Role of IPM in Controlling Crop Diseases

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ABSTRACT
In view of environmental and health concerns, a determined effort was made in the last years to reduce and rationalize the use of chemicals (pesticides, fungicides, nematicides etc) worldwide, in order to manage pests/pathogens more effectively. This approach led to the emergence of a new discipline called IPM (integrated pest management). IPM is a holistic approach to sustainable agriculture that focuses on managing insects, weeds and diseases through a combination of cultural, physical, biological and chemical methods that are cost effective, environmentally sound and socially acceptable. This includes the responsible use of crop protection and plant biotech products. As the global population is on the rise, and therefore so is food demand. This means farmers must increase yields on existing lands while protecting biodiversity and looking after the environment. So, IPM provides farmers with tools and strategies to minimize losses caused by insects, weeds and diseases to sustainably maximize production. This paper also highlights the what IPM is, the range of tools, tactics and methods employed in IPM, a step by step approach to implementing an IPM program.

Keyword: Plant Health, Pest Management, Sustainability, IPM

I INTRODUCTION

IPM is the combination of cultural, biological and chemical measures to manage pests. In IPM, we use all available pest control techniques and other measures that will discourage the development of pest populations while minimizing risks to human health and environment.

II WHY IS IPM IMPORTANT?

Now a days, demand for food and fiber is growing day by day and to fulfill this requirement farmers have to produce more crops on existing farmland. To increase these yields farmers need continuous improved agricultural technologies to minimize crop losses while protecting the environment. And to fulfill this requirement, IPM is the great solution for sustainable agriculture as it is safe and gives good quality food production, improves livelihood and conserves non-renewable resources.

III BENEFITS OF IPM

IPM provides multiple benefits like:-

- Decrease severity of pest infestations
- Stable, reliable and quality crop yields
- Reduces air pollution, water pollution and soil pollution
- New opportunities for established and novel products, techniques and services
- Protects the non-target species

IV COMPONENTS OF IPM

IPM requires competence in three areas: prevention, monitoring and intervention.

(a) Prevention - In this, we have to prevent the plants from the pests before they cause the economic damage to our plants and this is the most preferred approach in IPM. Generally, pests invade those agricultural crops that are unhealthy or injured. So, to prevent the plants from the pests, first we have to adopt good farming practices and these are as follows:- [1]

(i) Crop location- Before growing any crop, we should first check the location of the area. Is that climate, soil and topography of that area is suitable for that crop or not. If that area is suitable, then only we should grow the crop in that very place.

(ii) Variety selection- We should choose disease and pest resistance and herbicide- tolerant varieties because they might reduce the need for other crop protection measures.

(iii) Strategic planting and crop rotation- If we will grow similar crops alongside each other, they will increase pests. So, to avoid the pests we can sow different crops in alternate rows. We can also grow different crops in rotation and that will help in reducing the build-up of pests, especially those in the soil such as root-feeding insects and fungi.

(iv) Water management- Water is essential for plants but flood irrigating influence pest incidence and impact. To avoid this, we can do drip irrigation or grow crops on ridges or raised beds.

(v) Optimizing plant nutrition- Different soil types contain different amount of nutrients and after harvesting nutrients are removed with a crop from the soil. These nutrients have to be replaced with mineral and/or organic fertilizers in order to maintain or improve the soil fertility. These

products must be applied at the right time in the correct amounts to optimize soil health.

(vi) **Harvesting and storage-** Proper harvesting and storage methods can reduce the disease causing organisms.

(vii) **Preserving biodiversity-** We can conserve the biodiversity by protecting natural habitats near farmland including many natural pest enemies. Careful management of farmland edges, including trees and hedges, is important for wildlife habitats, providing cover and refuge for beneficial insects and animals.

(b) **Monitoring -** Management of any crop requires regular monitoring to assess the plants whether they are growing in a proper way or not. We can monitor the crops in the fields by using tools like pheromone traps, forecasting systems, geographic information system and remote sensing techniques or by walking through fields for scouting of pests and distinguishing them from non-pests and beneficial insects.

(c) **Intervention -** We can't always prevent the crops from damaging by pests. This means that when pest populations begin to approach the Economic Injury Level, an intervention has to be made to protect the crop and farm profits. Once we decided that an intervention is required, a range of intervention options are available. These include cultural, physical, biological and chemical control measures individually or in combination. While implementing these interventions, we must consider costs, benefits, timing, labor force and equipment as well as economic, environmental and social impacts.[2]

(d) **Cultural Interventions -** In this, the crops are grown in such a way to manage pests. Actually, the cultural interventions are eco-friendly. We use 'traditional' or modified versions of traditional practices for cultural control. Some are listed below:-

(i) **Crop rotation –** This has been used by farmers for both fertility and pest management tool from the long time. If we grow a succession of different crops in a field over several years; it will prevent the build-up of pests while if we grow the same crop for several years, it will increase the build-up of pests. Crop rotations are particularly effective in controlling soil-borne diseases.

(ii) **Multiple cropping –** In this, we grow two or more crops in the same field during one growing season instead of just one crop. This reduces the risk of weed growth, pest and disease infestation. Multi-cropping a monocotyledonous crop with a dicotyledonous crop disrupts the soil-borne pests.

(iii) **Border crops –** These are grown around a field of crops to prevent the immigration of pests into a crop field. For example, if our main crop is carrot, we use onion and garlic as border crops and these border crops will control the carrot root fly thrips.

(iv) **Trap crops –** A trap crop is also known as sacrificial crop. We plant the trap crops to attract the pests and protect the main crops from the insects. Once a trap crop is infested with pests, it is treated with chemical interventions or physically destroyed.

(e) **Physical Interventions -** These methods aim to reduce pest populations by using devices which affect them physically or alter their physical environment.

(i) **Hot or cold treatment –** The exposure of seeds and stored commodities to sun rays during hot summer months of April-June helps in killing number of pests. Steam sterilization of soil can be done to kill soil insects and nematodes. Fresh and dry fruits and vegetables are kept in cold storage for escaping fruit fly, potato tuber moth and pathogen damage.

(ii) **Moisture –** If we reduce the moisture content of air, the insects become highly sensitive, but this can be manipulated only in case of stored grain pests and under greenhouse conditions.

(iii) **Radiant energy –** Insect pests can be controlled by radiant energies like radio frequencies, infrared light, ultraviolet and visible light, X-rays and gamma rays. These radiations are used mostly for pests of stored grain and their products.

(f) **Biological Interventions -** These interventions are usually efficient at low pest intensities or other interventions are also required. These control include beneficial insects or predators, applying micro-organisms such as viruses, fungi, bacteria, cultivating botanical plants like neem, tobacco, chinaberry, custard apple etc and through modern biotechnology methods like development of crop varieties resistant to pests and diseases and\or tolerant to herbicides.

(g) **Chemical Interventions -** Chemical pesticides are biologically active chemicals that control a range of insects and vertebrate pests, disease and weeds. These are the most cost-effective way to control the pests but it is not an eco-friendly. So, we use chemical pesticides only when the pests are causing economic losses and they can't be controlled by any other interventions.

V TACTICS AND TOOLS OF IPM

In this, farmers are the only decision makers. They have to decide how they will manage the all pests that may damage the crops individually or collectively. The farmers combine different IPM tactics and tools according to changes in the environment, cropping patterns and market forces. [3]

(a) **Setting an economic threshold –** The extent of economic losses vary according to seasons, weather conditions and other factors. As we know the severity of pest infestation varies, it is better to monitor pest population or the damage they are causing before deciding to use a crop protection method or other interventions. Once we saw that the infestation has reached an 'economic threshold' we should apply the other methods of intervention.

(b) **Protecting natural enemies –** We should always keep in mind that if we are controlling the pest population through different controlling methods, we should not harm or kill the natural enemies of pest because they are useful in controlling the pest populations.

(c) **Selecting the right products –** In IPM, it is an important to review the product characteristics, applications, costs, whether they are broad spectrum or specific one and then we should select the product that provide the most cost-effective treatment with minimal undesirable effects.

(d) **Using products responsibly and safely –** The farmers should use or handle or apply the products as per the instructions provided by manufacturers. If they will not follow the guideline of manufacturers, the pests may become resistant, the natural pest enemies can die, can have adverse effect on environment and many more.[4]

(e) **Preventing pest resistance to crop protection products –** IPM offers a range of ways for preventing pest resistance like monitoring pest populations, applying treatments when the economic threshold is reached and implementing strategies such as alternating or mixing compatible crop protection products or biotech seeds with different modes of action.

VI IMPLEMENTATION AND ADOPTION OF IPM

An IPM programme takes time, money, patience, short- and long-term planning, flexibility and commitment. As we know, Indian farmers are used to a chemical pest management system and they do not like to consider any alternative methods as they think these will affect on crop yield. This happens due to low literacy, poor awareness and a positive attitude towards pesticides among small and medium farmers, who constitute the majority. So, governments and companies must take the lead in changing the mindset of farmers by educating them, telling the harmful effects of chemicals and useful effect of eco-friendly products. Then, implementing officials need to spend time or making contacts with extension and research personnel to discuss farming operations, which vary from location to location.

VII CONCLUSION

The dependency on pesticides for all pest problems created a number of ecological and environmental problems.To overcome these problems, IPM has been developed as an attractive and alternative method. Though the concept of IPM has been universally accepted but still few IPM programmes are functioning at the farmer level. These are an urgent need to develop IPM systems for different crops and this requires intensified research efforts in formulation, research and implementation phases of the IPM programmes. Theuse of insecticides is an essential component in most of the IPM programmes but their use will be based concept of ETLs. Lastly, the farmers need to be convinced by the benefits of IPM programmes so that these are implementing in proper way. Innovations in farmer participation and training will help to overcome many of the implementation problems.

REFERENCE

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