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Interactive Effect of FYM and Inorganic Fertilizers on Performance of Tomato (*Lycopersicon esculentum* Mill)

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Abstract: The present field experiment was conducted during summer season of 2010 at the Horticulture farm, SKN College of Agriculture, Jobner (Rajasthan) to study the interactive effect of farm yard manur (FYM) and inorganic fertilizers on performance of tomato (*Lycopersicon esculentum* Mill). The experiment consisted of four levels of FYM (control, 10, 15 and 20 t ha^{-1}) and four combinations of inorganic fertilizers (control, 50% RDF + B + Zn, 75% RDF + B + Zn and 100% RDF + B + Zn), in factorial randomized block design with three replications. Results indicated that the combined use of FYM @ 15 t ha^{-1} and 75% RDF + B + Zn proved to be the best treatment combination in terms of number of primary branches per plant, average number of fruits per plant, fruit yield, net returns and B:C ratio of tomato. This combination produced 372.97 q ha^{-1} fruit yield along with net returns of Rs. 178452 ha^{-1} and B:C ratio of 3.94.

Key words: Fruit weight, fruit yield, FYM, interactive effect, net return and tomato

Tomato (*Lycopersicon esculentum* Mill.) is a major vegetable crop that has achieved tremendous popularity over the last century. In India, it occupies 882.0 thousands ha area with a total production of 18735.9 thousands MT (Anonymous, 2014). It has great demand throughout the year. The tomato is low in calories and considered an excellent food for people who are to follow a weight loss plan. The attractive color of fruit, tasty flavor, refreshing juiciness, delicate acidity makes tomato a popular vegetable. It is a good source of vitamins A and C. Apart from having a fine appetizing flavor, tomato also possesses medicinal properties and is said to be an excellent purifier of blood. In view of these facts the tomato is referred to as "protective food". Tomato is consumed in the ripe as well as at the green stage. It is an important crop for the food processing industry, and many commercial products like soup, ketch-up, sauce, juice, paste, powder and purees are prepared out of it. Among the various factors responsible for low production, improper cultural operations and nutrient management are the important ones. In semi-arid regions of India integrated nutrient management (INM) is a system approach of nutrient management mainly emphasizes on the need to increase the fertilizer (nutrient) use efficiency and economise the use of costly mineral fertilizers by accounting for the residual effects of the applied fertilizers. A considerable amount of nutrients are removed by a bearing tomato plant from the soil, therefore, balanced manuring and fertilization practices in vogue are generally empirical. Due to escalating cost of chemical fertilizers and objective of minimizing environmental pollution, the search of alternative source of plant nutrients is imperative. The integrated plant nutrient supply envisages conjunctive use of inorganic and organic sources of plant nutrients for crop productivity besides sustaining soil health. Tomato is also responsive to micronutrients like boron and zinc. Deficiency of these micronutrients is leads to many physiological disorders in tomato crop. For example, deficiency of zinc produces changes in leaf morphology and cell histology, which cause several well known disorders such as "little leaf" or "rosette" and "mottled leaf", whereas, in case of boron deficiency cell division ceases at the growing point which specially leads to disorder like fruit cracking in tomato. Keeping the above facts in view, present experiment was conducted to know the interactive effect of FYM and inorganic fertilizers on performance of tomato.

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Materials and Methods

The present study was conducted during summer season of 2010 at the Horticulture farm, SKN College of Agriculture, Jobner (Rajasthan) in factorial randomized block design with

three replications. The soil was loamy sand in texture, alkaline in reaction (pH 8.2), low in organic carbon (0.13%), available nitrogen (134.75 kg ha^{-1}), available phosphorus (16.87 kg P_2O_5 ha^{-1}) and medium in potassium (151.6 kg K_2O ha^{-1}) content. The experiment consisted of four levels of FYM (control, 10, 15 and 20 t ha^{-1}) and four combinations of inorganic fertilizers (control, 50% RDF + B + Zn, 75% RDF + B + Zn and 100% RDF + B + Zn), thereby, making sixteen treatment combinations. Recommend dose of fertilizer was N (180 kg ha^{-1}), P_2O_5 (120 kg ha^{-1}), K_2O (80 kg ha^{-1}), B (10 kg ha^{-1}) and Zn (25 kg ha^{-1}). Fertilizers were applied as per treatment through urea, diammonium phosphate (DAP), muriate of potash (MOP), borax and zinc sulphate. Half dose of N and full dose of phosphorus, potash, boron and zinc were applied at the time of transplanting and remaining half dose of nitrogen was applied at 45 DAT. The tomato cv. Rocky (semi indeterminate) was sown on 20th January, 2010 in the nursery for preparation of seedlings. Five weeks old seedlings of tomato were transplanted on 26th February, 2010 when average height of seedlings was about 15-20 cm. The distance between plant to plant as well as row to row was kept at 45 x 45 cm. Thus 16 plants were accommodated in each plot. The transplanting was done in the evening time followed by light irrigation. The experimental data recorded for growth, yield and other characters were statistically analysed by Fisher's 'Analysis of Variance' technique (Fisher, 1950).

Results and Discussion

Combined application of FYM @ 20 t ha^{-1} + 100% RDF (NPK) + B + Zn produced significantly higher number of primary branches per plant as compared to other combinations FYM @ 20 t ha^{-1} + 75 % RDF (NPK) + B + Zn, FYM @ 15 t ha^{-1} + 75% RDF (NPK) + B + Zn and FYM @ 15 t ha^{-1} + 100% RDF (NPK) + B + Zn (Table 1). The increased number of primary branches per plant under this combination might be due balance nutrition to the crop plant. Under INM, inorganic fertilizers provide nutrition to the crop during early growth stages and organic manures later on, thus crop plant get balance nutrition throughout the growing season which led to better growth and produces higher number of branches per plant. Similar types of findings were also reported by Naidu *et al.* (2002) and Patil *et al.* (2004). Number of fruits per plant and fruit yield of tomato was also influenced significantly under combined use of FYM and inorganic fertilizers (Table 2 and 3). Application of FYM @ 20 t ha^{-1} along with 100% RDF (NPK) + B + Zn being at par with FYM @ 20 t ha^{-1} + 75% RDF (NPK) + B + Zn, FYM @ 15 t ha^{-1} + 75% RDF (NPK) + B + Zn and FYM @ 15 t ha^{-1} + 100% RDF (NPK) + B + Zn recorded significantly higher number of fruits per plant (28.99 $plant^{-1}$) and fruit yield of tomato (389.13 q ha^{-1}) over rest of the combinations. The significant increase in fruit yield under the combined application of FYM and inorganic fertilizers as basal dose was largely a function of improved growth and subsequent increase in number of branches per plant, fruits per plant and other yield attributes. Besides, adequate supply of macro and micro-nutrients through FYM and inorganic fertilization contributes to the higher number of primary branches per plant, fruits per plant and finally on fruit yield. Interaction effect of FYM and inorganic fertilizers were also showed significant response on net returns and B:C ratio of tomato (Table 4 and 5). Integration of FYM @

Table 1. Interactive effect of FYM and inorganic fertilizers on number of primary branches per plant

Inorganic fertilizers	FYM levels (t ha^{-1})			
	Control	FYM 10	FYM 15	FYM 20
Control	2.56	4.35	5.66	5.95
50% RDF (NPK) + B + Zn	4.23	5.46	6.38	6.63
75% RDF (NPK) + B + Zn	5.25	6.35	7.04	7.22
100% RDF (NPK) + B + Zn	5.65	6.60	7.24	7.34
S.Em ±	0.22			
CD (P = 0.05)	0.64			

Table 2. Interactive effect of FYM and inorganic fertilizers on average number of fruits per plant

Inorganic fertilizers	FYM levels (t ha^{-1})			
	Control	FYM 10	FYM 15	FYM 20
Control	10.21	17.18	22.36	23.50
50% RDF (NPK) + B + Zn	16.71	21.57	25.20	26.19
75% RDF (NPK) + B + Zn	20.74	25.08	27.81	28.52
100% RDF (NPK) + B + Zn	22.32	25.97	28.50	28.99
S.Em ±	0.88			
CD (P = 0.05)	2.53			

Table 3. Interactive effect of FYM and inorganic fertilizers on yield quintals per hectare

Inorganic fertilizers	FYM levels (t ha^{-1})			
	Control	FYM 10	FYM 15	FYM 20
Control	139.21	234.27	298.65	314.27
50% RDF (NPK) + B + Zn	227.81	294.05	337.42	350.89
75% RDF (NPK) + B + Zn	282.74	337.96	372.97	382.66
100% RDF (NPK) + B + Zn	304.28	350.93	382.40	389.13
S.Em ±	11.74			
CD (P = 0.05)	33.90			

Table 5. Interactive effect of FYM and inorganic fertilizers on B:C ratio

Inorganic fertilizers	FYM levels (t ha^{-1})			
	Control	FYM 10	FYM 15	FYM 20
Control	1.41	2.78	3.66	3.75
50% RDF (NPK) + B + Zn	2.37	3.10	3.57	3.63
75% RDF (NPK) + B + Zn	3.08	3.60	3.94	3.93
100% RDF (NPK) + B + Zn	3.28	3.66	3.95	3.90
S.Em ±	0.23			
CD (P = 0.05)	0.37			

20 t ha^{-1} + 100% RDF (NPK) + B + Zn fetched significantly higher net returns of Rs. 185827 ha^{-1} along with B:C ratio of 3.90 over other combinations of FYM and Inorganic fertilizers, except FYM @ 20 t ha^{-1} + 75% RDF (NPK) + B + Zn, FYM @ 15 t ha^{-1} + 75% RDF (NPK) + B + Zn and FYM 15 t ha^{-1} + 100% RDF (NPK) + B + Zn. These results are corroborated by the findings of Reddy *et al.* (2002) and Kumar and Sharma (2007).

Table 4. Interactive effect of FYM and inorganic fertilizers on net returns (Rs.)

Inorganic fertilizers	FYM levels			
	Control	FYM 10 t ha^{-1}	FYM 15 t ha^{-1}	FYM 20 t ha^{-1}
Control	48823	103362	140739	148860
50% RDF (NPK) + B + Zn	96173	133418	158192	165021
75% RDF (NPK) + B + Zn	128065	158699	178452	183019
100% RDF (NPK) + B + Zn	139931	165408	183044	185827
S.Em ±	6765			
CD (P = 0.05)	19539			

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