Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2582-2845.8284

ISSN: 2582 – 2845

Ind. J. Pure App. Biosci. (2020) *8*(4), 702-706

Indian Journal of Pure & Applied Biosciences

Peer-Reviewed, Refereed, Open Access Journal

Research Article

Effect of Plant Growth Regulators, Micro-Nutrients and Date of Transplanting on Growth and Yield of Tomato (*Solanum lycopersicum* L.)

Pragya Ramgiry*, D. P. Sharma and S. K. Pandey

Department of Horticulture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, M.P.

*Corresponding Author E-mail: ramgirypragya@gmail.com

Received: 10.07.2020 | Revised: 24.08.2020 | Accepted: 27.08.2020

ABSTRACT

The field experiment was carried out during the Rabi sesaon 2018-19 at the Horticulture Reaearch Complex, Maharajpur, Department of Horticulture, J.N.K.V.V. Jabalpur (M.P.) to evaluate the effect of micronutrients and plant growth regulators on different dates of transplanting in tomato.Significant differences was found for plant height, number of branches per plant, days to first flowering, number of clusters per plant, fruit length, fruit diameter, average fruit weight and fruit yield per plant.The highest plant height was recorded at T_{25}. *The Treatment* T_{45} *was found better for Number of branches per plant and days to first flowering. The number of clusters per plant was noticed maximum in* T_{14}. *The highest fruits yield per plant found in treatment* T_{13}. *While the rest of the characters namely fruit length, fruit diameter and average fruit weight in treatment* T_{30}.

Keywords: *Tomato, NAA, Boron, Zinc Salicylic Acid and Date of transplanting.*

INTRODUCTION

Tomato is botanically called *Solanum lycopersicum*. It is most popular crop all over the world for its nutritional value that's why it is called protective food. In India tomato is most versatile with wide usage in culinary tradition and widely used in soup, salad, pickles, ketchup, puree, sauce and in many other ways. Tomato is an important crop for value addition chain of processing. It comes under the warm season crop which requiers 21°c to 24°c for its growth and development. Day temperature of 28°c and night temperature of 18°c is ideal for its growth. Fruit set is affected at temperature higher than 35°c and relative humidity of more than 90%.

Micro-nutrients play important role Boron and Zinc two important micronutrient which are highly required for plant nutrition. Foliar application of boron and zinc significantly increased the number of fruits per plant, yield and quality of fruits. Boron play key role on accumulation of photosynthates that has correlation with fruit weight (Shukha, 2011).

Cite this article: Ramgiry, P., Sharma, D.P., & Pandey, S.K. (2020). Effect of Plant Growth Regulators, Micro-Nutrients and Date of Transplanting on Growth and Yield of Tomato (*Solanum lycopersicum* L.), *Ind. J. Pure App. Biosci. 8*(4), 702-706. doi: http://dx.doi.org/10.18782/2582-2845.8284

Boron involves in cell division, differentiation and maturation. Boron also promote seed germination, growth of pollen grains, development of pollen tube and fertilization process. Due to its defficiency growing point may die, stem weak and plant become dead. In tomato zinc play a vital role in enzyme reaction and involved in chloroplast development application of its maximize flower set, development, fruiting and also ensure even ripening. Difficiency causes dwarf leaves with show chlorosis, necrotic spots, bronzing and limiting the extraction of micro-nutrient from growing medium.

For increasing the profitable vagetable production plant growth regulator widely used. In this aspect two growth regulators namely salicylic acid and NAA included in the study. Salicylic acid has possitive effect on different aspects of plant life like plant growth and development, photosynthesis, evaporation, ion transmission and absorption, also causes to special changes in leaf anatomy and chloroplast structure (Sakhabutdinova et al., 2003) and salicylic acid also promote flowering and fruting under the cold stress. Naphthalene acetic acid (NAA) comes under the synthetic plant hormones which regulates the growth and development and also affect the biochemical and physiological process of plant and helps to promote plant growth by enhancing the cell division, cell elongation and cell differentiation which may initiate the development of plant organs. Flower cluster and whole plant spray of salicylic acid and NAA before the flowering, are highly beneficial. Therefore the present experiment was carried out with different dates of tranplanting along with above mention micronutrient and plant growth regulators with the following objectives to find out the effect of micronutrient, plant growth regulators and dates of transplanting on growth and fruit yield in tomato.

MATERIALS AND METHODS

The field experiment was conducted at the Horticulture Research Complex, Maharajpur, Department of Horticulture, J.N.K.V.V. Jabalpur (M.P.) during *Rabi* season of 2018-2019. The field experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. Treatment details of the experiment : T_1 :- Control, T_2 :- Salicylic acid (1.0mM), T_3 :- Salicylic acid (1.5mM), T_4 :- NAA (25ppm), T_5 :- NAA (50ppm) , T_6 :- Boron (100ppm), T_7 :- Zinc (100ppm), T_8 :- Salicylic acid (1.0mM) + Boron (100ppm), T_9 :- Salicylic acid (1.5mM) + Boron (100ppm), T_{10} :- Salicylic acid (1.0mM) + Zinc (100ppm), T_{11} :- Salicylic acid (1.5mM) + Zinc (100ppm), T_{12} :- NAA (25ppm) + Boron (100 ppm) , T_{13} :- NAA (50ppm) + Boron (100 ppm) , T_{14} :- NAA (25ppm) + Zinc (100 ppm) , T_{15} :-NAA (50 ppm) + Zinc (100 ppm).These treatments applied at three different dates of transplanting at 15 days of interval D_1 (30th Nov.), D_2 (15th Dec.) and D_3 (30th Dec.). The seedlings were transplanted at 60 cm x 50 cm. The details observations recorded on different growth parameters namely plant height (cm), number of branches per plant, days to first flowering, number of cluster per plant, fruit length (cm), fruit diameter (cm), average fruit weight (g) and fruit yield per plant (kg/plant). The analysis was done as per procedure given by Panse and Sukhatme (1967).

RESULTS AND DISCUSSIONS

The results of the present investigation are presented in Table: 1.The analysis of variance showed the significant differences for all the characters studied. The maximum plant height (153.50 cm) was recorded in the treatment T_{25} (D_2 +Salicylic acid (1.0mM)+Zinc (100 ppm)) followed by T_{30} (151.23 cm) and T_{15} (148.73 cm) as compare to other treatments. Similar result found by Ingle et al. (1993), Ahmed Abou El-Yazied (2011) and Choudhary et al. (2016). Among all the treatments, the minimum plant height 121.20 cm was noticed in the treatment T_{31} (D_3 + control). The foliar spray of NAA(50 ppm)+ Zinc (100 ppm) with third date of transplanting threatment (T_{45}) significantly increase the number of branches per plant (10.77) followed by D_2 +NAA (50 ppm)+ Zinc (100 ppm) (9.17) and D_2 +NAA (25 ppm)+ Zinc (100 ppm) (8.40), same result

denoted by Ingle et al. (1993). It showed that the foliar application of all three nutrients have a significant effect on the development of branches per plant in tomato. While lowest value was found in D_1+ control (5.77). The significant days to minimum first flowering was observed in T_{45} (52 days) followed by T_{40} (54 days).In respect to number of flower clusters maximum (25.43) noticed in treatment T_{14} (D_1 +NAA (25ppm)+ Zinc (100 ppm)), T_{30} (24.17) (D_2 +NAA (50 ppm)+ Zinc (100 ppm)) and T_{26} (23.10) (D_2 +Salicylic acid (1.5mM)+Zinc (100 ppm)) as compare to control.

The highest fruit length was recorded in treatment T_{30} (5.98 cm) followed by the treatment T_{12} (5.78 cm) and T_9 (5.68), while the shortest fruit length was found in treatment T_1 (4.44 cm). Significant variation was recorded in fruit diameter due to combine effect of NAA + Boron. The significant highest 6.25, 6.10 and 5.93 cm fruit diameter were recorded under the treatments T_{30} (D_2 +NAA (50 ppm)+Zinc (100 ppm)) and T_{28} (D_2 +NAA (50 ppm)+ Boron (100 ppm)) and T_{13} (D_1 +NAA(50 ppm)+ Boron (100 ppm)) respectively and which were at par with each other. Kiranmayi et al. (2017) reported that combine use of NAA + Boron gave the maximum fruit girth (2.98 cm). Whereas lowest fruit diameter was found in T_{32} (4.27 cm).

The result showed that the highest average fruit weight was noticed in T_{30} (88.86 g) followed by treatment T_{28} (87.73 g) and T_{15} (87.67 g). Same result reported by Mahadev V (2006) reported that the highest fruit weight per plant (1095.84 gm) and maximum number of fruits per plant (806.44) was obtained with the application of Boron 280 ppm + Zinc 0.50% +NAA 20ppm while the lowest average fruit weight was found in treatment T_{31} (68.28 g) as control. The data presented in the table 2 revealed that all the treatments had significant differences in case of fruit yield per plant. The maximum fruit yield per plant was noticed in treatment T_{13} (1.140 kg/plant), followed by T_{30} (1.133 kg/plant) and T_{28} (1.120 kg/plant), whereas lowest fruit yield was noticed in T_{31} contol (0.490 kg/plant). These finding are in closed agreement with Merwad et al. (2016) reported that the highest yield (121kg/tree) was recorded in mango tree when plant is spread with Zn +NAA (0.2%+25ppm). It is evident from the finding that the combine use of NAA, Boron and Zinc significant increased the fruit yield per plant in tomato.

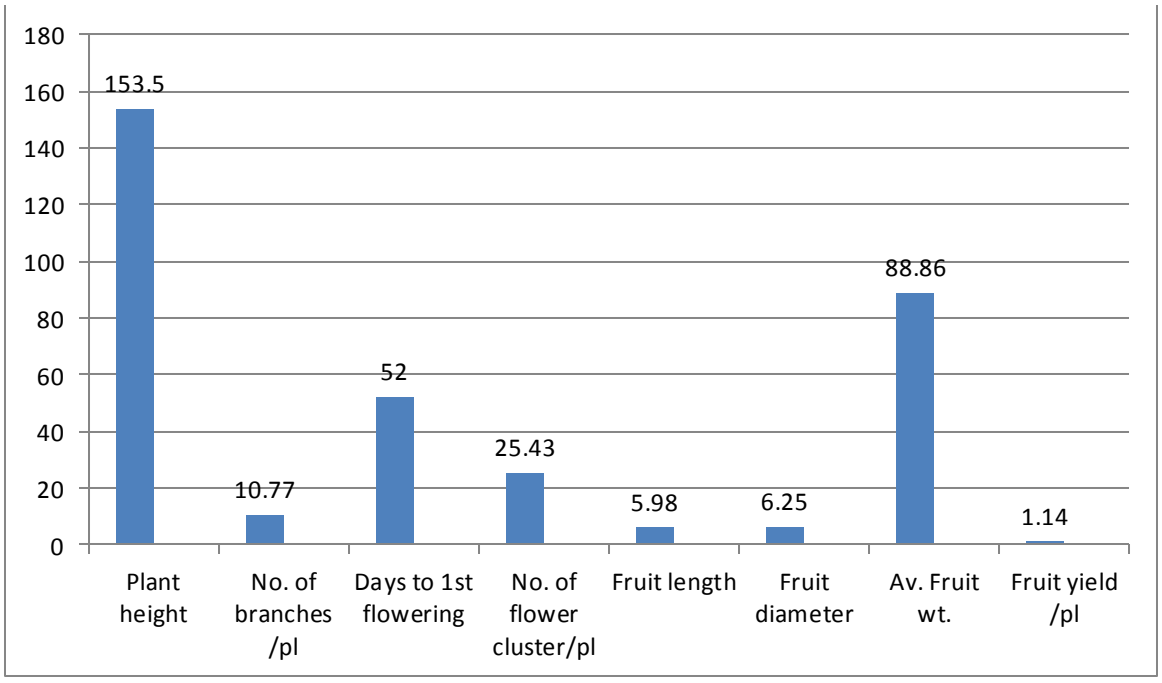

Fig. 1: Presentation of highest significant value of yield contributing tarits

Table 1: Effect of plant growth regulators, micro-nutrients and date of transplanting on Tomato

Sym.	Treatment details	Pl. ht. at 120 Days	Branches/ pl	days to 1st flowering	No. of flower cluster/pl	fruit length	fruit diameter	av. fruit wt.	fruit yield /pl
T_1	D1 +Control	121.60	5.77	62.33	15.27	4.44	4.38	68.78	0.713
T_2	D1 +Salicylic acid (1.0mM)	128.27	6.53	63.00	16.04	4.58	4.70	73.43	0.753
T_3	D1 +Salicylic acid (1.5mM)	131.10	6.73	63.00	15.83	4.58	4.84	73.89	0.790
T_4	D1 +NAA (25 ppm)	125.97	6.77	64.00	16.23	4.81	5.18	80.45	0.813
T_5	D1 +NAA (50 ppm)	124.67	6.97	61.67	16.37	5.06	5.24	75.88	0.890
T_6	D1 +Boron (100 ppm)	130.33	7.23	63.00	16.73	4.83	5.28	78.34	0.900
T_7	D1 +Zinc (100 ppm)	128.07	7.13	63.33	17.27	4.73	5.25	79.18	0.857
T_8	D1+Salicylic acid(1.0mM)+Boron (100 ppm)	130.93	7.10	63.33	18.93	5.19	5.27	80.42	0.913
T_9	D1+Salicylicacid(1.5mM)+Boron(100 ppm)	133.97	7.73	61.00	20.07	5.68	5.51	78.77	0.997
T_{10}	D1+Salicylic acid(1.0mM)+Zinc (100 ppm)	139.03	7.73	63.33	20.23	4.78	5.39	77.20	0.963
T_{11}	D1 +Salicylicacid(1.5mM)+Zinc (100 ppm)	133.23	7.20	60.33	20.63	4.75	5.46	81.57	1.080
T_{12}	D1 +NAA(25ppm)+ Boron (100 ppm)	136.87	8.03	62.33	20.93	5.78	5.45	81.24	1.097
T_{13}	D1 +NAA(50 ppm)+ Boron (100 ppm)	138.13	7.90	59.33	22.27	5.44	5.93	82.10	1.140
T_{14}	D1 +NAA(25ppm)+ Zinc (100 ppm)	144.23	8.07	62.33	25.43	5.05	5.58	79.31	0.977
T_{15}	D1 +NAA(50 ppm)+ Zinc (100 ppm)	148.73	8.37	59.33	22.93	5.23	5.91	87.67	1.103
T_{16}	D2 +Control	124.97	6.73	66.00	16.17	4.59	4.62	72.49	0.720
T_{17}	D2 +Salicylic acid (1.0mM)	131.37	6.77	62.33	16.40	4.79	4.77	78.82	0.767
T_{18}	D2 +Salicylic acid (1.5mM)	133.53	7.13	62.33	17.17	4.78	4.87	74.03	0.780
T_{19}	D2 +NAA (25 ppm)	127.13	7.20	61.67	17.60	4.67	5.13	77.59	0.793
T_{20}	D2 +NAA (50 ppm)	128.07	7.13	62.33	17.27	4.94	5.28	78.24	0.893
T_{21}	D2 +Boron (100 ppm)	133.87	7.33	60.67	17.37	4.56	5.46	79.75	0.857
T_{22}	D2 +Zinc (100 ppm)	131.17	7.57	63.00	17.30	4.85	5.43	78.37	0.877
T_{23}	D2+Salicylic acid (1.0mM)+Boron (100 ppm)	132.27	7.47	62.00	21.70	5.30	5.47	80.56	0.887
T_{24}	D2 +Salicylicacid (1.5mM) +Boron (100 ppm)	136.33	7.57	61.00	21.27	5.44	5.76	80.56	1.007
T_{25}	D2 +Salicylic acid (1.0mM)+Zinc (100 ppm)	153.50	7.87	62.67	21.30	5.16	5.70	80.30	0.970
T_{26}	D2 +Salicylicacid (1.5mM)+Zinc (100 ppm)	135.97	8.13	62.67	23.10	5.53	5.34	82.29	1.080
T_{27}	D2 +NAA(25ppm)+ Boron (100 ppm)	136.83	8.17	61.33	21.37	5.37	5.82	84.93	1.117
T_{28}	D2 +NAA (50 ppm)+ Boron (100 ppm)	139.30	8.13	62.67	22.63	5.57	6.10	87.73	1.120
T_{29}	D2 +NAA(25ppm)+ Zinc (100 ppm)	141.63	8.40	60.67	22.87	5.31	5.85	81.65	1.003
T_{30}	D2 +NAA(50 ppm)+ Zinc (100 ppm)	151.23	9.17	61.00	24.17	5.98	6.25	88.86	1.133
T_{31}	D3+Control	121.20	7.27	60.33	13.90	4.45	4.36	68.28	0.490
T_{32}	D3 +Salicylic acid (1.0mM)	125.87	7.37	59.33	14.00	4.59	4.27	73.58	0.590
T_{33}	D3 +Salicylic acid (1.5mM)	126.83	7.60	59.33	15.20	4.81	4.38	70.32	0.540
T_{34}	D3 +NAA (25 ppm)	122.20	7.93	59.33	13.97	4.52	4.43	69.56	0.560
T_{35}	D3 +NAA (50 ppm)	125.33	7.87	57.00	14.50	4.93	4.58	71.03	0.610
T_{36}	D3 +Boron (100 ppm)	127.83	7.60	56.67	15.43	5.15	4.63	70.38	0.680
T_{37}	D3 +Zinc (100 ppm)	128.80	8.40	57.33	14.67	4.76	4.71	70.98	0.580
T_{38}	D3+Salicylic acid (1.0mM)+Boron (100 ppm)	128.93	7.70	55.33	16.90	5.01	4.88	72.41	0.690
T_{39}	D3+Salicylicacid (1.5mM) +Boron (100 ppm)	130.73	7.80	54.67	17.90	4.96	4.70	75.78	0.800
T_{40}	D3 +Salicylic acid (1.0mM)+Zinc (100 ppm)	143.27	8.60	54.00	18.10	5.01	4.80	72.75	0.717
T_{41}	D3 +Salicylicacid (1.5mM)+Zinc (100 ppm)	130.90	8.53	56.33	19.03	5.08	4.78	78.21	0.910
T_{42}	D3 +NAA(25ppm)+ Boron (100 ppm)	137.83	8.73	55.33	19.77	5.16	4.73	78.91	0.807
T_{43}	D3 +NAA (50 ppm)+ Boron (100 ppm)	134.20	8.97	54.67	21.63	5.22	5.03	80.08	0.927
T_{44}	D3 +NAA(25ppm)+ Zinc (100 ppm)	137.63	8.83	54.00	19.77	5.03	5.05	73.95	0.730
T_{45}	D3 +NAA(50 ppm)+ Zinc (100 ppm)	144.50	10.77	52.00	20.12	5.66	4.86	78.40	0.837
	SEm ±	3.74	0.26	1.55	1.27	0.17	0.20	2.49	0.04
	C.D. at 5% level	10.59	0.75	4.38	3.61	0.49	0.56	7.06	0.12

REFERENCES

Abou El-Yazied, A. (2011). Effect of Foliar Application of Salicylic Acid and Chelated Zinc on Growth and Productivity of Sweet Pepper (*Capsicum annuum* L.) under Autumn Planting. *Research Journal of Agriculture and Biological Sciences*. *7*(6), 423-433.

Choudhary, A., Mishra, A., Bola, P.K., Moond, S.K., & Dhayal, M. (2016). Effect of foliar application of zinc and salicylic acid on growth, flowering and chemical constitute of African marigold cv. pusa narangi gainda (*Targets erecta* L.). *Journal of Applied and Natural Science*. *8*(3), 1467-1470.

Ingle, V.G., Thakre, A.U., Badhe, S.B., & Khan, M.A.H. (1993). Effect of foliar spray of auxins, micronutrients with urea on fruit drop and yield of chilli cv.CA 960. *Punjabrao krishi vidyapeeth research journal. 17,* 142-145.

Kiranmayi, P., Pavani, P., & Jyothi, K.U. (2017). Studies on the Effect of Naa, 4-Cpa and Boron on Growth and Yield of Green Chilli (*Capsicum annuum* L.) Var. Lam 353 in Summer. *Journal of Agricultural Engineering and Food Technology*. *4*(2), 98-103.

Mahadev, V. (2005). Effect of plant growth regulator and micronutrients on growth and yield of chilli (Capsicum annum L.) during summer season. M.sc. Thesis, MPKV Rahuri.67-71.

Merwad, M.A., Eisa, R.A., & Saleh, M.M.S. (2016). The be beneficial effect of NAA, Zn, Ca and B on fruiting, yield and fruit quality of Alphonso mango trees. *International journal of Chem Tec research*. *9*(3), 147-157.

Panse, V.G., & Sukhatme, P.V. (1967). Statistical Methods for Agricultural Workers, Indian Council of Agriculture Research, New Delhi, 381.

Sakhabutdinova, A.R., Fatkhutdinova, D. R., Bezrukova, M. V., & Shakirova, F. M., (2003). Salicylic acid prevents the damaging action of stress factors on wheat plants. Bulg. *Journal of Plant Physiology.*, special issue, 314–319.

Shukha, A.K. (2011). Effect of foliar application of calcium and boron on growth, productivity and quality of India gooseberry (*Emblica officinalis*). *Indian journal of agricultural science*. *81*(7), 628-632.