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Effect of Boron and Zinc on Growth and Yield of *Bt.* Cotton under Rainfed Condition

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ABSTRACT

A Field experiment was conducted during kharif 2017 on the Central farm Balsa. VNMKV Parbhani of clay texture soil. Application of 125% RDF + foliar spraying of 0.5% Zinc+0.2% Boron (T_{11}) twice during flowering (60 DAS) and boll development stage (80 DAS) recorded significantly Maximum growth attributes i.e., height of the plant (147.03) leaf area plant^{-1} (86.10), number of functional leaves plant^{-1} (137.93), number of sympodial branches plant^{-1} (21.38), total dry matter plant^{-1} (191.32) but it was at par with the 125 % RDF + foliar spraying of 0.2% of Boron (T_8) and 125 % RDF +foliar spraying 0.5 % Zinc (T_9). Yield attributing character and yield it is observed from the data presented in (Table 2) significantly higher yield attributing character number of picked boll plant^{-1}, seed cotton yield plant (g) plant^{-1}, seed cotton yield kg ha^{-1} were reported by application of 125% RDF + foliar spraying of 0.5% Zinc+0.2% Boron (T_{11}) twice during flowering (60 DAS) and boll development stage (80 DAS) recorded significantly but it was at par with the 125 % RDF + foliar spraying of 0.2% of Boron (T_8) and 125 % RDF +foliar spraying 0.5 % Zinc (T_9).

Key words: *Zinc and Boron, DAS, RDF*

INTRODUCTION

Cotton is the most important fiber crop of Indian farming community and plays and important role in agrarian and rural economy of India. It is cultivated in more than seventy countries. It is an important raw material of economic in term of both employment generation and foreign exchange and hence in is popularly known as white gold or friendly fiber the word cotton market is witnessing and increased the concentration in its production and trading cotton fiber combined with technological revolution in the spinning and yarn manufacturing sectors has reprioritized the importance of fiber quality parameters[8].

Cotton is one of the principal crops in India, which has been developed over the years with tools of science. Cotton occupies a prominent role among cash crops as it guides the density of large section of farming community as well as that of flourishing textile industries.

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Commercially cotton is the best export earning commodity in the country. Cotton is used not only for weaving of cloth but also for other purposes like preparation of edible oil from its seeds (16-24%). American cotton contains more percentage of oil as compared to *desi* cotton varieties. There is need to increase the production of cotton for improving financial status of farmers and strengthen national economy by increasing the productivity of cotton not only by increasing the area under production but also nutrient management. Fertilizer has become necessary input to supply essential plant nutrients to get expected crop yield as soils are poor in NPK content. Three known principal elements for plant growth are nitrogen, phosphourus and potassium. Essential micronutrients like Zinc and Boron important role in physiology of cotton crop being a part of enzyme system of catalyst in enzymatic reactions. The role of micronutrients in various physiological and biochemical processes in plant is well known, which enables a rapid change in the physiology of plant within one season to achieve desirable results[6].

Foliar application can be used to improve the efficiency and rapidity of utilization of a nutrient urgently required by cotton crop for maximum growth and yield. A major component of profitable cotton production ids adequate and balanced nutrition. Sound cotton fertilization practices ensure improved economics of production, efficiency of nutrient use, and environmental protection. Foliar nutrition serve as a supplement to traditional soil applied fertilizer for sufficient supply of nutrients to cotton crop[7]. Keeping in mind the struggle between plants for getting more plant nutrients, it will be essential to find out the appropriate method of micronutrient application and achieve the maximum yield under rainfed condition. Accordingly a field experiment carried out.

MATERIAL AND METHOD

The field experiment conducted during 2017 was conducted at balsa block Central Farm, VNMKV, Parbhani. The experimental field was leveled and well drained. The soil was clay in texture, low in nitrogen, medium in phosphorus and high in potassium and alkaline in reaction. Total rainfall received during crop growing season was 995.01 mm and distributed over 42 rainy days during the process of experimentation. The environmental conditions prevailed during experimental period was favourable for normal growth and maturity of *Bt* cotton.

The experiment was laid out in a Randomized block design with eleven treatments and three replications. *viz.*, T_1– 100% RDF (120:60:60 NPK kg ha^{-1}) Control , T_2 –100% RDF +Zinc @ 20 kg ha^{-1}, T_3 – 100% RDF +Boron @ 5.0 kg ha^{-1}, T_4 –125% RDF +Zinc @ 20 kg ha^{-1}, T_5–125% RDF +Boron @ 5.0 kg ha^{-1}, T_6–100% RDF+ foliar spraying of 0.2% Boron, T_7–100% RDF+ foliar spraying of 0.5 % Zinc, T_8–125% RDF+ foliar spraying of 0.2% Boron, T_9–125% RDF+ foliar spraying of 0.5% Zinc, T_{10}–100% RDF+ foliar spraying of 0.5% Zinc+0.2% Boron, T_{11}– 125% RDF+ of 0.5% Zinc+0.2% Boron foliar spraying at flowering (60 DAS) and boll development stage (80 DAS). The biometric observation and post harvest observation were recorded as per the standard procedure to evaluate treatment effects. The recommended cultural practices and preventive plant protection measures were undertaken timely.

RESULTS AND DISSECTION

The plant growth in respect of plant height, leaf area $plant^{-1}$, number of functional leaves $plant^{-1}$, number of sympodial branches $plant^{-1}$ and total dry matter $plant^{-1}$ were significant in influenced by treatment under study.

Table 1: Effect of micronutrient on growth and growth parameter of cotton crop

Treatments	**At harvest**		**120 DAS**		
(Soil application)	**Plant height (cm) plant^{-1}**	**Number of sympodial branches plant^{-1}**	**Number of functional leaves plant^{-1}**	**Leaf area (dm^2) plant^{-1}**	**Total dry matter plant^{-1}**
T_1–100% RDF (120:60:60 NPK kg ha^{-1}) Control.	127.60	12.80	116.26	70.19	168.58
T_2 –100% RDF +Zinc @ 20 kg ha^{-1}	128.25	14.97	118.78	73.81	171.73
T_3 –100% RDF +Boron @ 5kg ha^{-1}	129.35	15.35	119.07	74.60	172.40
T_4 –125% RDF +Zinc @ 20 kg ha^{-1}	133.24	19.28	125.71	77.30	176.05
T_5–125% RDF +Boron @ 5 kg ha^{-1}	134.95	18.65	126.38	78.63	177.11
(Foliar application)					
T_6–100% RDF+0.2% Boron	131.98	17.78	120.67	76.79	174.26
T_7–100% RDF+0.5 % Zinc	131.65	16.20	119.73	72.54	173.29
T_8–125% RDF+0.2% Boron	144.67	21.07	132.59	82.08	186.63
T_9–125% RDF+0.5% Zinc	141.07	20.45	128.68	81.40	183.68
T_{10} –100% RDF+0.5% Zinc+0.2% Boron	132.86	19.65	124.05	77.68	175.13
T_{11}–125% RDF+0.5% Zinc+0.2% Boron	147.03	21.86	137.93	86.10	191.32
SE(m) ±	4.12	0.63	3.78	2.47	4.52
CD at 5%	12.26	1.89	11.25	7.36	13.45
GM	134.78	18.00	124.53	77.31	177.28

It was observed that Table no 1. Maximum height of the plant (147.03) leaf area plant^{-1} (86.10), number of functional leaves plant^{-1} (137.93), number of sympodial branches plant^{-1} (21.38), total dry matter plant^{-1} (191.32) was attained with application of 125% RDF + foliar spraying of 0.5% Zinc+0.2% Boron (T_{11}) twice during flowering (60 DAS) and boll development stage (80 DAS) recorded significantly highest growth attributing character but it was at par with the 125 % RDF + foliar spraying of 0.2% of Boron (T_8) and 125 % RDF +foliar spraying 0.5 % Zinc (T_9). Significantly minimum growth parameters recorded in treatment (T_1) 100% RDF 120:60:60 kg NPK ha^{-1}.

The application of recommended dose of fertilizer with micronutrients i.e., Zinc and Boron resulted in increase in growth attributes may be due to better uptake trance location of better and translocation of plant nutrients to growing plants and more photosynthesis which in turn promoted more plant height, leaf area plant^{-1}, number of functional leaves plant^{-1}, number of sympodial branches plant^{-1} and total dry matter plant^{-1}. This result was conformity with Gawande[2], Nawalkhe *et al*[5], Eleyan *et al.*[1], Kulvir *et al*[3], Rajendran *et al.*[7].

Yield attributing character and yield it is observed from the data presented in (Table 2) significantly higher yield attributing character number of picked boll plant^{-1}, seed cotton yield plant (g) plant^{-1}, seed cotton yield kg ha^{-1} were reported by application of 125% RDF + foliar spraying of 0.5% Zinc+0.2% Boron (T_{11}) twice during flowering (60 DAS) and boll development stage (80 DAS) recorded significantly highest plant height but it was at par with the 125 % RDF + foliar spraying of 0.2% of Boron (T_8) and 125 % RDF +foliar spraying 0.5 % Zinc (T_9).

Table 2: Effect of micronutrient on yield and yield attributes of cotton crop

Treatments	Number of picked bolls plant^{-1}	Seed cotton yield plant^{-1} (g)	Seed cotton yield (kg ha^{-1})
T_1–100% RDF (120:60:60 NPK kg ha^{-1}) Control.	21.12	73.43	1231
T_2 –100% RDF +Zinc @ 20 kg ha^{-1}	25.25	90.14	1551
T_3 –100% RDF +Boron @ 5kg ha^{-1}	26.48	96.91	1579
T_4 –125% RDF +Zinc @ 20 kg ha^{-1}	28.02	103.62	1776
T_5–125% RDF +Boron @ 5 kg ha^{-1}	28.09	103.95	1789
(Foliar application)			
T_6–100% RDF+0.2% Boron	27.52	97.88	1649
T_7–100% RDF+0.5 % Zinc	27.08	97.09	1602
T_8–125% RDF+0.2% Boron	28.98	111.65	1888
T_9–125% RDF+0.5% Zinc	28.94	110.54	1861
T_{10} –100% RDF+0.5% Zinc+0.2% Boron	27.58	104.33	1707
T_{11}–125% RDF+0.5% Zinc+0.2% Boron	31.29	120.37	2028
SE(m) ±	0.90	3.68	57.45
CD at 5%	2.69	10.93	170.22
GM	27.30	100.90	1697

This might be due to enhancement of photosynthetic and enzymatic activity and also due to prevention of squares and shedding of bolls. This may be because of production of more number of fruiting points and flower production, which lead to marked influence in partitioning of vegetative and reproductive growth. Being a part of the enzyme system or as a catalyst in enzymatic reactions, they are required for plant metabolic activities such as respiration, meristomatic development chlorophyll formation, photosynthesis, energy system, protein synthesis and oil content and also these nutrients play a major role in production of more number of lateral branches, production of more number of bolls by arresting dropping of squares, flowers and bolls. This results are conformity with Mohmooda Burio *et al.*[4], and Yaseen *et al.*[9].

CONCLUSION

On the basis of one year data it can be concluded that application of 125 % RDF + foliar spraying of 0.5% Zinc+0.2% Boron twice during flowering (60 DAS) and boll development stage (80 DAS) during *kharif* season of 2017 recorded highest growth parameter, yield attributes, seed cotton yield and fallowed by treatment 125 % RDF + foliar spraying of 0.2% of Boron (T_8) and 125 % RDF +foliar spraying 0.5 % Zinc (T_9).

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