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Short Note

Quality attributes of tomato (*Lycopersicon esculentum* Mill.) as influenced by integrated use of organic, inorganic and biofertilizers

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Tomato (*Lycopersicon esculentum* Mill.) is an important commercial vegetable crop grown all over the India. It is tender, perennial herb rich in vitamin A and C, thiamin and riboflavin. Fruits are sweet, emollient, carminative, digestive, aperient, haematinic, depurative, intestinal, antiseptic, liver and kidney stimulant (Warrier, 1995). Considering the importance of this nutritious fruit vegetable in our daily diet, quality aspect is gaining tremendous attention. With experience, the Integrated Nutrient Management (INM) has become an accepted strategy to get sustained optimum yields of superior quality leaving the soils ameliorated and environment cleaner. To achieve the objectives a field experiment was conducted using organic, inorganic and bio-fertilizers (INM) to assess their effects on some quality parameters of tomato.

Field experiment on tomato (cv.Dhanashree) was conducted during summer (Kharif) season of 2002-2003 at Post Graduate Institute Research farm of Mahatma Phule Krishi Vidyapeeth, Rahuri (569 m amsl.). The experiment was laid out in RBD with ten treatments in triplicate. The seven treatments comprised of three bio-fertilizers viz; Azotobacter, Azospirillum and Phosphate solubilizing bacteria alone as well as in combination. The effect of these seven treatments was investigated in light of the recommended doses (RD) of N, P and K (100, 50, 50, kg ha^{-1}respectively) with 10 t ha^{-1} FYM. The other treatments were Absolute control and Control (only recommended NPK). Urea, SSP and MOP, were the sources of N, P and K. The whole quantity of P and K was applied before transplanting. Half of nitrogen was applied during transplanting and half one month after. Clayey calcareous soil was of alkaline reaction (pH 8.0) with 0.9 percent organic carbon having 166, 15.0 and 275 kg ha^{-1} of available N, P and K, respectively. The fruits at 2nd, 4th and 6th pickings were used for quality analysis. Half kg of uniformly ripened and accurately weighed fruits were collected and washed to clean before crushing to extract the juice for estimating quality parameters. Lycopene, total soluble solids (TSS), acidity and ascorbic acid were analysed by A.O.A.C. (1975) method. The reducing, non-reducing and total sugars were determined colorimeterically by following procedure of Nelson and Somogyi (1944). Results revealed non-significant effect of INM on TSS and Acid content of tomato fruit (Table 1), although increased values of TSS (6.23^0 brix) and acidity (0.63 percent) were noticed under RD of fertilizers along with Azospirillum. This was possibly due to the role of Azospirillum, in hoeing the nitrogen which ultimately increased TSS in tomato fruits. On the other hand combined application of organic and inorganic fertilizers significantly influenced the ascorbic acid content of tomato fruits (Table 1).The highest content (49.8mg$100g^{-1}$) were observed under RD+ Azospirillum +Phosphoinoculant which were at par with those obtained from absolute control (48.8 mg 100 g^{-1}), RD + Phosphoinoculant (48. 6 mg 100 g^{-1}),the control (46.2 mg 100 g^{-1}) and also under RD + Azotobacter + Azospirillum + Phosphoinoculant (44.2 mg 100 g^{-1}). However, minimum ascorbic acid content was recorded under RD+ Azotobacter (35.5 mg 100 g^{-1}) which was at par with RD alone (39.9 mg $100g^{-1}$) and RD + Azospirillum (37.3 mg 100 g^{-1}). The lycopene content was also affected significantly and positively with INM (Table1). The treatment involving recommended dose in combination with two or three bio-fertilizers Azotobacter, Azospirillum and phosphate solubilizing bacteria (T_7-7_{10}) recorded highest lycopene content

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Table 1. Effect of conjoint application of organic and inorganic on TSS, acidity, ascorbic acid, lycopene, reducing and non reducing sugar content of tomato

Treatments	Total soluble solids (^{0} brix)	Acidity (%)	Ascorbic acid (mg100g^{-1})	Lycopene (mg 100 g^{-1})	Reducing Sugar (%)	Non-Reducing Sugar (%)
T_1 Absolute control	3.93	0.57	48.8	0.732	2.41	0.13
T_2 Control (NPK)	5.03	0.54	46.2	0.618	2.75	0.19
T_3 RD (NPK+10 t ha $^{-1}$FYM)	5.53	0.56	39.9	0.683	2.79	0.30
T_4 RD+AZO	5.26	0.55	35.5	0.861	2.83	0.42
T_5 RD +AZOS	6.23	0.63	37.3	0.677	2.89	0.26
T_6 RD+PSB	5.06	0.42	48.6	0.735	2.86	0.25
T_7 RD+AZO+AZOS	5.56	0.59	40.4	1.203	2.88	0.20
T_8 RD+AZO+PSB	5.10	0.45	44.0	1.269	2.94	0.37
T_9 RD+AZOS+PSB	6.10	0.55	49.8	1.221	2.99	0.37
T_{10} RD+AZO+AZOS+PSB	4.70	0.62	44.2	1.250	3.07	0.47
CD (P=0.05)	N.S	N.S	7.4	0.232	0.13	0.19

(1.203 -1.269 mg 100 g^{-1}) in comparison to remaining treatments. Treatments with highest lycopene content (T_7-7_{10}) were statistically similar among themselves in respect of lycopene content.

The Reducing and Non- Reducing sugar content of tomato fruits varied from 2.41 to 3.07 and from 0.13 to 0.47% with average values of 2.84 and 0.29 %, respectively (Table1).Their highest content were under treatment T_{10} which was at par with T_8 and T_9 in affecting reducing sugar content and in case of non-reducing sugars, treatment T_{10} was statistically the same as treatments T_3 and T_4. The higher content of reducing and non-reducing sugars under INM could be attributed to the effect of growth hormones like IAA and cytokinin produced by Azospirillum (Nanthakumar and Veerunaganatham, 1990).Growth hormones (GA_3, IAA and dehydrozeatin) liberated from Azospirillum encourage leaf area development and increased synthesis of carbohydrate (Subbiah 1992). The present findings are in close agreement with findings of Prabhakaran and James Pitchai (2002) in tomato plant.

The results conclude that combined use of recommended NPK fertilizer with any two of the three bacteria (Azotobacter, Azospirillum and phosphate-solubilizing bacteria) is beneficial in improving quality of tomato fruit.

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