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Assessment of IPM practices in tomato crop in Lucknow district of Uttar Pradesh

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Abstract
The study was carried out to validation of IPM practices in tomato crop in Lucknow district of Uttar Pradesh. It showed that higher emergence of tomato seedling (80-90%) was recorded in bioagent treated seeds at raised bed than untreated seeds in flat bed traditionally. Demonstrated field showed less incidence of insects and diseases like fruit borer, whitefly, damping-off, blights, buckey rot, wilt and leaf curl viruses than farmers practices i.e. 80-90%. Increase in yield over farmer practice was upto 12.00 percent. Farmers generally grow hybrid varieties of tomato crop with use of excess amount of seeds, fertilizer and pesticides but could not get respectable yield. IPM demonstrated plot showed Rs. 75000 per ha. additional return over farmer practices with extra saving of Rs. 5000 per ha. from cost of cultivation. So, demonstrations of IPM practices in this crop were urgent ally required. It was further observed that in terms of economics higher net returns per hectare compared to framers practices in both year. Average percent technology index was 35.50 indicated the urgent need to motivate the farmers to adopt economical viable technologies for increasing production, productivity and profitability of tomato crop. Thus adoption of IPM module is an economically, ecologically viable and profitable venture.

Keywords: Tomato crop, farmers, ecologically viable and profitable venture

Introduction
Tomato is the most consumable vegetable crop after potato and sweet potato occupying the top of the list of canned vegetables and plays an important role in providing balanced nutrition. Its consumption quantity in recent years increased at an average rate of 3% annually. At present 6.1% area of vegetables is under tomato cultivation, both in winter and summer. It is cultivated all over the country due to its adaptability to a wide range of soil and climate.

India is 2nd largest vegetable grower in the world. Different agro climatic conditions of the country permit growing several vegetables round the year. Among these potato, tomato, onion, brinjal, cabbage, cauliflower and okra are most important. Presently, India produces about 191.77 Million Tonne vegetables in which tomato estimated the production 20.57 million tonnet./ha. (Anonymous, 2019) [1] Vegetable production influenced by many constraints including lack of profitable crop rotations and high pest incidence. The estimated loss due to pest in horticultural crops range from 30-35 percent every year depending upon the severity of pest attack. Farmers use pesticides for the management of pests and frequently resort to indiscriminate and non-judicious use of pesticides, which leads to several problems such as resistant development in insects/pathogens resurgence of pest due to destruction of natural enemies, toxic hazards due to pesticides residues on the edible products and deficient pollination due to destruction of pollinators resulting in non setting of fruits and low yields. Such results have emphasized on adoption of IPM strategy for sustainable pest management in fragile ecosystem. IPM practices should stress mainly upon use of ecofriendly pesticides, biocontrol practices like seed treatment, seedling treatment and need based application of pesticides. Tomato (*Lycopersicon esculentum* Mill.) is an important crop grown from June to December and get inflicted by various insect and diseases. Among them damping off (*Pythium aphanidermatum*), early blight (*Alternaria solani*) Buckey rot (*Phytophthora parasitica*), leaf curl and mosaic viruses are major diseases. Fruit borer (*Helicoverpa armigera,* Hb.), white fly (*Bemisia tabacii*) aphids (*Aphis gossypii, Myzuspersicae*) are important insects. Other than theses American serpentine leaf minor (*Liriomyza trifolii, Burgess*) is one of the recently introduced pests of tomato in India, whose infestation increasing every year at an alarming rate. Hence, it is urgent need to adopt safer management tools against tomato pest to achieve maximum yield with minimum cost or pesticides use. Though, the integrated crop management along with the IPM module contributed greatly in attaining higher yield than farmer practices but highlighted some of the useful implications. (Hooda *et al.,* 2009) [4].

Their validation in the form of IPM package was required to be tested for applicability in the field for wider adoptability in central plain. Considering this, an IPM module was validated at farmer's field of Lucknow district of Uttar Pradesh.

Methodology

On farm trials on IPM in tomato crop were conducted by KVK, Lucknow during *Rabi* 2017-18 and year 2018-19 in 1.0 ha. area. For farmer selection conducted a training programme under the titles of "IPM in vegetable crops" at a particular village for a farmer participatory mode. Total 20 farmers participated in training programme, in which 4 farmers were keen interested to validation of IPM module in their particular field. Approximately 15000 seedling of variety Himshikhar provided to farmers for plantation at 90 X 75 Cm^2 spacing. The IPM module for validation consisted of seed treatment, seedling treatment, mulching, stacking and removal of leaves upto 9" from soil. Treated seed were sown at a row spacing of 8 cm. in raised bed (15cm. above from the soil) in first week of September and drenching of nursery once with same bioagent @ 1% to pre-empt the incidence of post emergence rot. One month old seedling root dipped in bio agent solution were transplanted. All the agronomical practices recommended by Indian Institute of Vegetable Research (IIVR), Varansi were followed. Regular monitoring of insect and diseases were done through scouting traps like yellow and pheromone and need based application of pesticides (Bio/Chemical) were carried-out. For demonstrations the all critical inputs like seedling, pesticides etc. were provided by KVK. The data on the pest incidence in IPM and non IPM plots were recorded. The yield data were collected from both the demonstration and farmers plot (Control) and their technology gap, extension gap and the technology index were workout according to Samui *et al.*, 2000 [8] as given below. Economic analysis were also taken upto calculate BC ratio of the module to known the profitability of the technology.

Technology Gap = Potential Yield – Demonstration Yield

Extension Gap = Demonstration Yield – Farmers Yield

$$\text{Technology Index} = \frac{\text{Potential Yield} - \text{Demonstration Yield}}{\text{Potential Yield}} \text{ X100}$$

Result and Discussion

Comparison of applied IPM practices at farmers field

Gap among farmers practice and recommended practices in on farm trial are presented in Table 1. Perusal of table 1 revealed that farmers generally did not use recommended and improved technologies. In farmers practice broadcast method of sowing against the recommended line sowing was followed, farmers generally used upto 100gm more seeds from recommendation. They consumed excess seeds for getting more number of plants but faulty method of sowing i.e. broadcast sowing gave lanky or unhealthy seedlings. This was due to lack of knowledge. Farmers only use nitrogen and phosphorous fertilizer, N:P:K::150:100:00 while recommended dose of fertilizer in tomato is N:P:K:: 100:50:50.This shows the higher gap and imbalance use of fertilizer. While spacing shows to partial gap among farmers practice (75x60 sq cm.) and recommended practice (90x75sq cm.). Full gap in weed control was observed in farmer's practices over recommended practices. However, no gap in variety, land preparation, sowing, transplanting, irrigation and stacking was observed in tomato crop. Clipping means removal of leaves upto 9" from soil and unwanted leaves from plants showed full gap in farmer's practices over demonstration.

Table1 also revealed that Plant protection measures showed full gap in farmer's practices over recommended IPM practices, which was main component of this study. Farmers mainly applied higher doses of pesticides (insecticides and fungicides) in injudicious manner (higher dose and more number of spray) while recommended IPM practices followed different steps like soil solarization of nursery bed, Nursery bed covered with nylon net, application of bioagent mix FYM on nursery bed, seedling treatment with imidachloprid 17.8% @ 0.3 ml./lit., plantation of marigold after each 16 row of tomato, installation of bird purches (25/ha.) and pheromone traps(10/ha.),release of *Trichogramma brasiliense*.@3.0 lakh/ha 4-5 times from flower initiation for fruit borer management, spray of Ha NPV@ 250 LE/ha., 3 times at 28,35 and 42 DAP for fruit borer management, spray of NSKE 5% for sucking pest management, need based application of indoxacarb or spinosed etc.

Table 2 revealed that emergence of tomato seedling ranged 80-90% with bioagent treated seeds sown in raised beds as compared to 60-75% in case of untreated seeds sown in flat bed, which is traditionally followed by the farmers of this area. While control having 10-20% less germination to demonstration. On an average 80-90% pest control was achieved with IPM practices as compared to non-IPM practices. Similar results were obtained by Pandey *et al*, 2005 [7]; Sushil *et al*., 2006 [9], Hooda *et al*., 2009 [4] and Faud *et al*., 2019.

Technology gap, extension gap and technology index: Perusal table 3 indicated that technology gap shows the gap in the recommended practices on farm trial yield over potential yield and it was 395q./ha. and 385q./ha. in tomato crop. The observed technology gap may be attributed to dissimilarity in soil fertility status and weather conditions. Similar findings were documented by *Hiremathand Nagaraj* (2009) [3]. Hence to narrow down the gap between the yield of recommended practices and farmers practice location specific recommendation appear to be necessary.

The extension gap which range from 75.0 q./ha and 76.5 q./ha. during both year emphasis to educate the farmers through various means for the adoption of recommended IPM practices to reverse this trends of extension gap. The feasibility of the evolved technology in the farmers fields in indicating by the technology index. The lower the technology index more is the feasibility of technology (Mishra *et al.* 2007) [6] in this study technology index varied from35.9% and 35.0% in subsequent years. Moreover, reduction of technology index in general IPM in tomato crop over the year of study clearly exhibited the feasibility of technology demonstrated under on farm trail.

Economic analysis: Perusal of data in Table 4 of economic analysis of the data under on farm trial revealed that IPM practices applied farmers got additional return Rs. 75000 and Rs. 76500 per ha and extra saving of Rs.4500 and Rs.5000 per ha. of judicious use of pesticides over non IPM practices in year 2017-18 and year 2018-19. Besides, higher benefit cost ratio of demonstrated plot 4.8, 4.9 in year 2017-18 and r 2018-19 indicating high economic viability of the IPM technology at farmer's field. Similar findings were also reported by Hooda et al., 2009 [4] and Kumar et al., 2014 [5]. Therefore, it is a very useful technology for vegetable growers from economic as well as pesticides pollution point of view.

Table 1: Comparison of recommended practices demonstrated and farmers practice in tomato crop

Operations	Recommended Practices demonstrated	Farmers practice	Gap
Variety	Him Shikhar	Him Shikhar	Nil
Land preparation	Two harrow +One Leveler+ Two cultivator + One Leveler	Two harrow +One Leveler+ Two cultivator + One Leveler	Nil
Seed rate	250 gm./ha	350gm./ha	Higher
Method of sowing	Line sowing on nursery bed	Broadcast sowing on nursery bed	Full
Time of sowing	Last week of July	Last week of July	Nil
Time of transplanting	First week of September	First week of September	Nil
Fertilizer doses	N:P:K::100:50:50 per ha.	N:P:K::150:100:00 per ha.	Higher
Spacing	90x75 sqcm.	75x60 sqcm.	Partial
Weed Management	Pendimethalin application@ 3.5 to 4.0 lit./ha.	No or one hand hoeing	Full
Irrigation	3-4 flood irrigation	3-4 flood irrigation	Nil
Stacking	With bamboo pole, iron wire and plastic thin rope	With bamboo pole, iron wire and plastic thin rope	Nil
Clipping	Removal of leaves upto 9" from soil and unwanted leaves from plants	No	Full
PlantProtection	Soil solarization of nursery bed	No	Full
	Nursery bed covered with nylon net	No	Full
	Application of bioagent mix FYM on nursery bed, seed treatment with *T. harzianum*(1%),drenching	No	Full
	Seedling treatment with imidachloprid17.8%@0.3 ml./lit.	No	Full
	Plantation of marigold after each 16 row of tomato	No	Full
	Installation of bird purches (25/ha.) and pheromone traps (10/ha.)	No	Full
	Release of *Trichogrammabrasiliense*3.0lakh/ha 4-5 times from flower initation for fruit borer management	No	Full
	Spray of Ha NPV@ 250 LE/ha. 3 times at 28, 35 and 42 DAP for fruit borer management	No	Full
	Spray of NSKE 5% for sucking pest management	No	Full
	Need based application of indoxacarb or spinosed etc.	Injudicious spray of different insecticides	Higher
	Need based application of chlorthalonil/mencozeb/captan for control of early or late blight.	Injudicious spray of different fungicides	Higher

Table 2: Performance of IPM modules in tomato crops

Year	Germination (%)		Average Pest incidence (%)	
	Demo.	Control	Demonstration	Control
2017-18	85-90	70-75	DO-1;EB-2.0;LB-2.0;BR-3.0;W-0;TLCV-0;WF-2.0;FB-1.0	DO-15;EB-10.0;LB-10.0;BR-20.0;W-5;TLCV-10;WF-10.0;FB-10.0
2018-19	80-90	65-70	DO-0;EB-2.3;LB-0.7;BR-0.0;W-0.0;TLCV-0.4;WF-1.8;FB-1.0	DO-3.6;EB-4.8.0;LB-7.3;BR-7.5;W-2.1;TLCV-10;WF-12.3;FB-7.8

DO-Damping off;EB-Early blight; LB-Late blight; BR-Buckeye rot; W-Wilt;,TLCV-Tomato leaf curl mosaic viruses ;
WF-White flies;FB-Fruit Borer,

Table 3: Productivity, Technology Gap, Extension Gap and Technological Index % in Tomato

Year	Yield (Q/ha.)			% increase over control	Tech. Gap (Q/ha.)	Extension Gap (Q/ha.)	Tech. Index (%)
	Potential	Demo.	Control				
2017-18	1100	705.0	630.0	11.9	395.0	75.0	35.9
2018-19	1100	715.0	638.5	12.0	385.0	76.5	35.0
Mean	1100	710.0	634.3	11.95	390.0	75.8	35.5

Table 4: Economic analysis of OFT on IPM in tomato crop

Year	COC (Rs./ha.)		Gross returns (Rs./ha.)		Net returns (Rs./ha.)		ACOC	AR (Rs./ha.)	B:C Ratio (Rs./ha.)	
	DP	FP	DP	FP	DP	FP			DP	FP
2017-18	145000	150000	705000	630000	560000	480000	5000	75000	4.8	4.2
2018-19	144000	148500	715000	638500	669743	521704	4500	76500	4.9	4.3

COC-Cost of Cultivation; DP-Demonstrated plot; FP-Farmers Plot ;ACOC-Additional Cost of Cultivation in check; AR-Additional return over check; Rate-Rs.1000/q. tomato fruits

Conclusion

The integrated crop management along with IPM module contributed greatly not only in attaining economically higher yield than traditional practices but highlighted some of the useful implications. Yield of tomato crop can be increased to a greater extent by adopting the recommended IPM practices and improved technology in Lucknow district of Uttar Pradesh. Favorable benefit cost ratio is self explanatory of economic viability of on farm trial and encouraged the farmers for adoption on interventions imparted. It is also

observed that higher practices so that poor farmers with limited resources could improve their livelihood. Which emphasized the need of educate the farmers through various means like training, demonstrations etc. Technology index shows the feasibility of the technology demonstrated which shows the good performance of intervention point made to reduce the yield gap in tomato.

References

1. Anonymous. Tomato. Indian Horticulture data base. 2019;20:177-185.
2. Fuad M, Nurhasan M, Kayess M. Impact of Integrated Pest Management (IPM) Practices on Tomato Cultivation in Gazipur District of Bangladesh. Advances in Entomology. 2019;7:33-46.
3. Hiremath SM, Nagaraj MV. Evaluation of demonstrations on onion in Haveri district of Karnataka. Karnataka J of Agri. Sci. 2009;29(5):1092-1093.
4. Hooda KS, Bhatt JC, Joshi D, Sushil SN, Singh SRK, Siddiqie, *et al*. On-farm validation of IPM module in tomato in north west Himalayas. Indian J of Extension Education. 2009;45(3-4):33-36.
5. Kumar Sanjay, Singh Ravindra, Singh Akhilesh. Assesment of gaps in pulse production in Hamirpur district of Himachal Pradesh. Indian J of Extension Education. 2014;14(2):33-36.
6. Mishra DK, Tailor RS, Pathak G, Deshwal A. Yield gap analysis of blight disease management in potato through front line demonstration. Indian Res. J of Ext. Edu. 2007;7(2&3):82-84.
7. Pandey KK, Pandey PK, Mishra KK. Development and testing of an integrated disease management package for multiple diseases for tomato. Indian Phytopathology. 2005;58(3):294-297.
8. Samui SK, Maitra S, Roy DK, Mondal AK, Saha D. Evaluvation of front line demonstration on groundnut. Journal of Indian society of coastal agri. Research. 2000;18(2):180-183.
9. Sushil SN, Mohan M, Hodda KS, Bhatt JC, Gupta HS. Efficacy of safer management tools against major insect pests of tomato and garden pea in north west Himalayas. Journal of Biological control. 2006;20(2):118-133.