



EFFECT OF FOLIAR SPRAY BORON ON GROWTH AND YIELD IN TOMATO (CV., PKM-1)

N. Senthilkumar

¹Department of Soil Science and Agricultural Chemistry, Faculty of Agriculture, Annamalai University, AnnamalaiNagar-608 002. (TN) India.

Abstract

A pot culture experiment was conducted in clay loam soil at Department of Soil Science and Agricultural Chemistry, Faculty of Agriculture, Annamalai University. To study the effect of tomato to combined application of NPK with organic manures and boron during the year 2012-2013. The experiment soil was clay loam is texture, pH 7.85, Electrical Conductivity 0.75 dSm⁻¹ and low in available N (195kg ha⁻¹) and p (16kg ha⁻¹) and K (150kg ha⁻¹) status. The treatment detail as follows T₁ as control, T₂ as recommended fertilizers NPK (75:100:50 kg ha⁻¹) and T₃ as recommended fertilizers NPK plus FYM @12.5tha⁻¹ and T₄ as recommended fertilizers NPK plus FYM plus Boron 5.0 kg ha⁻¹ and T₅ as recommended fertilizer NPK plus FYM plus 0.1% boron as foliar spray at 25, 50 and 75th DAT and T₆ as recommended fertilizers NPK plus FYM plus 0.2% boron as foliar spray at 25,50 and 75th DAT day and T₇ as recommended fertilizer NPK plus FYM plus 0.3% boron as foliar spray at 25, 50 and 75 DAT. The inorganic fertilizer (half quantity of N and full quantity of P and K) and organic manures were given as basal dose in the experimental pots before transplanting. Boron (0.1, 0.2 and 0.3 per cent) was applied as foliar spray thrice viz., 25, 50 and 75 DAT. The experiment was laid out in CRBD with seven treatments in three replications. The number of fruits and single fruit weight are the most important trails in determining the yield and these trails were greatly influenced by the application of certain organic and micronutrient along with weight was maximum (18.83, and 37.75g) in the treatment combination of FYM 12.5 t ha⁻¹ RDF 75:100:50 kg NPK ha⁻¹ + 0.2% boron foliar spray (T₆) which recorded followed by the values of (18.42 and 37.52g) in T₇. The minimum value was recorded in control T₁.

Key words : Inorganic, Organic Sources, Boron, growth and yield tomato crop.

Introduction

Tomato (*Lycopersicon esculentum* Mill) is one of the most important vegetable commonly grown crops of the world due to its wide adaptability under agro climatic conditions. The effect of micronutrients like boron, and iron, if applied through foliar can also improve the vegetative growth and yield of crop. The conducted an treatments in the combination of boron 50ppm with the recommended dose of fertilizers was most effective for growth and yield. The role of boron which enhances the movement of sugar borate complex form the results of the fruit and increased fruit yield. Among the different kinds of vegetables, tomato find an important place in the human diet, because it is rich in ascorbic acid, sugar, calcium and vitamins. Organic manures play an vital role in improving the soil fertility and productivity of soil which has been acknowledged for generations. In recent years

organic farming is becoming more popular in India. Because people are now aware about the disastrous side effects caused by chemical farming on health and environment and now prefer organically grown foods. The use of contain organics like farmyard manure, NPK and Boron partly substitute chemical fertilizer and also reduce the cost of production. Farmyard manure, NPK and boron, it has a significant role in providing resistance to pests and diseases and in increasing the overall yield.

In India, it is grown in an area of 6.1 lakh hectares with an annual production of about 8.0 million tonnes (FAO, 2013) and in Tamilnadu, it is grown in an area of 0.46 lakh hectare with an annual production of 0.36 million tonnes (Namasivayam, 2014). The average productivity of tomato in India is only 17.5 t ha⁻¹ which is very low as compared to the world average production of tomato (25 t ha⁻¹). For increasing the high quality and quantity it needs to apply high amount of fertilizers, it leads to affect the soil parameters and affect the soil health.

*Author for correspondence : E-mail : senthilkumar.n.au@gmail.com

In recent years, adoption of high yielding varieties and use of high analysis NPK fertilizers led to decline in the micronutrient status in soil to below normal at which productivity of crops cannot be sustained (Kumar and Babel, 2011). Velu *et al.*, (2008) reported that 67 per cent of the soils of Cuddalore district were deficient in available Zinc (Zn) which needed attention towards Zn management in crops. Copper (Cu) and Iron (Fe) were deficient to the extent of 4 and 26 per cent respectively. Hence, it is an imperative need to develop a technology which improves the yield of crop without affecting the quality of produces as well as soil health. In Tamil Nadu about 57 and 44 per cent of total area is deficient in Zn and B respectively. Growing of tomato in such nutrient deficient soil is also one of the reasons for low productivity. Micronutrient management especially the Zn and B assumes greater significance for tomato production by their specific role in growth and metabolic activities. With this background in view, the present investigation was undertaken to effect of foliar spray Boron on growth and yield characters of tomato.

Materials and Methods

An investigation was carried out in vegetable, field unit, Department of soil Science and Agricultural Chemistry, Annamalai University. Annamalai Nagar. To study the effect of tomato to combined application of NPK with organic manures and boron during the year 2012-2013. Annamalai Nagar is situated at 112°N latitude and 79°41'E longitude at an altitude of 5.79m above mean sea level. Experiment soil was clay loam is texture, pH 7.85, Electrical Conductivity 0.75 dSm⁻¹ and low in available N (195kg ha⁻¹) and p (16kg ha⁻¹) and K (150kg ha⁻¹) status. The treatment combined of application of organic manures like FYM and inorganic fertilizer like nitrogen (urea), phosphorus (single super phosphate) and potassium (Muriate of potash) along with boron. The treatment detail as follows T₁ as control, T₂ as recommended fertilizers NPK (75:100:50 kg ha⁻¹) and T₃ as recommended fertilizers NPK plus FYM @ 12.5 t ha⁻¹ and T₄ as recommended fertilizers NPK plus FYM plus Boron 5.0kg ha⁻¹ and T₅ as recommended fertilizer NPK plus FYM plus 0.1% boron as foliar spray at 25, 50 and 75th DAT and T₆ as recommended fertilizers NPK plus FYM plus 0.2% boron as foliar spray at 25,50 and 75th DAT day and T₇ as recommended fertilizer NPK plus FYM plus 0.3% boron as foliar spray at 25, 50 and 75 DAT. The experiment was laid out in CRBD with seven treatments in three replications. The inorganic fertilizer (half quantity of N and full quantity of P and K) and organic manures were given as basal dose in the experimental plots before transplanting. The remaining

half quantity of N was applied 30 days after transplanting. Boron (0.1, 0.2 and 0.3 per cent) was applied as foliar spray thrice *viz.*, 25, 50 and 75 DAT. The biometric observation and sample were collected periodically and all the data should be analyzed statistically.

Results and Discussion

Data presented in table 2 shows that the growth parameters *viz.*, plant height, internodal length, number of branched, number of leaves and leaf area were significantly influenced by the application of certain organics or inorganic combination of boron on tomato cv. PKM -1. The highest plant height at 120 days (106.09 cm) was recorded in the treatment combination of recommended dose of fertilizer 75:100:50 kg NPK ha⁻¹ + FYM 12.5 t ha⁻¹ + 0.2% boron foliar spray at thrice (T₆) followed by (T₇). Recommended dose of fertilizer 75:100:50 kg NPK/ha⁻¹ +12.5t ha⁻¹ FYM + 0.3% boron foliar spray at thrice. Which recorded 105.21cm, the minimum plant height, (90.09 cm) was recorded in the control (T₁). Regarding the internodal length, it was maximum in T₆ (RDF 75:100:50 kg NPK ha⁻¹ + 12.5 t ha⁻¹ FYM + 0.2% boron foliar spray) which recorded 5.87 cm followed by T₇ (RDF 75:100:50 kg NPK ha⁻¹ + 12.5 t ha⁻¹ FYM + 0.3% boron foliar spray) which recorded 5.38 cm the minimum value of 3.88 cm was

Table 1a: Physical and chemical properties of the soil.

S.No.	Properties	Values
1	Physical Properties	
	Clay %	36.2
	Silt %	15.3
	Fine sand %	33.3
	Course sand %	15.2
	Texture class	Clay loam
2	Chemical Properties	
	Soil reaction (pH)	7.85
	Electrical conductivity (EC) dSm ⁻¹	0.75
	Available Nitrogen (kg ha ⁻¹)	195.00
	Available Phosphorus (kg ha ⁻¹)	16.00
	Available Potassium (kg ha ⁻¹)	150.00
	Boron (kg ha ⁻¹)	1.60

Table 1b: Physical and chemical properties of FYM.

S.No.	Properties	FYM
1	pH	8.38
2	EC dSm ⁻¹	1.50
3	Organic carbon (%)	10.80
4	Total N (%)	0.95
5	Total P (%)	0.35
6	Total K (%)	0.60

Table 2: Effects of organic and inorganic combination of boron on growth characters of tomato cv. PKM-1.

Treatments	Plant height (cm)			
	30 days	60 days	90 days	120 days
T ₁ – Control	42.81	64.76	86.64	90.09
T ₂ – Recommended dose of fertilizer 75:100:50	45.48	64.76	86.64	103.48
T ₃ – Recommended dose of fertilizer 75:100:50 Kg NPK ha ⁻¹ + FYM 12.5 t ha ⁻¹	46.67	65.84	89.59	102.51
T ₄ – Recommended dose of fertilizer 75:100:50 Kg NPK ha ⁻¹ + FYM 12.5 t ha ⁻¹ + Boron @ 5 kg ha ⁻¹	47.49	66.80	86.77	102.97
T ₅ – Recommended dose of fertilizer 75:100:50 Kg NPK ha ⁻¹ + FYM 12.5 t ha ⁻¹ + 0.1% Boron Foliar spray at 25, 50 and 75 th DAT.	47.43	67.02	91.85	104.44
T ₆ – Recommended dose of fertilizer 75:100:50 Kg NPK ha ⁻¹ + FYM 12.5 t ha ⁻¹ + 0.1% Boron Foliar spray at 25, 50 and 75 th DAT.	48.72	71.07	94.23	106.09
T ₇ – Recommended dose of fertilizer 75:100:50 Kg NPK ha ⁻¹ + FYM 12.5 t ha ⁻¹ + 0.3% boron Foliar spray at 25, 50 and 75 th DAT.	47.62	68.64	92.70	105.21
S.E.D	0.55	0.18	0.29	0.09
C.D.(P=0.05)	0.78	0.25	0.41	0.13

recorded in the control (T₁).

The number of branches cumbers of leaves/plant showed significant variations among the various treatments. The maximum number of branches of leaves (28.65) were recorded in the treatment T₆ (RDF 75:100:50 kg NPK ha⁻¹ + 12.5 t ha⁻¹ FYM + 0.2% boron foliar spray) at thrice where as the control (T₁) recorded the minimum value for number of branches (3.65) of leaves (25.27). Regarding the leaf area T₆ (RDF 75:100:50 kg NPK ha⁻¹ + FYM 12.5 t ha⁻¹ + 0.2% boron foliar spray) at thrice recorded by the maximum value of 54.78 cm² followed by T₇ (RDF 75:100:50 kg NPK ha⁻¹ + 12.5 t ha⁻¹ FYM + 0.3% boron foliar spray) which registered a value of 53.07cm² in T treatment the control (T₁) registered the minimum leaf area 35.53cm².

The results of the present study are in agreement with the findings of Mohamed Rafi *et al.*, (2002) in tomato and Subbarao and Sankar (2001) in Brinjal. Organic manures improves the soil physical conditions and promotes microbial and soil organic matter, which in there produces organic acids, which inhibits IAA oxides enzymes, results in enhancing the promoting effect of Auxin- IAA, which has direct effect on plant growth (Lecopold, 1974). The increase in growth parameters due to application of boron may be due to the presence of growth substances and others essential nutrients (Bano *et al.*, 1987).

Data presented in table 2 shows significant variations among the various treatments. In the present study, plants

supplied with organic manures *viz.*, farm yard manure 12.5 t/ha + Recommended dose foliar spray 0.2% boron (T₆) showed more number of flower cluster per plant (9.74) and more number of flowers per cluster (5.02) followed (T₇) showed less number of flowers/plant (6.71) and less number of flower/cluster (3.13) respectively. This might be due to the better nutritional status of the plant, which was favored by this treatment. Subbarao and Sankar (2001) supported that application of FYM + boron resulted in earlier flowing and higher flower production. Which may be due to better aeration, adequate drainage and creation of favorable soil environment for deeper penetration of root and nutrient extraction will be higher from the soil.

The number of fruits and single fruit weight are the most important traits in determining the yield and these trails were greatly influenced by the application of certain organic and micronutrient along with weight was maximum (18.83 and 37.75g) in the treatment combination of FYM 12.5 t ha⁻¹ RDF 75:100:50 kg NPK ha⁻¹ + 0.2% boron foliar spray (T₆) which recorded followed by the values of (18.42 and 37.52g) in T₇. The minimum value was recorded in control T₁.

Conclusion

Finally concluded that from the results of present study that application of RDF + 12.5 t ha⁻¹ FYM + 0.2% boron foliar spray (T₆) resulted in improving the growth and yield character in tomato followed by the (T₇). RDF + 12.5 t ha⁻¹ FYM + 0.3% boron foliar spray.

Table 2a: Effect of organic and inorganic combination of boron on growth characters of tomato cv. PKM-1.

Treatments	Internodal Length (cm)	Number branch Plant ¹	Number of leaves	Leaf area (cm ²)
T ₁ – Control	3.88	3.65	25.27	35.53
T ₂ – Recommended dose of fertilizer 75:100:50 Kg NPK ha ⁻¹	4.38	4.04	26.11	46.67
T ₃ – Recommended dose of fertilizer 75:100:50 Kg NPK ha ⁻¹ +FYM 12.5 t ha ⁻¹	4.56	4.35	26.33	49.82
T ₄ – Recommended dose of fertilizer 75:100:50 Kg NPK ha +FYM 12.5 t ha ⁻¹ + Boron 5.0kg ha ⁻¹	4.93	4.88	27.43	50.72
T ₅ – Recommended dose of fertilizer 75:100:50 Kg NPK ha ⁻¹ +FYM 12.5t ha ⁻¹ + 0.1% Boron Foliar spray at 25, 50 and 75 th DAT.	5.07	5.31	27.88	52.61
T ₆ – Recommended dose of fertilizer 75:100:50 Kg NPK ha ⁻¹ + FYM 12.5 t ha ⁻¹ +0.2% boron Foliar spray at 25, 50 and 75 th DAT.	5.87	6.22	28.65	54.78
T ₇ – Recommended dose of fertilizer 75:100:50 Kg NPK/ha +FYM 12.5 t ha ⁻¹ +0.3% boron Foliar spray at 25, 50 and 75 th DAT.	5.38	5.76	28.04	53.07
S.E.D	0.06	0.08	0.04	0.02
C.D. (P=0.05)	0.08	0.11	0.06	0.03

Table 2b: Effects of organic and inorganic combination of boron on yield character of tomato cv. PKM-1.

Treatments	Number of flower cluster/plant ⁻¹	Number of flower /cluster ⁻¹	Number of fruit/plant ⁻¹	Single fruit weight (gm)	Ascorbic acid (mg/100g)	Yield / plant (gm)
T ₁ – control	6.71	3.13	12.31	28.61	25.48	353.35
T ₂ – Recommended dose of fertilizer 75:100:50 Kg NPK ha ⁻¹	7.71	3.41	17.21	34.22	26.28	611.10
T ₃ – Recommended dose of fertilizer 75:100:50 Kg NPK ha ⁻¹ + FYM 12.5t ha ⁻¹	7.54	3.95	17.47	36.28	27.09	636.36
T ₄ – Recommended dose of fertilizer 75:100:50 Kg NPK ha ⁻¹ + FYM 12.5 t ha ⁻¹ + Boron 5.0kg ha ⁻¹	8.66	4.03	17.91	36.54	27.15	652.70
T ₅ – Recommended dose of fertilizer 75:100:50 Kg NPK ha ⁻¹ +FYM 12.5 t ha ⁻¹ + 0.1% Boron Foliar spray at 25, 50 and 75 th DAT.	9.04	4.62	18.21	37.22	30.15	696.14
T ₆ - Recommended dose of fertilizer 75:100:50 Kg NPK ha ⁻¹ +FYM 12.5 t ha ⁻¹ +0.2% boron Foliar spray at 25, 50 and 75 th DAT.	9.74	5.02	18.83	37.75	39.63	712.81
T ₇ – Recommended dose of fertilizer 75:100:50 Kg NPK ha ⁻¹ + FYM 12.5t ha ⁻¹ + 0.3% boron Foliar spray at 25, 50 and 75 th DAT.	9.14	4.34	18.52	37.52	31.70	673.01
S.E.D	0.03	0.02	0.02	0.03	0.02	2.13
C.D.(P=0.05)	0.05	0.03	0.03	0.05	0.03	2.99

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