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Research Article

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Impact of integrated nutrient management on the yield performance of winter tomato (*Lycopersicon esculentum* Mill.) cv. ARKA VIKAS

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Summary

The experiment was conducted at Seed Science and Technology Department, Odisha University of Agriculture and Technology Bhubaneswar during winter season,2015.The current approach of integrated nutrient management focused on disseminating the technical knowledge how to major stakeholders to optimize use of organic and inorganic for sustainable agriculture. The experiment consisted of eight treatments during the study. The highest yield of tomato was recorded with the application of FYM and recommended dose of NPK fertilizer. The yield parameters and seed quality parameters of winter tomato like, no.of fruit/plant, fruit weight(g), fruit diameters (cm), fruit yield (q/ha), seed yield (kg/ha), germination (%), seedling length (cm), seedling dry weight (g), SVI-I and SVI-II was found significantly highest at the treatment combination T_6 (60kg N+30kgP_2O_5+40kgK_2O+30 tonnes FYM/ha) followed by T_4 other treatments.

Key words : Tomato, FYM, Vermicompost, N, P, K

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Introduction

Tomato (*Lycopersicon esculentum* Mill.) is an important mineral and vitamin rich crop playing a vital role in Indian economy by virtue of its various uses as vegetable and processed forms as well as industrial product. It comes under the family Solanaceae. It is universally treated as a protective food and is also a very good source of income to small and marginal farmers.An adequate application of fertilizers and optimum plant population assume great importance in yield maximization of a particular crop. Major component of organic farming are organic manures, biofertilizers and biopesticides (Asokan *et al*., 2000). Organic manures not only balance the nutrient supply but also improve the physical and chemical properties of soil (Nair and Peter, 1990). During the decades, the concept of integrated nutrient management aims at efficient and judicious use of all major sources of plant nutrients in an integrated manner so as to get maximum economic yield without any deleterious effect on physiological and biological properties of the soil. The organic manuring has positive influence on soil texture and water holding capacity and also benefit to crop plant. In this connection to give more emphasis on organic vegetable, production, which minimizes cost of production, increase quality of product

and maintain the soil fertility.

Resource and Research Methods

The present investication was carried out on winter tomato cultivar Arka vikas during the year 2015 at Seed Science and Technology Department, Odisha University of Agriculture and Technology, Bhubaneswar. The experiment was conducted in Randomized Block Design. All the treatments wear randomly distributed among the plots and replicated 3 times. All the organic manures were applied and spread thoroughly all over the experimental plot and rest of the inorganic fertilizers wear also applied as per principles. The half dose of nitrogen and full dose of phosphorus and potassium wear applied as basal dressing before transplanting and remaining half dose of nitrogen was applied into two split doses at 30 days and 45 days after transplanting. The desired amounts of fertilizers as per treatment wear mixed thoroughly and the mixture was placed in the line marked for transplanting of seedlings. After placement of fertilizer mixture, the seedlings wear transplanted on the marked places. After preparation of field and demarcation of beds, the seedlings of uniform size wear transplanted on 17th november, 2015 during evening hours. Just after transplanting a light irrigation was done.

After the field experiment, the lab experiment was conducted in seed testing laboratory, Department of Seed Science and Technology. The experiment was conducted in Complete Randomized Design. Two hundred seeds were used for each treatment in four replications (50×4). The seeds were subjected to germination test, vigour index test based on seedling length and seedling dry weight along with the control.

Treatments-nutrient applied :

T_1 - 120kg N+60kgP_2O_5+80kg K_2O/ha
T_2 - 150kg N+75kg P_2O_5+100kg K_2O/ha
T_3 - 90kg N+45kg P_2O_5+60kg K_2O+2 tonnesV.C./ha
T_4 - 60kg N+30kg P_2O_5+40kg K_2O+5 tonnes V.C./ha
T_5 - 90kg N+45kg P_2O_5+60kg K_2O+15tonnes FYM/ha
T_6 - 60kg N+30kg P_2O_5+40kg K_2O+30tonnes FYM/ha
T_7 - 10 tonnes FYM/ha
T_8 - (Control) .

Effect of seed germination was studied following between paper method (ISTA, 1985). Fifty seeds were placed equidistantly between two sheets of germination paper soaked in water, rolled and tagged and incubated inside germinator at 30^0C. Final count was taken on 10th day. Observation was recorded on normal seedling and seedling showing root and shoot abnormality. For calculating seed vigour index, ten normal seedling showing normal root and shoot growth were randomly selected. The root and shoot portion were separated their length was measured and mean seedling length was calculated.

The SVI (seed vigour index) was calculated following formula:

SVI-I= Germination per cent × Length of seedling in cm

The root and shoot portion of each seedling collected was taken for determining the dry weight, following oven dry method and SVI-II was calculated as :

SVI-II= Germination per cent × Seedling dry weight in g

Research Findings and Discussion

The results obtained from the present investigation as well as relevant discussion have been summarized under the following heads:

No. of fruit/plant:

The data in Table 1 revealed that the integrated nutrient management showed significant effects with the respect of number of fruit/plant during the investication. The maximum number of fruit/plant (23.25) was recorded under T_6 (60 kg N+30 kg P_2O_5+40 kg K_2o+30 tonnes FYM/ha) treatment followed by T_4 (90kg N+45 kg P_2O_5+60 kg K_2O+15 tonnes FYM/ha) treatment 21.64. While the minimum number of fruit/plant (15.00) were recorded under the control. The increase in number of fruit owing to this treatment might be due to the greater availability of mineral nutrient from nitration of vermicompost and farm yard manures to the plants. These results are in conformity with the finding of Patil *et al*.(2004); Kumar and Srivastava (2006) and Dass *et al*. (2008).

Fruit weight (g) :

The fruit weight depicted in Table 1 show that the maximum fruit weight (54.4g) was recorded under the treatment combination T_6 (60kg N+30kg P_2O_5+40kg K_2O+30tonnes FYM/ha) followed by T_4. While the lowest value of fruit weight (43.3g) was recorded under control. The increasing fruit weight with the application of integrated nutrient management due to the fact of balanced supply of nitrogen, phosphorus and potassium through chemical fertilizers and macro and micro nutrients from farm yard manures and vermicompost increased the availability of nutrient to the plant. The

results are in close conformity of the study carried out by Patil *et al*. (1998).

Fruit diameters (cm) :

The data presented in Table 1 revealed that application integrated nutrient management significantly increased the fruit diameters at a constant level. The highest value of fruit diameter (4.80cm) was recorded at the treatment combination T_6 (60 kg N+30kg P_2O_5+ 40kg K_2O+30 tonnes FYM/ha) followed by T_4. While, the lowest value of fruit diameters (2.95cm) was recorded under control. The fruit diameters increased might be due to the better photosynthetic activity also. Since, nitrogen is one of the basic minerals associated with synthesis of amino acid. Similar result was also obtained by Dademol and Dongale (2004).

Fruit yield (q/ha) :

The fruit yield increased significantly with the application of integrated nutrient management (Table 1). The maximum yield (322.50q/ha) was recorded with T_6 treatment followed by T_4 treatment. While, the minimum yield (175.6q/ha) was recorded under control. The increased yield with integrated nutrient management application may be due to the fact that plant supplied with abundant NPK which assimilate higher photosynthetic and better translocation of foods (assimilates) from source to sink resulting increased yield of tomato. These results are in close conformity with the study carried out by Patil *et al*. (1998) and Dademol and Dongale (2004).

Seed yield (kg/ha) :

The seed yield increased significantly with the application of integrated nutrient management (Table 1). The maximum seed yield (182.6kg/ha) was found in T_6 treatment followed by T_4 treatment. The minimum (108.3kg/ha) was recorded in control. Integrated nutrient

Table 1 : Impact of integrated nutrient management on the yield parameters

Treatments	Notation	No. of fruit/plant	Fruit weight (g)	Fruit diameters (cm)	Fruit yield (q/ha)	Seed yield (kg/ha)
120kg N+60kgP_2O_5+80kg K_2O/ha	T_1	17.00	48.2	3.36	206.12	134.3
150kg N+75kg P_2O_5+100kg K_2O/ha	T_2	18.64	50.8	3.10	233.97	154.6
90kg N+45kg P_2O_5+60kg K_2O+2 tonnesV.C./ha	T_3	19.70	51.2	3.31	247.0	165.6
60kg N+30kg P_2O_5+40kg K_2O+5 tonnes V.C./ha	T_4	21.64	53.3	3.80	280.0	175.0
90kg N+45kg P_2O_5+60kg K_2O+15tonnes FYM/ha	T_5	21.22	52.0	3.72	265.72	172.0
60kg N+30kg P_2O_5+40kg K_2O+30tonnes FYM/ha	T_6	23.25	54.4	4.80	322.50	182.6
10 tonnes FYM/ha	T_7	17.34	48.8	3.60	212.0	145.3
Control	T_8	15.00	43.3	2.95	175.6	108.3
C.D.(P=0.05)	-	2.01	1.51	0.36	2.95	4.08
S.E.±	-	0.66	0.49	0.11	0.97	1.34

Table 2 : Impact of nutrient management on seed quality parameters

Treatments	Notation	Germination (%)	Seedling length (cm)	Seedling dry weight (g)	SVI-I	SVI-II
120kg N+60kgP_2O_5+80kg K_2O/ha	T_1	73	15.3	0.001	1123.5	0.110
150kg N+75kg P_2O_5+100kg K_2O/ha	T_2	71.5	16.3	0.001	1171.5	0.108
90kg N+45kg P_2O_5+60kg K_2O+2 tonnesV.C./ha	T_3	74	16.2	0.001	1201.8	0.110
60kg N+30kg P_2O_5+40kg K_2O+5 tonnes V.C./ha	T_4	71.5	19.5	0.002	1397.7	0.213
90kg N+45kg P_2O_5+60kg K_2O+15 tonnes FYM/ha	T_5	72	17.5	0.001	1256.7	0.109
60kg N+30kg P_2O_5+40kg K_2O+30 tonnes FYM/ha	T_6	75	19	0.001	1408.0	0.113
10 tonnes FYM/ha	T_7	72	15.4	0.001	1111.2	0.109
Control	T_8	70.75	15.1	0.001	1073.7	0.106
C.D.(P=0.05)	-	1.74	0.66	NS	64.8	0.12
S.E.±	-	0.59	0.22	NS	22.2	0.04

** SVI-I : Seed vigour index -I, SVI-II: Seed vigour index –II NS= Non-significant

management increased the seed yield by increasing number of seeds per fruit, seed weight per fruit, in different crops mainly in capsicum, reported by Jeevansab (2000).

Seed quality parameters :

Integrated nutrient management also helps for increasing seed quality parameters by increasing germination percentage. The highest germination per cent (Table 2) was found in T_6 (75%) treated seeds, followed by T_3. The lowest was found in control (70.75%). But seedling length was found better in T_4 treated seeds (19.5cm) followed by T_6 (19cm). Integrated nutrient management also increased seed vigour index-I (SVI-I). Maximum(1408) recorded in T_6, then T_4 and T_5. Minimum was found in control (1073.7). But there was no difference found in seedling dryweight. SVI-II was found better in T_4 (0.213) followed by T_6 (0.113) and lowest was recorded in control (0.106). So integrated nutrient management increased seed quality parameters and T_6 and T_4 gave better result as compared to others.

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