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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH, YIELD AND QUALITY OF TOMATO (*LYCOPERSICON ESCULENTUM* L.) CV. PUSA RUBY

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Abstract

A field experiment was carried out entitled "Effect of integrated nutrient management on growth, yield and quality of Tomato (*Lycopersicon esculentum* L.) cv. Pusa Ruby" in Randomized Block Design with three replications. The experiment was conducted at the Horticulture Research Farm of the Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareli Road, Lucknow (U.P.), India, during *Rabi* season of 2015. The experiment comprises of different doses of organic manures *i.e.* RDF100% , FYM 100%, Azotobacter 100% , Azospirillum 100%, (RDF50% + FYM50%), (RDF50% + Azotobacter50%), (RDF50% + Azospirillum50%), (FYM50% + Azospirillum50%), (FYM50% + Azotobacter50%) , (Azotobactor 50%+ Azospirillum50%) and (RDF25% + FYM 25%+ Azotobactor25% + Azospirillum25%). The growth, yield and quality attributing characters were recorded maximum Plant height (16.15cm), number of branches (4.36), first flowering (37.72). number of flower per plant (39.34), number of clusters per plant (9.78), number of fruit per plant(15.95), Fruit diameter (cm) (60.69), Fruit weight (68.28gm), Fruits yield per plant (1.09kg), Fruit yield/plot (17.44kg), Fruit yield(363.60 q/ha), Acidity (0.59%), TSS (6.04), Vitamin-C (27.37mg/100g).

Key words : Biofertilizers, tomato, growth, yield, quality.

Introduction

Recent developments in agriculture have contributed a lot towards improvement in vegetable production throughout the world. India can claim to grow the largest number of vegetable crops as compared to other countries in the world as many as 61 annual and 4 perennial vegetable crops are commercially cultivated (Harihar, 2005). India, being the second largest producer of vegetable in the world next only to china, shares about 15 per cent of the world output of vegetables from about 3 per cent of total cropped area in the country. The current production level is over 101.43 million tones from an area of 6.76 million hectare (Anonymous, 2007). In spite of such a large production, the per capita per day supply of vegetables could not rise about 175 g in the country, which is lower, than the recommended dietary allowance of 280 g per capita per day for balance diet (Singh, 2004). The vegetable requirement of our country is estimated to be 185 million tones by 2009-2010 and 220 million tones by 2020 (Singh,2004). Tomato (*Lycopersicon esculentum* Mill.) is one of the most popular and widely grown vegetable crop throughout the world. It is rich source of vitamins, vegetable protein and minerals and hold a glorious position among vegetable after the potato and sweet potato. Tomato known as poor man's apple contribute large quantity of vitamins A, B and C with considerable quantity of other minerals. Tomato is used as soup, salad, pickles, ketchup, puree, sauces, tomato paste, tomato juice and other products. This can be accomplished through integrated nutrient management, which involve a combined use of fertilizers and organics to sustain crop production and maintenance of soil health (Nanjappa *et al*., 2001). Also, the organic manures supply the trace of micronutrients, which is not supplied by chemical fertilizers (Kachat *et al*., 2001). However, biofertilizers offer an alternative to chemical inputs, which have ability to mobilize the nutritionally important elements from non-usable to usable from

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through biological process and are known to increase yield in several vegetables (Purkayastha *et al*., 1998 and Kumar *et al*., 2001). These bio-fertilizers play a significant role in solubilizing insoluble phosphate. Around 95-95% of total soil phosphorous is insoluble which is not directly available to plants. *Azospirillum barasilense*, a heterotrophic nitrogen fixing organism has been reportedto be beneficial and economical on several cereals, legumes and in some solanaceous crops *viz*., chilli and tomato (Jeevansab, 2000). The phosphate solubilizing bacteria may convert insoluble form of phosphate to soluble form by producing organic acid. About 15-25% of insoluble phosphate can be solublized saving chemical fertilizer significantly.

In view of this, present investigation entitled "Effect of integrated nutrient management on growth, yield and quality of Tomato (*Lycopersicon esculentum* L.) cv. Pusa Ruby" have been planned and carried out with the following objectives:

1. To investigate the effect of various treatments on growth of tomato.
2. To examine the effect of different treatment on yield of tomato.
3. To assess the influence of various treatments on quality parameter of tomato.

Materials and Methods

The present experiment entitled entitled "Effect of integrated nutrient management on growth, yield and quality of Tomato (*Lycopersicon esculentum* L.) cv. Pusa Ruby" was conducted at Research Farm of Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Lucknow of 2015-2016. The experiment was conducted during Rabi season under Randomized Block Design with three replications. Details of material used and methodology employed to plan and execute the experiment are described in this chapter. Geographically Lucknow is situated at $26^0 50'$ N latitude, $80^0 52'$ E longitude and altitude of 111 meter above mean sea level (MSL).

The seeds of the cultivar were collected from Indian Agricultural Research Institute, New Delhi, India. Pusa Ruby was can even set fruit when night temperatures drop to 8^0C. The plant has moderate foliage cover and prolific bearing. The fruits are flattish-round, smooth and develop a uniform red colour at maturity. The cultural practices required for good growth, and the pests and diseases and their control are highlighted. Seedlings were transplanted at a spacing of 45 x 30 cm and thus in a plot, 16 seedlings were accommodated. All the agronomic package of practices was taken to grow a healthy crop in each replication. In each replication, randomly fine plants were selected for taking observation. The experimental materials included ten treatment combinations *viz.* $\mathbf{T_0}$ (Control), $\mathbf{T_1}$ (RDF 100%), $\mathbf{T_2}$ (FYM 100%), $\mathbf{T_3}$ (Azotobacter 100%), $\mathbf{T_4}$ (Azospirillum 100%), $\mathbf{T_5}$ (RDF 50%+ FYM 50%), $\mathbf{T_6}$ (RDF 50% + Azotobacter 50%), $\mathbf{T_7}$ (RDF 50% Azospirillum 50%), $\mathbf{T_8}$ (FYM 50% + Azospirillum 50%), $\mathbf{T_9}$ (FYM50% + Azotobacter50%), $\mathbf{T_{10}}$ (Azotobactor 50%+ Azospirillum 50%) and $\mathbf{T_{11}}$ **(**RDF 25% + FYM 25% + Azotobactor 25% + Azospirillum 25%).

The observations were recorded on 14 characters under growth, yield and quality attributing traits in tomato *i.e.* plant height (cm), number of branches per plant, number of days to first flowering, number of flower cluster per plant, number of flowers per plant, number of fruit per plant, fruit diameter (cm), fruit Weight (g), yield per plant (Kg), fruit yield per plot (Kg), fruit yield per ha, titratable acidity (%), Total Soluble Solids (T.S.S. ^{0} brix), ascorbic acid (vitamin C) were recorded by A. O. A. C. (1980), Sagar and Samaul (2005) and Saini *et al*. (2001).

Result and Discussion

Data from tables 1 and 2 revealed that the differences with respect to the plant height were significant among different treatment combinations at various stages of crop growth. Maximum plant height (30.53cm) per plant was observed under treatment $\mathbf{T_{11}}$ (RDF25% + FYM25% + Azotobactor25% + Azospirillum25%) followed by (28.90) treatment $\mathbf{T_9}$ (FYM 50% + Azospirillum 50%) was significantly superior over all other treatments. It is also find out that maximum number of branches (7.04) per plant was observed under the treatment of $\mathbf{T_{11}}$ (RDF25% + FYM 25% + Azotobactor25% + Azospirillum25%) and recommended dose of N & K through chemical fertilizers followed by (6.07) treatment $\mathbf{T_9}$(FYM 50% + Azospirillum 50%). The $\mathbf{T_{11}}$ (RDF25% + FYM25% + Azotobactor25% + Azospirillum25%) significantly in increased in the treated than the control. Statistical analysis revealed that minimum number of days taken for blooming of days $\mathbf{T_{11}}$(RDF25% + FYM25% + Azotobactor25% + Azospirillum25%) (32.44) and maximum were found in treatments $\mathbf{T_0}$ (37.72) was highly significant. Maximum number of flower per plant (39.34) were recorded at $\mathbf{T_{11}}$(RDF25% + FYM25% + Azotobactor25% + Azospirillum25%). While the minimum number of flower per plant (24.26) was recorded from $\mathbf{T_0}$ (control). Maximum number of clusters per plant (9.78) were recorded at $\mathbf{T_{11}}$. While the minimum number of cluster per plant (5.67) was recorded from control ($\mathbf{T_0}$). A maximum number of fruit per plant

Table 1 : Effect of integrated nutrient management on growth and yield of tomato.

S.no.	Treatment	Characters										
		Plant height (cm)	No. of branches/ plant	No. of days to first flowering	Number of flowers per plant	No. of flo-wer cluster per plant	Number of fruit per plant	Fruit diameter (cm)	Fruit weight (g)	Yield per plant (Kg)	Fruit yield per plot (Kg)	Fruit yield per ha
1.	T_0	25.52	4.75	37.72	24.64	5.67	10.69	41.94	41.87	0.41	6.51	301.58
2.	T_1	25.33	5.55	36.77	29.10	6.89	12.87	45.40	46.79	0.41	6.61	306.04
3.	T_2	26.09	5.16	36.52	31.05	6.51	11.85	44.96	43.69	0.49	7.82	361.91
4.	T_3	26.22	5.85	36.62	32.13	7.16	12.14	47.18	50.93	0.50	8.06	373.01
5.	T_4	25.54	5.74	36.43	34.56	7.58	12.00	48.28	51.30	0.57	9.06	419.40
6.	T_5	26.97	5.24	36.32	29.66	6.88	12.33	47.98	51.69	0.58	9.22	426.78
7.	T_6	26.03	5.55	36.55	28.02	7.18	11.91	47.94	50.78	0.54	8.67	401.41
8.	T_7	26.11	6.06	37.03	35.44	8.23	11.34	52.95	56.74	0.63	10.15	469.92
9.	T_8	27.79	5.75	36.82	36.73	8.21	12.37	53.51	57.46	0.54	8.70	402.85
10.	T_9	28.90	6.07	36.61	35.65	7.98	11.48	56.61	58.29	0.52	8.29	383.81
11.	T_{10}	27.98	5.88	36.27	36.33	8.20	11.92	58.76	66.92	0.49	7.90	365.54
12.	T_{11}	30.53	7.04	32.44	39.34	9.78	12.95	60.69	68.28	0.65	10.42	482.47
CD at 5%		2.638	0.737	2.146	4.631	1.414	0.902	5.306	5.285	0.114	1.824	84.456

Table 2 : Effect of integrated nutrient management on quality of tomato.

S. no.	Treatment	Characters		
		Acidity	TSS (°Brix)	Vit.C
1.	T_0	0.45	4.02	23.71
2.	T_1	0.48	4.64	24.84
3.	T_2	0.49	4.56	24.52
4.	T_3	0.46	4.59	24.99
5.	T_4	0.49	4.84	25.16
6.	T_5	0.52	4.95	24.78
7.	T_6	0.50	5.21	25.09
8.	T_7	0.51	5.33	24.83
9.	T_8	0.49	5.18	24.79
10.	T_9	0.50	5.29	25.21
11.	T_{10}	0.51	4.52	25.01
12.	T_{11}	0.55	6.04	27.37
CD at 5%		0.032	0.865	1.184

was recorded in $\mathbf{T_{11}}$ (RDF25% + FYM25% + Azotobacter25% + Azospirillum25%) (5.67, 9.02 and 12.95) respectively 60, 90 and 120 DAT. While the minimum number of fruit per plant (3.12, 6.68 and 10.69) was recorded from $\mathbf{T_0}$ (control). The fruit diameter (cm) was significantly higher value in observed in the treatment $\mathbf{T_{11}}$ (60.69) and minimum was recorded in (41.94) $\mathbf{T_0}$ (Control). The maximum fruit weight T_{11} (68.28gm) was highly significant and minimum fruit weight were found under treatment $\mathbf{T_0}$ (41.87). The tomato fruits yield per plant was high in the treatment $\mathbf{T_{11}}$ (0.65) and minimum observed in (0.41) $\mathbf{T_0}$ (Control). Clearly noticed that the treatment $\mathbf{T_{11}}$(RDF25% + FYM25% + Azotobacter25% + Azospirillum25%) maximum (10.42) fruit yield/plot of tomato over other treatments and minimum number of fruits were recorded in (6.51) control. The superiority of the treatment $\mathbf{T_{11}}$ (RDF25% + FYM25% + Azotobacter25% + Azospirillum25%) have yielded highest (482.47q/ha) and Lowest yield was recorded $\mathbf{T_0}$ (301.58q/ha) control. Highest acidity found $\mathbf{T_{11}}$(RDF25% + FYM25% + Azotobacter25% + Azospirillum25%) (0.59%) and lowest acidity observed $\mathbf{T_0}$ (0.45%). The maximum TSS $\mathbf{T_{11}}$ (RDF25% + FYM25% + Azotobacter25% + Azospirillum25%) (6.04) of fruit and minimum data was recorded in under Treatment $\mathbf{T_0}$ (Control). Treatment $\mathbf{T_{11}}$ (RDF25% + FYM25% + Azotobacter25% + Azospirillum25%) showed maximum vitamin-C (27.37mg/100g) and minimum observed in Treatment in (23.71 mg/100g) $\mathbf{T_0}$ (Control).

Conclusion

It can fairly be concluded on the basis of above findings that the application (RDF25% + FYM25% +

Azotobacter25% + Azospirillum25%) at optimum level is quite effective to promote growth, yield and quality of Tomato. It increased height, leaves, branches, flowers, clusters, fruit diameter and yield per hectare, along with better quality of of TSS, acidity and ascorbic acid.

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