Int.J.Curr.Microbiol.App.Sci (2018) *7*(7): 3473-3480

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 7 Number 07 (2018)**
Journal homepage: http://www.ijcmas.com

Case Study https://doi.org/10.20546/ijcmas.2018.707.403

Promotion of Integrated Pest Management Technologies in Selected Vegetable Crops through Farmers Participatory Approach in Peri-Urban Farming Community of Sikandrabad, Bulandshahr (Uttar Pradesh)

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Keywords

IPM promotion, Collaborative approach, IPM stakeholders, participatory action learning, Vegetables, Participatory constraint analysis, Participatory action learning.

Article Info

Accepted:
26 June 2018
Available Online:
10 July 2018

A B S T R A C T

Integrated pest management (IPM) is an eco-friendly approach for management of pests by connecting biological, cultural and chemical tools to decrease economic, health and environmental hazards. The study assessed the chemical pesticide use in vegetable crops and prioritized the constraints for successful adoption of IPM practice in selected vegetable crops in peri-urban agriculture. IPM programs have progressed rapidly in recent times because of changes in pest resistance, regulatory decisions limiting the availability of pesticides, increased chemical costs, consumer concerns and environmental issues. Pest management in vegetable crops had not received the same level of attention as other crops. Participatory approach such as Farmer Field School (FFS) and Participatory Action Learning (PAL) have proved to be very successful in promotion of Integrated Pest Management in vegetable crops and used to engage IPM stakeholders as to complementary groups that together could support the range of extension needs. One of the most effective methods of training is extension of integrated pest management, farm is on the way to school. The learning process can be facilitated by the extension workers or trained farmers which can hence encourage the farmers to discover key agro-ecological concepts and develop IPM skills through self-discovery activities.

Introduction

In Uttar Pradesh, Agriculture is one of the dominant sectors in the economy and growth rate of Agriculture and allied sector is 5.3 percent, that of primary sector is 5.4 percent and the national figure is 4.0 percent. Secondary and Tertiary sectors are also at a fast pace in the country as a whole but in U.P. though growth of secondary sector is near to national figure, lagging behind is the tertiary sector. Yet Agriculture and allied sector growth being the lowest has a potential to improve and thus provide boost to the overall economy of the state. Acreage devoted to individual vegetable crops is small, but economic returns per acre are substantially higher than those from agronomic crops. Pest management represents a high portion of the costs in producing major agronomic crops (i.e.

cotton, corn, soybeans) and producers are highly responsive to tactics that will reduce costs. IPM technologies first were developed to address the prospect of economic ruin in agronomic crops and later were adapted to vegetables. Economic realities in vegetable production make changing producer behavior and decision making far more challenging than in agronomic crops because of several factors. Because vegetable growers primarily face risks in product quality and markets, the adoption of IPM practices has been more challenging because of the disparity in production costs and economic risks between the two kinds of crops. Over-reliance on insecticides greatly increases long-term risks of resistant pests emerging for which no short-term remedy is economically available. Development and implementation of IPM in vegetables is further exacerbated by ecological realities of crop host and pest diversity (Smith and McSorley, 2000). The cost of a single insecticide application in agronomic and vegetable crops is similar but may be 20-fold higher when viewed as a percentage of the expected gross returns of the two kinds of crops. For example, an additional insecticide application in cotton represents 22% of the expected net return and may make the difference between profit or loss for the grower. In contrast, an additional treatment in cabbage represents 1% of the economic return and the cost can be more easily absorbed and justified with far less jeopardy to profitability. Short-term economic gains in chemical pest control is offset by the longer term biological reality of pesticide resistance in pests of all crops. Most vegetable cultivars were bred for yields and market traits, with limited attention to reducing pest susceptibility under conditions of high fertility and irrigation, which favor pest development. Furthermore, marketing requirements and quality standards are intolerant of pests at harvest. For example 5% infestations of *Helicoverpa zea* (Boddie) (Lepidoptera: Noctuidae) that can be ignored in field corn would be ruinous in marketing tomato, cantaloupe, squash or cucumber. IPM tactics in vegetables typically must keep pests at lower densities compared with agronomic crops to achieve economic production. Development of agriculture to a considerable extent depends on the adequate expansion and development of irrigation facilities. The state has an agrarian economy and performance of agriculture and allied activities such as horticulture, animal husbandry, dairying and fisheries that are critical in determining the growth rate of U.P.

Objective of the program initiated by National Research Centre for IPM

To promote the promising IPM technologies in selected vegetables through farmers participatory approach in Sikandrabad, Bulandshahr (Uttar Pradesh).

Proposed work

The project is based on the extension programme for conducting studies to identify the existing IPM technological practices, information, knowledge and technological gaps, training and information needs of farmers and extension personnel towards IPM in selected vegetable crops of the project location. The project will ameliorate the constraints in IPM adoption at farmer level through active collaboration with extension agencies for facilitation of IPM information, knowledge, training and extension activities.

Problem definition

IPM technologies have been validated to address the problems of overuse of the chemical pesticides associated with the vegetable production in the project area. These IPM technologies require enhanced knowledge and understanding of the farmers regarding the biological factors and ecological

interactions for accelerate adoption. It is important for the researchers and extension workers to analyze the field level constraints and ameliorate the same for better adoption of IPM technologies especially in the vegetable cultivation. The project output would strengthen the vegetable IPM technology development, refinement of IPM research programmes and will also support in IPM extension mechanism for promotion of IPM. IPM validation implemented as per improved extension methodologies would lead not only for enhanced adoption but also better skill development, confidence in technology, improved and safer vegetable production system and overall increased productivity, profitability and acceptability. This will entail social capital building and institutionalization of integrated pest management in project location.

Materials and Methods

Facilitate expertise in planning, training, production of bio-agents and implementation of IPM for accelerating of IPM adoption.

Promotion of the information and knowledge sharing among the stakeholders through networking as a common platform for IPM related issues.

Encourage local entrepreneurs/Farmers to produce and market biological based alternatives to hazardous pesticides.

Evaluation of program for further rectification.

Obstacles in IPM adoption

Integrated pest management (IPM) has been the dominant crop protection paradigm promoted globally. In spite of several socio-economic and environmental advantages of these technologies, the adoption of IPM at the farmer level is not very encouraging. The possible reasons behind the developing countries, poor adoption of IPM have been the subject of considerable discussion since the 1980s, but this debate has been notable for the limited direct involvement from developing-country stakeholders. Adoption is limited, however, due to technical, institutional, social, cultural, economic, educational and informational policy constraints. Few are listed below:

Lack of training and technical support to farmers

Lack of encouraging government policies and support

Low level of education and literacy of farmers

Lack of collective action within farming community

Dominant influence of pesticide industry

Insufficient IPM research

Lack of long term funding for IPM

Limited access to IPM inputs, like resistant cultivars and bio-pesticides

Limited access to IPM extension publications and knowledge

Benefits of IPM are less as compared to costs

IPM approach to use minimum pesticides whereas conventional approach with lots of pesticides

Farmers not interested in changing habitual management practices

IPM many a times becomes difficult to explain and understand

Shortage of inter-institutional collaboration in IPM; e.g. between universities and private sector

Shortage of well-qualified IPM experts

Farmers are too risk averse

IPM seems to be too expensive for farmers

Lack of IPM guidelines for many pests and diseases are both old and emergituug

Lack of market incentives and profit for the farmers to adopt IPM as consumers demand high quality at low price

IPM guidelines not location-specific

IPM research is poorly oriented to the needs of farmers

Shortage of IPM training programs in universities and other training institutions

Insufficient attention to traditional and local knowledge

Shortage of IPM guidelines focused on crop health instead of specific pests

Shortage of practices and products as effective as chemical pesticides

Shortage of well-qualified extension officers.

Conventional management with pesticides responds well to needs of farmers

Farmers unaware of IPM

Farmers have limited understanding of unintended effects of pesticides

IPM is too labor-intensive

IPM unsuitable for smallholder agriculture because farmers grow too many crops, each demanding unique IPM program

Shortage of interdisciplinary collaboration in IPM; e.g. between pathologists and rural sociologists

Access to pesticides is too easy and unrestricted in rural areas

Farmers become disillusioned with IPM because experts overestimate its benefits

IPM combines many practices but farmers want just the single best

IPM extension publications are difficult to understand for farmers

Poor understanding of mechanisms behind successful extension programs

Shortage of pest identification services

Benefits of pesticides are much more apparent than their negative effects

Experts underestimate legitimate role of pesticides in IPM

Farmers cannot make IPM priority, have more important problems to address

Lack of attention to biological control

Lack of attention to host plant resistance

Lack of attention to participatory methods

IPM not very effective when pest populations are very high

Many IPM recommendations are not evidence-based or research-based

Weak regulation of pesticide industry

Lack of attention to cultural practices like crop rotations and intercropping

Lack of attention to decision-support tools

Lack of attention to gender issues

Promotion of IPM technologies

Research has generated new technologies using naturally occurring enemies of insect pests (parasitoids, predators and pathogens) for use in IPM. Some important commercially available products include *Trichogramma, Bracons, Crysoperla carnea, Crytaemus montrouzieri, Bacillus thuringiensis, Bacillus sphaericus,* Nuclear polyhedrosis viruses (NPV) and Trichoderma. In addition, there are number of valuable bio-pesticides such as Azadirachtin (neem), pyrethrum, nicotine etc. In India, more than 160 natural enemies have been studied for their utilization against insect pests. Technologies have been standardized for multiplication of 26 egg parasitoids, 39 larval/nymphal parasitoids, 26 predators and 7 species of weed. It was therefore decided to explore the topic further by eliciting and mapping the opinions of a large and diverse pool of IPM professionals and practitioners from around the world, including many based in developing countries. The objective was to generate and prioritize a broad list of hypotheses to explain poor IPM adoption in developing-country agriculture. Participatory approach such as Farmer Field School (FFS) and Participatory Action Learning (PAL) have proved to be very successful in promotion of Integrated Pest Management in vegetable crops and used to engage IPM stakeholders as to complementary groups that together could support the range of extension needs. One of the most effective method of training - extension on integrated pest management, farm is on the way to school. This method of learning about the ecology and management of cultivated land area cultivated by very practical ways for farmers to provide. The purpose of this research introduces teaching methods- a school extension in the field as an effective method of training in integrated management of pests. The results showed that the extension of school education in the field, a very effective way to achieve sustainable agriculture in the context of integrated pest management training. The learning process can be facilitated by the extension workers or trained farmers which can hence encourage the farmers to discover key agro-ecological concepts and develop IPM skills through self-discovery activities (Fig. 1–4).

Fig.1 Interaction with the farmers of the selected village

Fig.2 Interaction of the team with Agriculture officers of the district

Fig.3 Interaction of the team with the extension workers

Fig.4 Linkage development with the schools and other agencies

Expected output and conclusion are as follows

The implementation of the project would decrease the chemical consumption and thus directly improve quality of vegetable produce, socio-economic condition of farmers and also will develop social capital and healthy environment. It will strengthen the vegetable based IPM technology and refinement in the IPM research programmes. The findings of project will provide valuable suggestions, aspiration and needs of vegetable growers towards pest management. The implementation of the finding in vegetable IPM research programme enhanced the

acceptability of technologies and adoption of IPM at farmers level will increased. The project is an extension study involving safer use of pesticides. The project will increase awareness about the safe use of chemicals, health hazards of injudicious use of pesticides and overall impact on clientele, consumers and environment. The data analysis would bring out the impact on awareness on safe use of pesticides/equipment etc. The overall goal is to support IPM extension mechanism for promotion of IPM technology.

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How to cite this article:

Singh, R.V., Meenakshi Malik, A.K. Kanojia, Avinash Singode. 2018. Promotion of Integrated Pest Management Technologies in Selected Vegetable Crops through Farmers Participatory Approach in Peri-Urban Farming Community of Sikandrabad, Bulandshahr (Uttar Pradesh) *Int.J.Curr.Microbiol.App.Sci.* 7(07): 3473-3480. doi: https://doi.org/10.20546/ijcmas.2018.707.403