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Role of Integrated Crop Management Practices on the Yield and Economics of Tomato in Kalaburagi District of Hydrabad Karnataka Region

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ABSTRACT
The ICAR- KVK, Raddewadagi UAS, Raichur scientists was conducted Front Line Demonstration of 10 farmers in 2 ha during 2016-17 Rabi season. Integrated crop management practices with the improved variety of Arka Rakshak and soil test based fertilizers application at Jewargi and Chittapur taluka of Kalaburagi district of Karnataka. Demonstrations showed that farmers could increase the tomato productivity notably by switching over to improved variety and adoption of improved production technology. Integrated crop management practices, it was observed that the improved tomato variety of Arka Rakshak along with integrated management practices recorded higher yield (67 tn/ha) compared to the farmer's practices variety (58 tn/ha). The increase in the demonstration yield over farmer's practices was 16.42per cent. Technology gap and the technology index values were 8.0 tn/ha and 9.0 tn/ha respectively. The decline in overall yield and area under cultivation of tomato in Kalaburagi district was due to the high incidence of Leaf Curl Virus, Bacterial Wilt and Early Blight. The increment in yield of tomato crop under integrated management practices was due to spreading of improved variety of Arka Rakshak and soil test based fertilizers application and latest technology viz., seed treatment with bio-agents, recommended seed rate, proper dose of fertilizers and plant protection measure. The improved technology gave higher gross return, net return with higher benefit/cost ratio than farmer's practices.
Key words: *Tomato, ICM, Farmer practice, Yield, Economics*

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INTRODUCTION

Tomato (*Lycopersicon esculentum* L.*)* is one of the most important vegetables in the world ranking second in importance to potato in many countries. It is a warm season crop. Tomato is widely cultivated vegetable and has tremendous potential in India. It is grown round the year in one or other part of the country. It supplies vitamin C (ascorbic acid), vitamin A, thiamine and riboflavin in the order. Red colour of tomato is due to the presence of pigment "lycopene" (20-50mg/100g of edible portion). The yellow and orange colour of tomato fruit is due to the presence of carotene and prolycopene pigments, respectively. The fruits are eaten raw or cooked. Large quantities of tomatoes are used to prepare soup, juice, ketchup, puree, pickle, paste and powder Fageria [8]. It is grown in an area of 0.458 Mha with a production and productivity of 7.27 mt and 15.9 MT/ha respectively Anonymous, [2]. In Karnataka it is grown in an area of 54,287 ha with a production 19, 06,865 Metric tons and productivity of 35.13 tons/ ha. The major tomato producing States are Bihar, Karnataka, Uttar Pradesh, Orissa and West Bengal. In Karnataka, tomato is grown over an area of 51,200 ha. Anonymous, [2]. It is directly involved in the synthesis of Indole Acetic Acid and proteins. The principal function is a metal activator of enzymes in plants. Zinc deficiency may be related to weather conditions, as it increases in cold and wet weather, which might be due to the limited root growth in cool soils, or reduced activity of microorganisms and release of zinc from organic material. Due to zinc deficiency leaves are small and distorted, the shoot length become shortened, giving the leaves a clustered arrangement near the growing tip. Its deficiency symptoms appear generally on younger leaves starting with interveinal chlorosis as well as an overall paleness of the whole plant. Flowers may drop off and fruit fail to set. Its deficiency occurs at soil pH above 7.5 and below 5.0. Nutrients can be applied either by conventional methods or by foliar application

but the major advantage of foliar application is the instant availability of nutrients to plants. In the present day cultivation, continuous use of chemical fertilizers affects soil health and leads to environmental pollution. By using the bio- fertilizers to supplement part of the nutrient needs of the plant not only the cost of inputs be brought down, but also the environmental hazards associated with the chemical fertilizers can be avoided. Therefore, the current trends is to explore the possibility of supplementing chemical fertilizers with organic ones more particularly, bio-fertilizers of microbial origin. With this background the present study was conducted to study the effect of Integrated Nutrient Management on growth and yield of Tomato (*Solanum lycopersicum* L.) var. Arka Rakshak.

The main objective of Front line Demonstration (FLD) is to introduce suitable agriculture practices like high yielding varieties, seed treatment, spacing, timely sowing, nutrient management including micronutrients, growth hormones, pest and disease management etc. among the farmers accompanied with organizing extension programmes (field day) for horizontal dissemination of the technologies. FLD is playing a very important role for transfer of technologies and changing scientific treatment of the farmers by seeing and believing principle. In order to have better impact of the demonstrated technologies for farmers and field level extension functionaries, Front Line Demonstrations was conducted at farmer's field, in a systemic manner, to show case the high yielding new varieties, to convince them to about the potential of improved production technologies to enhance yield of tomato. Generally, the agricultural technology is not accepted by the farmers as such in all respects. There is always gap between the recommended technology by the scientist and its modified form at the farmer's level which is major absentee in the efforts of increasing agricultural production in the country. It is need of the hour to reduce this technological gap between the agricultural technology recommended by the scientists or researchers and its acceptance by the farmers on their field. In view of the above facts, front-line demonstrations were undertaken in a systematic manner on farmer's field to show the worth of improved practices and convince the farmers to adopt in their farming system.

MATERIAL AND METHODS

The study was conducted at ICAR- KVK, Raddewadagi in Kalaburagi district in Karnataka state in farmer's fields during *Rabi* 2016-17 with objective to popularize improved technologies for productivity enhancement of Tomato yield through ICM. Ten FLD were conducted in farmer's field. To diffuse tomato productivity enhancement technologies on campus and off campus trainings were conducted. The field was prepared by deep ploughing and harrowing. The seeds were sown in well prepared raised bed during first week of October. All the improved practices were demonstrated with the following technologies

1. Improved variety Arka Rakshak
2. Raised bed, line sowing
3. Plant spacing 60 X 75 cm plant and row
4. Application of FYM 20 tn/ha
5. Application of fertilizer (NPK) 250:250:250 kg/ha
6. Seed treatment with *Trichoderma* (10 g per kg of seeds)
7. Integrated pest management (Timely spray of insecticides)
8. Integrated nutrient management

In check plot, farmers were applied in their regular practices (local variety). The tomato crop was sown during *Rabi* 2016-17 in an adequate soil moisture condition. The crop was harvested at maturity stage. For the study, technology gap, extension gap and technology index were calculated as suggested by Samui *et al.,* [15].

Technology gap= Potential yield – Demonstration yield

Extension gap = Demonstration yield – Farmers yield

Technology index (%) = (Potential yield – Demonstration yield /Potential yield) * 100

RESULTS AND DISCUSSION

The data were subjected to analyze, technology gap, extension gap and technology index was calculated as per the formula and economic analysis was done as per procedure and data were presented in the table 1 and 2.

From the front line demonstrations, it was observed that the improved tomato variety Arka Rakshak along with integrated management practices recorded higher yield (67tn/ha) compared to the farmers' practices variety (58 tn/ha). The increase in the demonstration yield over farmer's practices was 26.81 per cent. The results indicated that the ICM demonstrations gave good impact over the farming community of Kalaburagi district as they were motivated by the new agricultural technologies applied in the ICM plots (Table 1). This finding is in corroboration with the findings of Anburani A. and Manivanna

[1] Chumyani *et al.* [7], Neerja *et al.* [13], Veeramani *et al.* [16], Raj *et al*. [14]. The higher yield of tomato in ICM was mainly attributed to the adoption of improved technologies. Tomato variety Arka Rakshak is potential yielder than local control and having resistance to pests. Seed treatment with bio-inputs enabled to mobalise nutrients from native soil nutrients. Seed treatment with *Trichoderma* helped the crop to resist against diseases. The technology gap in the demonstration yield over potential yield was 8 tn per ha. The technological gap may be attributed to the dissimilarity in the soil fertility status and weather conditions Mukherjee [12]. The extension gap of 9 tn per ha was noticed. This emphasized the need to educate the farmers through various means for the adoption of improved agricultural technologies to reverse this trend of wide extension gap. More and more use of latest production technologies with high yielding variety will subsequently change this alarming trend of galloping extension gap. The new technologies will eventually lead to the farmers to discontinue the old technology and to adopt new technology. The technology index shows the feasibility of the evolved technology at the farmer's fields and lower value of technology index more is the feasibility of the technology Jeengar *et al.*[9]. In this demonstration noticed 13.43 per cent technologies index, which indicates proper adoption of improved technologies. Similar results were also recorded by Lalit *et al.* [10] in greengram, Bar and Das [5] in tur, Anuja *et al.* [3] in different oilseeds crops, Balai *et al.* [4] in rapeseed mustard and Berjesha *et al.* [6] in Brassica.

The inputs and outputs prices of commodities prevailed during the study demonstrations were taken for calculating gross return, cost of cultivation, net return and benefit cost ratio (Table 2). The cultivation of tomato with improved technologies gave higher net return of Rs. 542000 per ha as compared to farmer's practices. The benefit cost ratio of tomato in ICM was 5.23. This may be due to attributed higher yields obtained under improved technologies compared to local check. This finding is in corroboration with the findings of Mokidue *et al.* [11].

Table 1: Grain yield of tomato, technology gap, extension gap and technology index as influenced by improved practices

Fruit yield (tn/ha)		% increase in yield in ICM over FP	Technology gap (tn/ha)	Extension gap (tn/ha)	Technology index (%)
ICM	FP				
67.00	58.00	16.42	8.0	9.0	13.43

Table 2: Economic analysis of tomato demonstration

Net returns (Rs/ha)		Additional returns (Rs /ha)	B:C	
ICM	FP		ICM	FP
542000	460000	82000	5.23	4.83

CONCLUSION

The study reported that the ICM programme was found useful in enhancing the knowledge and adoption level of farmers in various aspects of tomato production technologies. ICM practices created great awareness and motivated the other farmers to adopt appropriate tomato production technologies. The area of high yielding variety of tomato has increased which will spread in taluks including the adjoining area. The selection of critical input and participatory approach in planning and conducting the demonstration definitely help in the transfer of technology to the farmers.

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