

Effect of Boron and Phosphorus fertilizer on yield contributing characters of TomatoN Sultana^{1*} and M Faruque-bin-Hossain²**Present address**

¹Assistant Professor,
Dept. of Genetics and
Plant Breeding, PSTU
Patuakhali and ²SSO
BARI, Gazipur

Correspondence*

nsazad2@gmail.com

Accepted: 22 June 2015

Abstract

The effect of different levels of boron, phosphorus and their combined effect showed significant variations for yield components of tomato. Plants were treated with four levels of phosphorus (P) viz. 0, 22, 30, 38 kg/ha and four levels of boron (B) viz. 0, 0.6, 1, 1.2 kg/ha in 16 combinations. Plants grown with 30 kg P/ha gave the highest number of fruits per plant, flowers per plant, fruit yield per plot (23.70 kg) and fruit yield per hectare (55.23 t/ha). Plants fertilized with 1 kg B/ha gave the highest fruit yield per plot (22.19 kg) as well as per hectare (53.94 t). The highest fruit yield per plot (28.70 kg) as well as per hectare (65.10 t) were achieved from the treatment combination of 30 kgP/ha with 1 kg B/ha.

Key word: phosphorus, boron, yield contributing character**Introduction**

Tomato (*Lycopersicon esculentum*) is one of the leading vegetables in the world due to its nutritive value and multipurpose uses. In Bangladesh tomato stands for most prioritized vegetables due to consumers demand. However, production of tomato in Bangladesh (6.46 t/ha) is much lower than those of the advanced countries of the world such as USA, Japan or India (FAO, 2003). To break the yield ceiling, it is necessary to take a combined effort comprising high yielding varieties, appropriate cultural practices and nutrient management. Fertilizer management practice is one of the most important cultural practices particularly in tomato due to gradual decline in soil nutrients. This situation can be alleviated by proper fertilizer management practices (Tindall, 1983). So, judicious use of fertilizers is indispensable. Optimum level of phosphorus application increases the vegetative growth, yield and yield attributes and each nutrient element had a positive effect on vegetative growth as well as yields (Shil et al 1997). A positive correlation was observed between boron and number of flowers, flower bud and weight of fruits in case of tomato (Bose et al, 2002). Numerous research works have been carried out on fertilizer requirements on growth and yield of tomato in developed countries but information on systematic research in this context in Bangladesh is fragmentary. Therefore, the present study was undertaken to study the effect of phosphorus and boron on the growth and yield and to find out an appropriate combination of phosphorus and boron fertilizer.

Materials and methods

The effect of phosphorus and boron on the yield contributing characters were investigated at the Horticulture farm of Patuakhali Science and Technology University during the period from October 2010 to March 2011. The two factor experiment consisted of four doses of phosphorus (P) viz. 0, 22, 30, 38 kg/ha and four doses of boron (B) viz. 0, 0.6, 1, 1.2 kg/ha. Randomized complete block design (RCBD) with three replications were followed. P and B were applied as the form of TSP and Borax respectively. The size of unit plot was 2.4m x 1.8 m. date of transplanting was 20 November 2010. 10 plants were randomly selected from each plot to record the data. Different cultural practices were done as necessary. The planting materials were collected from local farmers. The collected data were statistically analysed by MSTAT program.

Results and Discussion

There was significant influence on P on yield contributing characters. Noticeably, there was an increased response of all the parameters with increased levels of P upto certain level. The highest flowers per plant, fruits per plant, flower cluster per plant, fruit diameter, fruit length, fruit weight, and fruit yield per hectare were found from 30 kg P/ha. Plants grown with 38 kg P/ha showed the maximum height (112.15 cm). Plants fertilized with 30 kg/ha produced highest fruit yield per plot (23.70 kg) and per hectare (55.23 t) (Table 1). Similar results were found by Adebooye et al 2006.

Table 1: effect of phosphorus on yield contributing characters of tomato

Phosphorus level	Plant height (cm)	No. of flower cluster per plant	No. of flowers per plant	No. of fruits per plant	Fruit length (cm)	Fruit diameter (cm)	Weight of individual fruit (g)	Weight of fruits per plant (kg)	Fruit yield/plot (kg)	Yield (t/ha)
P0	102.00	13.00	64.45	33.67	3.90	5.00	82.45	1.02	20.00	45.01
P1	109.56	15.22	100.21	42.31	3.59	5.21	94.17	1.04	19.19	44.90
P2	109.27	15.00	105.00	44.50	3.39	4.49	121.19	1.021	23.70	55.23
P3	112.15	15.23	99.34	44.70	3.26	4.90	102.00	1.11	20.59	47.20
LSD (0.05)	3.41	0.73	9.90	4.0	0.29	0.33	6.19	0.08	1.66	3.00

Legend: P0= 0 kg P/ha, P1=22 kg/ha, P2=30 kg/ha, P3=38 kg/ha.

Table 2: Effect of boron on yield contributing characters of tomato

Boron level	Plant height (cm)	No. of flower cluster per plant	No. of flowers per plant	No. of fruits per plant	Fruit length (cm)	Fruit diameter (cm)	Weight of individual fruit (g)	Weight of fruits per plant (kg)	Fruit yield/plot (kg)	Yield (t/ha)
B0	106.00	12.90	78.99	37.01	3.11	4.99	88.13	0.99	17.90	45.79
B1	106.10	13.01	88.42	39.21	3.30	4.69	97.10	1.07	18.50	45.12
B2	110.00	14.50	105.20	43.29	2.90	5.26	110.01	1.31	22.19	53.94
B3	109.11	13.02	97.20	44.12	3.19	4.80	105.00	1.19	19.16	47.01
LSD(0.05)	2.99	0.83	9.30	4.00	0.28	0.43	7.00	0.10	1.99	4.01

Legend: B0=0kg B/ha, B1=0.6 kg B/ha, B2=1 kg B/ha, b3=1.2 kg B/ha

Table 3: combined effect of boron and phosphorus on yield contributing characters of tomato

Boron level	Plant height (cm)	No. of flower cluster per plant	No. of flowers per plant	No. of fruits per plant	Fruit length (cm)	Fruit diameter (cm)	Weight of individual fruit (g)	Weight of fruits per plant (kg)	Fruit yield/plot (kg)	Yield (t/ha)
P0B0	99.40	10.01	46.91	24.00	3.31	4.0	94.39	1.04	19.40	43.90
P0B1	101.30	11.10	63.90	32.01	3.01	4.19	79.01	1.04	19.49	44.01
P0B2	101.80	12.90	67.21	35.02	3.29	4.18	78.91	1.02	19.99	45.09
P0B3	104.52	12.99	76.90	33.31	3.43	4.14	73.90	1.03	18.70	42.07
P1B0	108.60	13.01	88.99	41.90	3.59	5.13	135.84	1.07	18.01	42.05
P1B1	107.29	13.01	92.10	37.01	3.35	4.19	110.10	0.99	17.99	43.21
P1B2	110.90	14.90	114.01	40.90	3.48	5.15	123.06	1.06	25.98	54.29
P1B3	110.11	14.02	106.49	45.91	3.95	5.60	113.99	1.09	22.92	50.00
P2B0	105.89	13.90	98.98	40.02	3.33	5.01	75.30	1.19	22.90	52.01
P2B1	103.20	14.01	104.94	39.34	3.49	5.43	80.01	1.32	21.01	49.90
P2B2	116.83	16.50	125.80	53.29	4.11	6.70	153.01	1.90	28.70	65.10
P2B3	106.21	13.79	92.04	45.09	3.43	5.13	99.90	1.53	20.96	46.70
P3B0	110.10	13.38	77.99	39.09	3.12	4.53	86.70	0.97	18.98	41.39
P3B1	110.20	14.01	92.99	43.01	3.59	4.93	78.09	0.96	17.84	39.99
P3B2	111.12	15.01	113.94	44.90	3.74	4.87	84.69	1.12	23.49	52.80
P3B3	112.01	15.04	112.28	48.01	3.86	5.18	129.10	1.01	24.43	55.10
LSD(0.05)	4.40	1.98	15.00	5.51	0.40	0.55	10.00	0.15	2.50	5.99

Legend: P0= 0 kg P/ha, P1=22 kg/ha, P2=30 kg/ha, P3=38 kg/ha.
B0=0kg B/ha, B1=0.6 kg B/ha, B2=1 kg B/ha, b3=1.2 kg B/ha

All the characters were significantly influenced by different doses of Boron. There was an increasing response of all the parameters with the increasing levels of boron upto certain level (1kg B/ha) and declined thereafter. The maximum plant height was obtained by from the plant fertilized with 1 kg B/ha. In addition, the highest flower clusters per plant, fruit length, flowers per plant, individual fruit weight, fruit diameter and fruit weight per plant were obtained from the same treatment. Maximum fruits per plant were obtained from the treatment 1.2 kg B/ha. Plants fertilized with 1 kg B/ha gave the highest variation on fruit yield per plot (22.19 kg) as well as per hectare (53.94 t) (table 2). Interaction effects of different levels of phosphorus and boron were found to be significant on plant height, no of flowers per plants, fruit length, fruit diameter, weight of individual fruit, weight of fruits per plants.

The maximum plant height, number of flowers per plant, number of flower cluster per plant, fruit length, number of fruits per plant, fruit diameter, individual fruit weight, fruit weight per plant were recorded from the combined treatment of 30 kg P/ha with 1 kg B/ha. The highest fruit yield per plot 28.70 kg as well as per hectare (65.10 t) were also achieved from the same treatment (table 3).

Conclusion

The combined doses of phosphorus (30 kg P/ha) with boron (1kg B/ha) has been found to be optimum to achieve the best performance regarding yield. Future research can be carried out by formulating a different combination of treatment or by adding new nutrient source.

References

- Adebooye OC, Adeoye GO and Eniola HT. 2006. Quality of fruits of three varieties of tomato as affected by phosphorus rates. *J.Agron.*, 5(3):396-400
- Bose TK, Kabir J, Tmaity K, Parthasarathy VA and Som MG. 2002. *Vegetable Crops*. Naya Prokash 206 Bidhan sarani, Calcutta, India. P 35
- FAO. 2003. *Fao production yearbook. Basic Data Branch, Statistics Division, FAO. Rome Italy.* 57:140-142
- Oyinlola EY and Chude VO. 2004. Response of Irrigated tomato to boron fertilizer Yield and fruit quality Nigerian *J.Soil. res.* 5:53-61
- Shil IC, Haider AJMS, karim M Ali and hossain MM. 1997. Optimizing fertilizer requirement for grafted tomato cultivation *Ann. Bangladesh Agric.* 7(1):9-14
- Tindall HD. 1983. *Vegetables in the Tropics* McMillan Press. UK. p533