ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 10, Iss 06, 2021

EFFECT OF FOLIAR APPLICATION OF NITROGEN AND BORON ON THE YIELD OF TOMATO (*LYCOPERSICON ESCULENTUM* MILL.)

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Abstract

The present investigation entitled "Effect of Nutrient application of Nitrogen and Boron on the Yield of Tomato (*Lycopersicon esculentum* Mill.)'' was conducted at the experimental farm of the faculty of Agricultural Sciences and Allied Industries, Rama University, Mandhana, Kanpur (U.P.) during 2017-18. The experiment was laid out in randomized block design (RBD) with three replications comprising of 16 treatment combinations. The treatments were Nitrogen (0 %, 0.10 %, 0.15 % and 0.20 %) and Boron (0 %, 0.15 %, 0.20 % and 0.25 %). Seeds of Azad T-9' were sown in the nursery on 15th Sep.2017 and transplanting was done on 22th Oct.,2017 and result, N_3 (0.20%) and B_3 (0.25%) produced maximum significant values of every yield attributes of tomato. So, it is advised to research workers and vegetable growers of Central Uttar Pradesh that for obtaining optimum yield spraying with 0.20% nitrogen and 0.25% boron is recommended.

Keywords: Spraying of fertilizer; Tomato; Nitrogen, Boron and Yield.

Introduction

Tomato (*Lycopersicon esculentum* Mill.) a member of Solanaceae family and is one of the most popular, nutritious and widely grown vegetable plants across the world. It is origin place in South America.Due to the excellent adaptability to wider range of soil and climatic conditions it is widely grown in any parts of the world (Ahmed, 1976). Tomato plants were brought to Europe by Red Indians and started cultivation of tomato. It was introduced in Indian Subcontinent by the Europeans. Later on, local people also started its consumption due to its popularity. It is now used everywhere in the country in so many forms. Balance fertilizations in crops will act as an insurance against possible nutrient deficiencies that may be created by the respected use of a single nutrient. Among different nutrients that were required for tomato cultivation nitrogen and boron are the most important nutrients. It also promotes vegetative growth, flower and fruit setting of tomato. Next to nitrogen fertilizer, phosphatic fertilizers dwell is the second most important input for increasing crop production.

All types of soil are suitable for tomato production including sandy andheavy clay with soil pH of 5.5 to 7.5 is best one. However, sandy loam soil isconsidered best for an early crop.

ISSN PRINT 2319 1775 Online 2320 7876

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Highest yield can be obtained by growingtomato in loam, clay loam and silt loam having enough organic matter.

Fertilizer plays important role in enhancing of tomato yield andquality. Essential macro nutrient (N, P and K) and some micro nutrient suchas (B, Cu and Zn) are very important for enzymatic reactions with in plantbody such as making of RNA and DNA, protein formation, synthesis of cellwall, occurrence of flowering and fruit formation, important part of growthhormone, while their deficiency affects yield and quality of plants.

Nitrogen is essential for carbohydrates, protein metabolism and sexualfertilization. It is also essential for the synthesis of tryptophan which is the precursor of Indole Acetic Acid (IAA).

Boron is essential for yield and quality of tomato. It helps in the development of cell wall, occurrence of cell division, formation of the vascular bundle, protein synthesis, root system development, fruit and seed formation and transport of sugar.

Keeping the above points in view the present investigation entitled ‘’Effect of Nutrient application of Nitrogen and Boron on the Yield of Tomato (*Lycopersicon esculentum* Mill.)’’

Materials and Methods

Site and location of experiment

The experiment was conducted in Rama university Research farm Kanpurduring the year 2017-2018.

Geographically Kanpur is situated in the Gangetic plains of central U.P. It lies in altitude and longitude ranges between 25.28˚ to 28.50˚ north and 79.31˚ to 84.34˚ east at elevation of 125.91 m above sea level.

Weather conditions

Kanpur is characterized by sub-tropical climate with hot dry summer and cold winters. The annual rainfall is about 800-860 mm. The major portion of rain is received between July to September, with scattered shower in winter from the North-East monsoon.

Experiment Details

The treatment comprised combination of four levels of Nitrogen (0 %, 0.10 %, 0.15 % and 0.20 %) and Boron (0 %, 0.15 %, 0.20 % and 0.25 %). Thus, the total numbers of treatments with their symbols have been presented in Table 3.5

Table 1: Details of treatments with their symbols

Treatments	Symbols
N levels (%)	
0 %	N_0
0.10%	N_1
0.15 %	N_2
0.20 %	N_3
B levels (%)	

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 UGC CARE Listed (Group -I) Journal Volume 10, Iss 06, 2021

0 %	B_0
0.15%	B_1
0.20 %	B_2
0.25 %	B_3

Experiment Design and Layout

The experiment was carried out in Randomized Block Design with three replications. In all, there were sixteen treatment combinations and were randomly allotted to different plots with the help of Fisher's random number table (**Fisher, 1950)**. The gross plot size was 2.25 m × 1.50 m (3.375 $m^{2)}$. The treatment combinations are sown in Table 1

Table 1: Treatment combinations

Treatment	Symbols
$Nn_0 B_0$	T_1
$Nn_0 B_1$	T_2
$Nn_0 B_2$	T_3
$Nn_0 B_3$	T_4
Nn_1B_0	T_5
Nn_1B_1	T_6
Nn_1B_2	T_7
$Nn_1 B_3$	T_8
Nn_2B_0	T_9
Nn_2B_1	T_{10}
$Nn_2 B_2$	T_{11}
Nn_2B_3	T_{12}
Nn_3B_0	T_{13}
Nn_3B_1	T_{14}
Nn_3B_2	T_{15}
Nn_3B_3	T_{16}
Total number of treatments	16

Statistical Analysis

The experimental data recorded on each aspect on each treatment were statistically computed in RBD as following procedure which is given by **Panse and Sukhatme (1985).** For calculating standard error of mean and critical difference (t) value was taken at 0.05 level of significance.

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Techniques Adopted for Recording Observations

Yield attributes-

Number of fruits per plant

Several pickings were required as all the fruits did not mature at a time. In each picking, fruits were counted and after last picking, the average number of fruits per plant was calculated.

Diameter of fruit (cm)

The diameter of fruit was measured in centimeter from the middle of the fruit with the help of a Vernier Calliper. The diameter of all the fruit of sampled plants was taken and mean was worked out.

Weight of fruit (g)

The weight of randomly selected fruits was pooled and average fruit weight was calculated in gram.

Results and Discussion

1. Maximum 27.83 number of fruits per plant of tomato was observed withNn_3 (0.20%)and it was minimum 23.88 withNn_0. Boron at 0.25 % produced maximum 26.80 fruits per plant and it was minimum 24.71 in B_0. Interactive treatment Nn_3B_3 recorded maximum 29.53 fruit per plant and it was recorded minimum 21.20 withNn_0B_0 as given below table-

Table 2: Analysis of variance for number of fruits per plant of tomato (*Lycopersicon esculentum* Mill.)

Source of Variation (S.V.)	Degree Of Freedom (d.f.)	Sum of square (S.S.)	Mean sum of square (M.S.S.)	F cal.	F tab.	
					At 5 %	At 1 %
Replication	2	5.230	2.615	1.454		
Factor N	3	59.598	19.861	10.962**	2.92	4.51
Factor B	3	17.445	5.819	3.230*	2.92	4.52
N × B	9	21.043	2.338	1.381	2.25	3.09
Error	30	54.523	1.815			
Total	47	157.840				

2. Diameter of fruit was obtained maximum 7.47 cm with Nn_3 (0.20%)and it was minimum 6.42 cm with Nn_0recorded maximum 7.42 cm diameter of fruit and minimum 6.68 cm diameter of fruit showed with B_0. Interactive treatment Nn_3B_3 recorded maximum 7.55 cm diameter of fruits and it was minimum 5.12 withNn_0B_0as given below table-

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Table 3: Analysis of variance diameter of fruits (cm) of tomato (*Lycopersicon esculentum* Mill.)

Source of Variation (S.V.)	Degree Of Freedom (d.f.)	Sum of square (S.S.)	Mean sum of square (M.S.S.)	F cal.	F tab.	
					At 5 %	At 1 %
Replication	2	0.610	0.310	2.899		
Factor N	3	3.223	1.133	10.666**	2.91	4.54
Factor B	3	0.977	0.356	3.045*	2.94	4.53
Zn × B	9	1.267	0.145	1.251	2.77	3.14
Error	30	3.213	0.151			
Total	47	9.466				

3. The maximum 43.99g fruit weight was obtained with Nn_3 (0.20%) and it was minimum 41.58g withNn_0(0.25%) recorded maximum 43.17g fruit weight and it was minimum 42.04g with B_0. Interactive treatment Nn_3B_3 recorded maximum 44.12g fruit weight and it was recorded minimum 40.06g in Nn_0B_0as given below table-

Table 4: Analysis of variance for weight of fruit (g) of tomato (*Lycopersicon esculentum*Mill.)

Source of Variation (S.V.)	Degree Of Freedom (d.f.)	Sum of square (S.S.)	Mean sum of square (M.S.S.)	F cal.	F tab.	
					At 5 %	At 1 %
Replication	2	5.656	2.828	1.326		
Factor N	3	197.261	65.736	30.814**	2.92	4.53
Factor B	3	56.936	18.971	8.892**	2.82	4.59
N × B	9	70.339	7.788	3.649*	2.23	3.11
Error	30	64.555	2.131			
Total	47	393.889				

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Conclusion

On the basis of experiment conducted during Rabi season of 2017-2018 at Rama university research farm Kanpur (U.P.) with the summary of results as

From above scenario of result, N_3 (0.20%) and B_3 (0.25%) produced maximum significant values of every yield attributes of tomato. So, it is advised to research workers and vegetable growers of Central Uttar Pradesh that for obtaining optimum yield spraying with 0.20% nitrogenand 0.25% boron is recommended.

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