

Status of IPM program in greenhouse crops in Iran, success and needs

Valiollah Baniameri

Iranian Research Institute of Plant Protection (IRIPP), IRAN

Introduction

Greenhouse crops are currently grown on 6158 ha mainly in southern and central parts of Iran of which about 3483 ha are vegetables. Vegetable crops (mainly cucumber, 90%, tomato and pepper) are grown from September to late May in cold and mild climate areas. Due to high value of vegetables in off-seasons, growers are highly interested to produce these crops in greenhouse. The problem of pest and disease increases every year and growers try to control the pests and diseases by chemical control. To solve this problem the PPDR I is developing related IPM program, with the aim of focusing on non-chemical control methods and application of biocontrol agents. There are several pests and diseases that cause damage on greenhouse vegetables (cucumber, tomato and pepper). Our goal is to develop and implement an IPM program relying on alternative methods to pesticides application in pests and diseases control in greenhouse vegetables. At PPDR I, more than 30 research activities have been conducted on greenhouse crops and some more 125 activities are carrying out through an IPM program.

Characteristics of the greenhouse agro ecosystem in Iran

The greenhouse area allocated to vegetables is about 3483 ha of which 1150 ha is concentrated in Jiroft region (Southeast Iran) (Ministry of Agriculture Statistics Office). Since Iran has many different climatic zones, the program varies depending on regional conditions. The climate of growing area includes two types. 1. In Southern area particularly in Jiroft, the climate is mild for most of the year, except in summer that hot weather prevails. Greenhouses are devoid of heating system and protected with plastic covers. Crops (about 90% cucumber) encounter high pest populations, especially in autumn through mild winter, because the protected crops are mixed with open field crops. 2. In other area mainly Esfahan, Yazd and Tehran (located in central part of the country), the climate is cool and freezing in autumn and winter seasons. Greenhouses are protected by plastic covers with heating system. Crops are mainly cucumber, tomato and pepper.

Common Pests and Diseases in greenhouses

The main pests are leafminer (*Liriomyza trifolii*), two spotted spider mite (*Tetranychus urticae*), greenhouse whitefly (*Trialeurodes vaporariorum* and *Bemisia tabaci*), onion thrips (*Thrips tabaci*) and cotton aphid (*Aphis gossypii*). Additionally, appeared since 1999 leaf caterpillar (*Diaphania* sp.) can cause severe damages to cucumber in Jiroft.

The main diseases are stem and root rots (*Phytophthora drechsleri*, *Pythium aphanidermatum*, *Verticillium dahliae*, *Fusarium oxysporum* and *Sclerotinia sclerotiorum*), cucumber downy mildew (*Pseudoperonospora cubensis*), powdery mildew (*Sphaerotheca fuliginea*) and leaf spots (*Alternaria* sp. and *Cladosporium cucumerinum*), and gall nematode (*Meloidogyne* sp.).

Current integrated control

Currently, some Iranian growers are using techniques such as yellow sticky traps, soil solarization, nutrient management, insect screening, resistant varieties and removal of infested plants through IPM program. Except few, most growers do not have access to any commercially produced biological agents. However, naturally occurring population of parasitoids of leafminers has been detected in some areas such as Jiroft and Tehran. Despite of using the above mentioned techniques the control program is still dominated by use of pesticides

Progress in research

The Plant Pests and Diseases Research Institute (PPDRI) affiliated to Ministry of Agriculture mainly responsible for crop protection researches in Iran. Research activities are also conducted by other authorities such as Universities, Research Institutes and etc. More than 30 research activities on different subjects such as pest and disease identification, biological control, chemical pesticides and soil solarization in greenhouses has been conducted in PPDRI. In case of biological control activities, some natural enemies have been identified in some regions, including the identification of native parasitoids of leafminers and greenhouse whiteflies, native phytoseiid mites and anthocorid bugs. Currently, few species are evaluated for their ability to be used for commercial production. Also, four microbial pesticides are produced and being trailed, including *Bacillus subtilis*, *Trichoderma harzainum*, *T. viridae*, *T. koningi*. The three later products are using against stem and root rots in cucumber and tomato in some greenhouses. In addition, *Bacillus thuringiensis* var. *kurstaki* is using against caterpillars such as *Plusia* sp. in cucumber greenhouses.

At present, we are developing an IPM program including 125 research activities on different subjects. The goal of this program is to reduce pesticides usage and application of biocontrol agents throughout the country. There are several governmental and private organizations that would like to collaborate with this program such as Plant Protection Organization (PPO), Greenhouse Products Office and Greenhouse Vegetable Growers Cooperation and etc.

Training

Several IPM training courses have been conducted for the growers with the aim of pesticide use reduction in greenhouses. In these courses, growers were

trained some techniques on using yellow sticky traps against leafminers and sucking pests for monitoring and mass trapping, use of insect screening, soil disinfestations by solarization, removal of highly infested plants and sanitation. We try to empower the growers to recognize the natural enemies and conserve them. Finally, we recommended application of the native natural enemies against the main pests in small scale in greenhouses and improvement of pesticides application methods. We also suggested the use of insecticide soaps against aphids and mites.

Conclusions

There is an enormous potential for the expansion of the use of IPM programs in greenhouse crops in Iran, but much work needs to be done on research, training and extension. In modern agriculture cucumber, tomato and pepper have especial place in organic production, because these crops are produced in greenhouse and are served freshly. However, our long-term goals are to develop and implement an IPM program that relies on alternative methods besides the rational use of pesticides for pests and diseases control.

Needs:

1. Enhance of IPP program with active involvement of the grower's community as following five components of the IPP strategy:
 - (i) Planting material (i.a. seed quality, raising of healthy plantlets, cultivar selection, grafting)
 - (ii) Cultivation practices (i.a. plant density, mulch, plant pruning and training, site selection, plant nutrition, crop rotation, pollination)
 - (iii) Technology (i.a. greenhouse cultivation, fertigation management, drainage, soilless culture)
 - (iv) IPM (i.e. sanitation and scouting, use of traps and baits, biological control, intelligent and safe use of pesticides)
 - (v) Labeling (quality norms and standards, traceability, crop protocols, certification).
2. Organizing workshops for trainers and extension officers on selected subjects in line with the five components of the IPP strategy.
3. Organizing technical, training courses for researchers and scientists related to technological novelties (once per year with the contribution of international resources persons from ISHS and IOBC/wprs).
4. Developing and implementation of a biocontrol program in a **demogreenhouse** with active cooperation of private companies to mass rearing of biological agents.
5. Establish an international cooperation to develop guidelines and standards on IPP for greenhouse vegetable growing, including greenhouse structure, materials, equipment and climate control and IPM techniques etc.