seven different plant growth regulators (Alar, Ethephon, Cipa, GA_3, 2,4-D, NAA, Paclobutrazol (each with two concentrations such as 50 and 100ppm; 50 and 100ppm; 10 and 20ppm; 10and 20ppm; 5and 10 ppm; 20and 40ppm; 10and 20 ppm respectively) and control (water) were used as foliar spray at 30, 45 and 60 days after transplanting of the seedlings of the cultivar "Pant T-3". All the P.G.R. reduced the plant growth than control except GA_{20} ppm which was at par . CIPA 20ppm, Paclobutrazol 20 ppm and 2, 4-D 10 ppm reduced plant height significantly. Number of branches increased by Alar 100ppm, Naa 40ppm and Ethephon 100ppm while 2,4 D 10 and 5 ppm ; CIPA 20 ppm and Ethephon 100 ppm showed early maturity of fruits. More number of fruits per plant was recorded in CIPA 20 ppm, 2-4 D 5 ppm and NAA 40ppm. The percent fruit set was higher in CIPA 20ppm, 2, 4-D 5 ppm and GA_3 10 ppm than control. Equatorial fruit diameter was greater in 2, 4-D 5 ppm, CIPA 20 and 10 ppm whereas polar diameter was higher in Ethephon 100 ppm, Alar 100 ppm and CIPA 10 ppm. More no of locules per fruit was higher in 2, 4-D 5 ppm and CIPA 20ppm on the other hand, NAA 40ppm, 2, 4-D 10ppm and paclobutrazol 20 ppm showed higher TSS and pericarp thickness was greater in Ethephon 50 ppm, NAA 40 ppm, 2, 4-D 5 ppm and CIPA 20 ppm. The lowest leaf curl virus infection was recorded in 2, 4-D 50 ppm (40%), 2, 4-D 10 ppm (45%) and NAA 40 ppm (68.3%). The highest fruit yield per plant was recorded in CIPA 20 ppm, 2 4-D 5 ppm and Alar 50 ppm and maximum fruit yield was recorded in CIPA 20 ppm, 2, 4-D 5 ppm and Alar 50 ppm which showed 71.47, 40.1 and 33.2% higher yield over control, respectively.

Key Words: Growth regulators, Growth, Tss, Yield.

INTRODUCTION

Tomato is one of the most popular solanaceous vegetable cultivated round the year in one or another part of the country from temperate to tropical region. The growth, yield and quality of any crop is affected by various kinds of the factor, particularly in adverse climatic conditions. In such situations plant growth regulator play an important role in increase or decrease the growth, yield as well as quality of the produce if applied in suitable forms and an appropriate concentrations. Some of the plant growth regulators are very effective to increase the fruit set , fruit size, growth as well as yield and quality under low and high temperature environment Singh and lal, (1994) and Singh et al., (1990). The beneficial response of plant growth regulators to increase the yield and quality of solanaceous and other vegetables have been reported by various workers. So far in tomato, Phookan et al. (1991), Singh and Singh (1993), Singh and Singh (1996) and Singhand Lal(2002). In Chilli, Singh and Lal(1994), Sing.h et al.(1990), Singh and lal(1995) and Joshi and singh (2001). In Okra , Singh and kumar (1988) and Singh et al.

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(1999). The influence in yield and quality may vary greatly depending upon the type of plant growth regulator and their concentration and its method of application. Presently a large number of plant growth regulators are available in the market but their method of application and concentrations may vary crop to crop and season to season and climate to climate. Hence, they are very meagre available in this crop. So there is urgent need to identify the most suitable plant growth regulators and their appropriate concentrations to increase yield as well as quality parameters of tomato under tarai conditions of uttarakhand for higher production and for commercial applications to the farmers of this region.

MATERIAL AND METHODS

The present trial was carried out during winter season at Vegetabale Research Centre, Patherchatta, G. B. Pant University of agriculture and Technology, Pantnagar, U.S. Nagar, Uttarakhand. Seven plant growth regulators with two concentrations of each. (Alar, 50 and 100 ppm; Ethephon 50 and 100 ppm; Paclobutrazol, 10 and 20 ppm; GA_3 10 and 20 ppm; CIPA, 20 and 40 ppm; 2-4 D, 5 and 10 ppm, NAA, 20 and 40 ppm and control (0 ppm)were applied as foliar spray at 30, 45 and 60 days after transplanting of tomato seedlings of cultivar Pant T- 3. The trial was laid out in Randomized Block Design with three replications. The seedlings were transplanted at a distance of 60x45 cm. Twenty plants were maintained in a plot of 5.40 m^2 area. All the cultural practices and plant protection measures were followed as per crop reported by Singh (1996). The data were recorded on growth, yield and quality attributes. The was analyzed by Cochron and Cox (1959). The plant height and number of branches per plant were recorded at final harvesting of the crop.

RESULTS AND DISCUSSION

The data presented in Table 1 revealed that the plant height was significantly reduced by CIPA 20 ppm, pp 33 10 and 20 ppm and 2,4 D 10 and 5 ppm than control. It might be due to herbicidal nature of plant growth regulators like 2, 4-D and CIPA. These results are in agreement with the findings of Singh and Singh (1993) and Singh and Lal (2002). The number of primary branches per plant were significantly increased with the application of Alar 100 ppm followed by NAA 40 ppm, Ethephon 100 ppm and2,4-D 10 ppm as compared to control. All the plant growth regulator showed early maturity of the fruits, 2,4-D 10 and 5 ppm followed by ethephon 100 ppm, CIPA 20 ppm and Alar 50 ppm took minimum days to fruit ripening. The results are in accordance with the results of Singh and Lal (2002); who have also reported early maturity of the fruits in 2,4-D 10 ppm and CIPA 20 ppm.

All the plant growth regulators increased the fruit set percentage as compared to control treatment. The percent fruit set was found maximum in CIPA 20 ppm (74%), 2,4-D 5 ppm (71.8%) and GA_3 10 ppm (71.4%) than control (45.9%). Equatorial fruit diameter was significantly increased by 2,4-D 5 ppm CIPA 20 ppm and CIPA 10 ppm as compared to control whereas polar diameter was significantly influenced by Ethephon, 100ppm, Alar 100 ppm and CIPA 10 ppm. The higher number of locules per fruit were recorded in 2,4-D 5 ppm followed by CIPA 20 ppm and 2,4-D 10 ppm than control. Total soluble solids were increased by all the plant growth regulators. It was recorded higher in NAA 40 ppm, 2,4-D 10 ppm and PP 333 20 ppm than control. Fruit skin thickness were influenced by all the plant growth regulators. It was significantly higher in Ethephon 50 ppm, NAA 40 ppm, 2,4-D 5 ppm and CIPA 20 ppm than control. The minimum incidence of leaf curl virus affected plants was recorded in 2,4-D 10 ppm and 2,4-d 5 ppm. It is because of the hard skin of the tomato plant by the foliar spray of 2,4-D in which the white fly did not reach the cell sap and unable to transmit the virus from one plant to another plant. The results are in accordance with the findings of Singh (1989). All Plant growth regulators increased the average fruit weight than control. Highest average fruit weight was recorded in CIPA 20 ppm, 2,4-D 5 ppm and Ethephon 50 ppm than control. It might be due to accumulation of photosynthates in fruit under these treatments. These results are in accordance with the findings of Singh and Singh (1993) and Singh and Lal (2002). More number of fruits per plant was harvested with the application of CIPA 20 ppm followed by 2,4-D, 5 ppm, NAA 40 ppm and Alar 50 ppm. It might be due to higher percentage of fruit set in these treatments. Similarly

higher fruit weight per plantwas recorded in CIPA 20 ppm, 2,4-D 5 ppm,Alar 50 ppm and NAA 40 ppm. All the plant growth regulators significantly increased the total fruit yield except PP 333 treatments. Maximumtotal fruit yield was found in CIPA 20 ppm, 2,4-D 5 ppm, Alar 50 ppm and NAA 40 ppm as compared to control, probably this is due to early flowering , fruitn setting, more no. and weight of fruits per plant, fruit size and less incidence of leaf curl and mosaic virus under the influences of plant growth regulators. The increase in total fruit yield with the application of CIPA 20 ppm, 2,4-D 5 ppm, Alar 50 ppm, Ethephon 50 ppm, NAA 40 ppm and Ethephon 100 ppm, Cipa 10 ppm, NAA 20 ppm and 2,4-D 10 ppm was mainly due to more no of fruits and their weight per plant, average fruit weight, averge fruit diameter, fruit setting percentage andless infection of leaf curl virus and more accumulation of photosynthates towards the fruit under these concentrations of plant growth regulators. The results of present investigations are in agreement with the findings of Phookan et al.(1991), Singh and Singh (1993), and Singh and Lal (2002) and other possible reason for the enhancement in the yield by applications of growth regulators might be due to better utilization of nutrients and photosynthates for the development of fruits as a result of reduction of vegetative growth. These findings are in accordance with the results of Singh and Lal (2002), Singh and Singh(1996), Singh and Singh (1993), Phookan et al. (1991) and Singh (1989).

CONCLUSIONS

On the basis of above findings it may be concluded that Cipa 20 ppm, 2,4-D 5 ppm, Alar 50 ppm Ethephon 50 ppm and NAA 40 ppm were found better than the other concentrations of plant growth regulators and can be recommended to the growers for better production during winter season under Tarai conditions of Uttarakhand.

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