HortFlora Research Spectrum
Vol. 7, Issue 1; 67-69 (March 2018)
www.hortflorajournal.com
ISSN: 2250-2823
NAAS Rating : 3.78

YIELD AND YIELD ATTRIBUTES OF TOMATO (*Lycopersicon esculentum* MILL.) AS INFLUENCED BY INTEGRATED NUTRIENTS MANAGEMENT FOR SUSTAINABLE PRODUCTION

Narottam Kumar Yadav and S.S. Singh*

Department of Crop Science, M.G.C.G.V. Chitrakoot, Satna (M.P.) India
**Corresponding Aurhor's E-mail: tiwariajay064@gmail.com*

ABSTRACT : A field experiment with eleven treatments including control was conducted at the Rajola Farm of the Faculty of Agricultural Sciences, MGCGV, Chitrakoot – Satna (MP), during the Kharif season of 2009 to find out the most appropriate integrated nutrient management system for sustainable tomato production. The best treatment comprising of organic manures (FYM and Vermicompost), inorganic fertilizers (N, P and K), and plant growth regulator GA_3 on growth and yield of Tomato, for this region. It was found that application of T_9 100% RDF + VC 10 t ha^{-1} + Seedling treatment with GA_3 100 ppm gave fruit yield (49.79 t ha^{-1}) over control (10.00 t ha^{-1}) which was significantly higher over all the treatments. The organic sources of nutrition along with inorganic sources showed incremental effect for almost all parameters including yield over inorganic sources alone.

Keywords : *Tomato, INM, nitrogen, phosphorus, potash, growth, yield.*

India is a leading vegetable producing country in the world. Presently it occupies 7.49 million hectares area with the annual production of 116.03 million tonnes and productivity of 15.49 t ha^{-1} (National Horticulture Board; Area, Production and Productivity of Horticultural Crops for the year 2006 – 07). The country being blessed with the unique gift of nature of diverse climate and distinct seasons, make it possible to grow an array of vegetables, number exceeding more than hundred types.

The tomato (*Lycopersicon esculentum* Mill.), family solanaceae is one of the most important productive foods both because of its nutritive value and also bid to its widespread production. It is the world's largest vegetable crop after potato and sweet potato, but it tops the list of canned vegetable. Tomato is cultivated in India over 5.4 lakh hectare with a total production of 5.3 million tonnes (United Nations, Food and Agricultural Organisation estimates).

The tomato has many medicinal uses. It is an excellent source of minerals, proteins and particularly ascorbic acid (vitamin C); the pulp and juice are blood purifier and promoter of gastric secretion. It is good in chronic dyspepsia, stimulating to rapid liver and is also considered to be intestinal antiseptic and useful in treating cancer of mouth. One of the major aspects for high yield of tomato is manuring. Therefore, balanced application of manures and fertilizers is very important for successful crop production. Nitrogen deficiency causes general paling and stunted plants; phosphorus deficiency results in dirty greyish green leaves and premature shedding while potassium deficiency causes interveinal chlorosis of young leaves followed by yellowing and premature shedding. Well-rotten farmyard manure and/or poultry manure should also be thoroughly incorporated at the time of land preparation.

Article's History:
Received: 30-01-2018 *Accepted: 24-02-2018*

Gibberellic acid and auxin like NAA and IAA play a major role in plant growth. The endogenous gibberellic acid synthesized by the seeds are not sufficient and as such the external application boost the growth by increasing cell multiplication and cell elongation, resulting in higher plant growth. The rapid and early germination also help in producing vigorous growth of seedlings during subsequent period of growth.

MATERIALS AND METHODS

The present investigation entitled *"Studies on integrated nutrients management for sustainable productivity of tomato* (*Lycopersicon esculentum* Mill.)" was conducted at Chitrakoot, Satna (M. P.) during the rainy (*Kharif*) season of 2009. The experiment was conducted at the Rajola Farm of the Faculty of Agricultural Sciences, MGCGV, Chitrakoot, Satna (Madhya Pradesh), during the Kharif season of 2009. All the facilities necessary for conducting the experiment, including labour and resources, which were necessary for normal cultivation were readily available in the department. Chitrakoot is situated at an altitude of 306 m above mean sea level at 24° 31' N latitude and 81° 15' E latitude. The climate of the region is semi-arid and sub-tropical having extreme winter and summer.

The experiment was laid out in Randomized Block Design having 11 treatments comprising of organic manures (farmyard manure and vermicompost), inorganic fertilizers (nitrogen, phosphorus and potassium) and plant growth regulator GA_3 applied either alone or in combination, each replicated three times, making a total of 33 plots. Treatments were randomly arranged in each replication. The treatment description is presented in, T_0 Control, T_1 Farmyard manure (FYM) @ 20 t ha^{-1}, T_2 Vermi compost (VC) @ 10 t ha^{-1}, T_3 100% RDF (N : P : K @ 120 : 60 : 60 kg ha^{-1}), T_4 100% RDF + Seedling treatment with GA_3 100 ppm, T_5 100% RDF + Seedling treatment with GA_3 100 ppm + foliar application of GA_3 100 ppm at 30 DAT, T_6 100% RDF + Seedling treatment with GA_3 150 ppm + foliar application of GA_3 150 ppm at 30 DAT, T_7 100% RDF + FYM 20 t ha^{-1}+ Seedling treatment with GA3 100 ppm, T_8 100% RDF + FYM 20 t ha^{-1}+ Seedling treatment with GA_3 150 ppm , T_9 100% RDF + VC 10 t ha^{-1} + Seedling treatment with GA_3 100 ppm, T_{10}, 100% RDF + VC 10 t ha^{-1}+ Seedling treatment with GA_3 150 ppm. The growth and yield parameters were measured by randomly selecting five plants from each net plot.

RESULTS AND DISCUSSION

Number of flower clusters/plant and per cluster

Application of FYM and vermicompost along with 100% RDF and gibberellic acid recorded significantly higher number of flower clusters per plant as compared to control, 100% RDF, FYM, vermicompost alone or 100% RDF + GA_3. Increase in concentration of GA_3 from 100 to 150 ppm recorded reduced number of flower clusters per plant.

Maximum number of flower clusters was recorded with T_9 (100% RDF + Vermicompost @ 10 t ha^{-1} + seedling treatment with GA_3 100 ppm) (11.20) followed by 10.80 with T_{10} (100% RDF + Vermicompost @ 10 t ha^{-1} + seedling treatment with GA_3 150 ppm). More vigour attained by the plants through better photosynthetic activity might have resulted in greater number of flower clusters per plant.

Increased number of flowers per cluster might have been possible due to increased cell division and cell elongation effected by gibberellins, when applied in proper concentration, as well as amylase and protease enzymes induced by gibberellic acid, thereby increasing number of flowers.

Number of flowers cluster 100% RDF + Vermicompost @ 10 t ha^{-1} + seedling treatment with GA_3 100 ppm (T_9) recorded maximum number of flowers per cluster (4.53) closely followed by 4.47 with 100% RDF + Vermicompost @ 10 t ha^{-1} + seedling treatment with GA_3 150 ppm (T_{10}). Similar results were reported by Krishna and Krishnappa (2). Nanthakumar and Veeraraghavathatham (5) also reported identical results in brinjal.

Number of fruits/cluster and fruits/plant

100% RDF + Vermicompost 10 t ha^{-1} + seedling treatment with GA_3 100 ppm (T_9) recorded maximum number of fruits per cluster (3.77) followed by 3.50 with 100% RDF + Vermicompost 10 t ha^{-1} + seedling treatment with GA_3 150 ppm (T_{10}). number of fruits per plant 100% RDF + Vermicompost 10 t ha^{-1} + seedling treatment with 100 ppm GA_3 (T_9) recorded maximum number of fruits per plant (42.22) followed by 37.80 with 100% RDF + Vermicompost 10 t ha^{-1} + seedling treatment with 150 ppm GA_3 (T_{10}). The results reported by Samawat *et al*. (7) Krishna and Krishnappa (2) and Shukla *et al*. (9) are in close conformity with these findings.

Fruit size and Weight of fruit (g)

Combination 100% RDF + Vermicompost 10 t ha^{-1} + seedling treatment with GA_3 played a significant role in increasing the fruit size as compared to their application alone or in different combination. T_9 (100% RDF + Vermicompost 10 t ha^{-1} + seedling treatment with GA_3 100 ppm) recorded the maximum volume of fruit (49.31 cc). On increasing the concentration of GA_3 to 150 ppm, the fruit size significantly reduced to 48.20 cc with 100% RDF + Vermicompost 10 t ha^{-1} + seedling treatment with GA_3 150 ppm (T_{10}). Higher fruit weight showed increasing trend with the increase in supply of nutrients to the plants. The maximum fruit weight was obtained with 100% RDF + Vermicompost 10 t ha^{-1} + seedling treatment with GA_3 100 ppm (T_9). However, increase in concentration of GA_3 to 150 ppm significantly reduced the fruit weight to 31.65 g in T_{10} [100% RDF + Vermicompost 10 t ha^{-1} + seedling treatment with GA_3 150 ppm) Results reported by Matsubara *et al*. (3), Samawat *et al*. (7), Krishna and Krishnappa (2) and Mohd. Rafi *et al*. (4).

Fruit yield per plant (g) and Fruit yield (t ha^{-1})

FYM or vermicompost in combination with 100% RDF and application of plant growth regulator GA_3 played a significant role in increasing the fruit yield per plant as compared to their application alone or 100% RDF + GA_3. Combination of 100% RDF + Vermicompost 10 t ha^{-1} + seedling treatment with GA_3 100 ppm (T_9) recorded maximum fruit yield per plant

Table 1 : Effect of INM on yield attributes and yield of Tomato.

Treatment	No. of flower cluster/ plant	No. of flowers/ cluster	No. of fruits/ cluster	No. of fruits/plant	Fruit size	Weight of fruit (g)	Fruit yield/ plant (g)	Fruit yield (t ha^{-1})
T_0	6.23	2.27	1.97	12.27	29.23	29.23	272.34	10.09
T_1	7.67	3.47	2.63	20.17	37.53	37.53	571.08	21.15
T_2	8.00	3.60	2.70	21.60	38.55	38.55	618.84	22.92
T_3	8.40	3.73	2.83	23.77	39.27	39.27	686.54	25.43
T_4	8.93	3.87	2.90	25.90	42.05	42.05	755.42	27.98
T_5	9.20	4.07	3.03	27.88	44.49	44.49	831.01	30.78
T_6	9.07	4.00	2.97	26.94	43.73	43.73	792.26	29.34
T_7	10.40	4.33	3.43	35.67	47.24	47.24	1083.38	40.13
T_8	10.00	4.27	3.37	33.70	45.76	45.76	1009.33	37.38
T_9	11.20	4.53	3.77	42.22	49.31	49.31	1344.43	49.79
T_{10}	10.80	4.47	3.50	37.80	48.20	48.20	1196.39	44.31
C. D. (P=0.05)	0.12	0.05	0.04	0.38	0.24	0.24	16.39	0.61

(1344.43 g). Combination of 100% RDF + Vermicompost 10 t ha^{-1} + seedling treatment with GA_3 100 ppm (T_9) recorded maximum fruit yield (49.79 t ha^{-1}). However, with increased concentration of GA_3 (150 ppm) the fruit yield significantly reduced to 44.31 t ha^{-1} in the combination of 100% RDF + Vermicompost 10 t ha^{-1} + seedling treatment with GA_3 150 ppm in T_{10}. The fruit yield was corresponding to number, size and weight of each fruit. Similar results were also reported by Sharma *et al*. (8), Bharadwaj *et al*. (1) and Renuka and Sankar (6).

REFERENCES

1. Bharadwaj, M. L., Harender, Raj and Koul, B. L. (2000). Yield response and economics of organic sources of nutrients as substitute to inorganic sources in tomato (*Lycopersicon esculentum*), Okra (*Hibiscus esculentus*), cabbage (*Brassica oleracea* var. Capitata) and cauliflower (*B. oleracea* var. Botrytis). *Indian J. Agric. Sci.* **70** (10) : 653 – 656.
2. Krishna, H. C. and Krishnappa, K. S. (2002). Growth and yield of tomato cv. Avinash in relation to inorganic fertilizer and organic manures. *South Indian Horti*, **50** (4–6) : 335–341.
3. Matrsubara Y. I., Tamura H. and Harada T. (1995). Growth enhancement and verticillium wilt control by vesicular-arbuscular mycorrhizal fungus inoculation in egg plant. *J. Japanese Soc. Hort. Res.*, **65** : 478–491.
4. Mohd Rafi, Narwadkar, P. R., Prabu, T. and Sajindranath, A. K. (2002). Effect of organic and inorganic fertilizers on growth and yield of tomato (*Lycopersicon esculentum* Mill.). *South Indian Hort.*, **50** (4/6) : 522–526.
5. Nanthakumar S. and Veeraragavathatham D. (1999). Effect of integrated nutrient management on yield attributes of brinjal (*Solanum melongena*) cv. PLR 1. *South Indian Hort.*, **47** (1/6) : 42–48.
6. Renuka B. and Sankar C. R. (2001). Effect of organic manures on growth and yield of tomato. *South Indian Hort.*, **49** (Special) : 216–219.
7. Samavat S., Lakzian A. and Zamirpour A. (2001). Effect of organic manures on growth and yield of tomato. *South Indian Hort.,* **49** (Special) : 216-219.
8. Sharma A. K., Rattan R. S. and Pathania N. K. (1992). Effect of plant growth regulators on yield and morphological traits in brinjal (*Solanum melongena* L.). *Agric. Sci Digest*, Karnal, **12** (4) : 219–222.
9. Shukla Y. R., Thakur A. K. and Joshi A. (2006). Effect of inorganic and organic fertilizers on yield and horticultural traits in tomato (*Lycopersicon esculentum* Mill.). *Ann. Biol.,* **22** (2) : 137–141.

❑

Citation : Yadav N.K. and Singh S.S. (2018). Yield and yield attributes of tomato (*Lycopersicon esculentum* Mill.) as influenced by integrated nutrients management for sustainable production. *HortFlora Res. Spectrum,* **7**(1) : 67-69