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Integrated Disease Management- An Overview

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ABSTRACT: We have discussed the categories of principle of plant disease management and integrated management strategies in this review. Integrated plant disease management (IDM) can be defined as a decision-based process involving use of multiple tactics for optimizing the control of disease in an ecologically and economically. The principles of Integrated Disease Modules are exclusion, eradication, protection and therapy. IDM consists of scouting with timely application of combination of strategies and tactics. These may include site selection and preparation, altering planting practices, utilizing resistant cultivars modifying the environment by drainage, irrigation, thinning, shading, pruning and applying pesticides, wherever required. This article describes integrated illness management, which includes cultural, biological, chemical, genetic, mechanical, and physical. Additionally discussed are institutional, social, economic, and political barriers to integrated illness management.

KEYWORDS: IDM, Disease management, Biological control

I. INTRODUCTION

In the integrated disease management program a large number of Integrated disease management strategies are used to prevent and manage diseases in crops including site selection and preparation, altering planting practices, modifying the environment by drainage, irrigation, pruning, thinning, shading, applying pesticides, rotation of the crop, use of disease resistant varieties, removal of infected parts of the plants etc., still the effectiveness of all these treatments fail to overcome the severe damage caused by the disease. So, the alternative method which can be effectively used is use of potential bio pesticides. *Trichoderma* is a versatile bio control organism which can be effectively used for control of wilt diseases in different crop plants. Several investigators have explored the potential of various *Trichoderma* spp. to manage diseases in crop plants. The management strategies employed in IDM can be utilised separately, but in this approach they need to be complimentary and they will interact strongly to lessen the burden of the illness (Khoury *et al.*, 2010). The management techniques that lower the number of inoculums also lower the incidence of disease in the soil. Some of the management techniques include the use of tillage, solarization, fumigants, herbicides, tolerant crops planted later in the crop cycle, and organic soil amendments (Lodha *et al.*, 2017). Using bioagents and other agents is also a part of it.

The basic objectives of any IDM program should be reduce the possibility of introducing diseases into the crop, avoid creating conditions suitable for disease establishment and spread, simultaneous management of multiple pathogens, regular monitoring of pathogen effects, and their natural enemies and antagonists as well, use of economic or treatment thresholds when applying chemicals, integrated use of multiple and suppressive tactics.

Integrated Disease Management

Integrated plant disease management (IDM) can be defined as a decision-based process involving use of multiple tactics for optimizing the control of disease in an ecologically and economically. IDM consists of scouting with timely application of combination of strategies and tactics. These may include site selection and preparation, altering planting practices, utilizing resistant cultivars modifying the environment by drainage, irrigation, thinning, shading, pruning, and applying pesticides, wherever required. But in addition to these traditional measures, monitoring environmental factors (temperature, moisture, humidity, soil pH, nutrients, etc.), disease forecasting, and establishing economic thresholds are important to the management scheme. Biological control is the alternative approach for disease management that is eco-friendly and reduces the amount of human contact with harmful chemicals and their residues

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(Sharma *et al.*, 2017). Integrated Disease Management Elements: Host-plant resistance, cultural practises, biological control, and chemical control are the main elements of disease management. Even though each of these elements will be discussed separately, it should be noted that they frequently work best together and interact strongly with one another and the surroundings. For a better understanding of population biology at the local farm level and to rely on the integration of control components that are easily accessible to the resource-poor farmers, it is crucial to move away from relying on a single technology and adopt a more ecological approach (Thomas, 1999).

These measures should be applied in a integrated and harmonized manner to maximize the benefits of each component. However, this is not always easy to accomplish, and “disease management” may be reduced to single measures exactly the same as the ones previously called “disease control.” Regular crop monitoring and record keeping provides reliable information to guide an IDM program. Monitoring for disease incidence and development, it is important to inspect foliage and flowers preferably, at weekly interval.

Principles of Integrated Disease Modules:

Exclusion:

Exclusion a pathogen means preventing the entrance and establishment of pathogens in uninfested crops in a particular region. It means using certified seed or plants, sorting bulbs before planting, discarding any that are doubtful, possibly treating seeds, tubers or corms before they are planted, and most especially, refusing obviously diseased specimens from dealers.

Eradication:

Eradication involves the elimination of a pathogen once it has become established on a plant or in a field. It can be accomplished by removal of diseased plants, or parts, as in roguing to control virus diseases or cutting off a cankered tree limb; by cultivating to keep down weed hosts and deep ploughing or spading to bury diseased plant debris; by rotation of susceptible with non susceptible crops to starve out the pathogen. Spraying or dusting foliage with sulfur after mildew mycelium is present is eradication, and so is treating the soil with chloropicrin to kill nematodes and fungi. Exclusion, Eradication, Protection Therapy

Protection:

Protection is the use of some protective barrier between the susceptible part of the suspect or host and the pathogen. In most cases this is a protective spray or dust applied to the plant in advance of the arrival of the fungus spores; sometimes it means killing insects or other inoculating agents; sometimes it means the erection of a windbreak or other mechanical barrier.

Therapy:

Therapy is used on individual plants and can't be used on a large scale. It is achieved by inoculating or treating the plant with something that will inactivate the pathogen. Chemotherapy is the use of chemicals to inactivate the pathogen, whereas heat is sometimes used to inactivate or inhibit virus development in infected plant tissues so that newly developing tissue may be obtained which is free of pathogen. Thermotherapy involves the exposure of diseased plants or parts of them to hot water or high air temperatures for different periods of time. Loose smut of wheat is controlled by treating the seeds with hot water, but modern resistant varieties are a simpler method of control. Hot water treatment has been used to kill nematodes in bulbs, corms, tubers, and fleshy roots while they are in a dormant condition.

Cultural practices:

Cultural practices usually influence the development of disease in Crops by affecting the environment. are important non-chemical methods to manage the plant diseases. Agricultural practices like crop rotation, field fallowing, application of organic amendments are known to reduce the incidence of root rot, wilt and root knot nematode etc. Such practices are intended to make the atmospheric, edaphic, or biological surroundings favorable to the crop plant,

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unfavorable to its parasites. Cultural practices that lead to disease control have little effect on the climate of a Particular region but can exert significant influence on the microclimate of the crop plants in a field. Although a range of novel treatments with both narrow and wide specificities are now readily available, there is still a danger associated with their practical application of selecting resistant pathogen populations (Gullino et al., 2000).

Crop rotation:

Crop rotation is useful against those pathogens which do not persist for a long time in the soil in the absence of the suitable host or plant. In this method, host plants and non-host plants are rotated in a way that reduces the inoculum size in the soil.

Disease free seeds: Some seeds carry the pathogen internally and externally.

Field sanitation:

Field sanitation is also important aspect. Plant debris are important sources of harboring plant pathogen in its active stage or dormant stage. The field should therefore be free from the debris after harvest.

The field should be free from the plant debris after harvesting. Organic amendments increase the activity of saprophytic micro-organisms which may inhibit the pathogens. Black scurf of potato, Root knot of vegetables, wilt and Phytophthora rot of pepper are controlled effectively. Club root of cabbage which by acidic soils can be controlled by liming to the soil. Whereas, potato scab which is favoured by alkaline soils can be controlled by addition of sulphur powder.

Soil-borne plant pathogens greatly increase their populations as soils are cropped continuously, and reach to levels that contaminated soils are unfit for crop production. Chemical treatments of soil that eradicate the plant pathogens or micro-organism. Pre planting chemical treatment of field soils for the control of nematode-induced diseases, and fumigation of seedbed and greenhouse soils (with methyl bromide, for example) is commonly practiced to eradicate weeds, insects, and plant pathogens. Field applications of soil-treatment chemicals for fungus control are usually restricted to treatments of furrows. Weeds are the secondary source of inoculum for the pathogens in addition to the primary host. Field should be free from the weeds. Alternate hosts are known to play an important role in completing life cycles of many rust fungi. Eradication of alternate host plants is necessary to eradicate a pathogen or break disease cycle. Seed treatment is also important measure there are two types of seed treatment (a) physical (b) Chemical.

Physical seed treatment is effective in eradication of internal seed borne inoculum.

Hot water seed treatment: The method demonstrated by scientist Jensen against loose smut of wheat caused by *Ustilago segetum tritici*. The use of chemicals for seed dressing is old practice. And not eco friendly. Chemicals effectively used for controlling many seed borne diseases such as wilt, wheat bunt, leaf spot of maize, Rice brown spot, smut etc. Owing to their hazardous nature, many chemicals are banned for use in agriculture. Alternative, fungicides thiram, captan, maneb and zineb etc. are quite popular among farmers which control numerous diseases such as damping-off, wilt, seedling rot and anthracnose. Seed rots and blights of maize. Systemic fungicides such as carboxin (smuts), oxycarboxin (rusts), metalaxyl (downy mildew of pearl millet) have added further Possibilities of effective control of pathogens located deep inside the seeds. Antibiotics in mixtures are very effective isolation and also reduce the possibilities of development of antibiotic resistant mutants.

Plant nutrient:

The nutrient directly effect to crop plants and also an important component of integrated disease management (IDM). Both deficient and over-nourished plants invite to disease. The amount of nutrient, time and method of application of fertilizers affect to the metabolism of plants and occurrence and severity of diseases.

Fertilization with both K and P nutrient significantly reduces to the leaf rust damage and powdery mildew infection in wheat. P plays an important role in survival of crop plants under stress conditions. The deficiency of macronutrients also affect to the incidence of many diseases.

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Protective sprays and dust

Protective fungicides prevent germination, growth, and penetration of plant pathogens. In order to use protective fungicides effectively, the farmer must not only select the right fungicide for the job, but also apply it in the right amount, at the right times, and in the right way. Too little fungicide fails to control disease; too much may be toxic to the plants to be protected. The farmer and applicator, therefore, must always follow use instructions to the letter. Timing of applications is also important.

Quarantine:

Quarantine plays an important role in excluding the pathogen from a place, a country or state. Where, it is not already established. Numerous diseases which were introduced in India from other countries. By follow quarantine rule many diseases can be controlled. In India DIP (Destructive Insect and Pest) Act was enforced in 1914 to prevent the entry of pathogens from other countries or states. Quarantine stations are established in major airports, seaports and land frontiers. All the plants and plant commodity should be accompanied with the phytosanitary certificate issued by competent authorities to pass through the quarantine system. All these products will be checked and fumigated, if necessary both at entry and exit. Quarantine are two types: embargo or domestic. Embargo bans the import of some plant materials from a particular country or state where the disease is more prevalent. e.g., Cocoa from Srilanka and Africa, Rubber from America and West Indies, Sunflower seeds from Argentina and Peru are totally banned. Domestic quarantine also prevents the entry of pathogen from one state to another state. Movement of potato seed from west bangal, banana suckers from Gujarat and Maharashtra are restricted and Nilgiri of Tamil Nadu Cardamom from Anamalai hills of Kerla and Cardamom from Anamalai hills of Keral control the spread of disease to other states

Resistant variety:

Resistant variety in some soil borne diseases, use of resistant varieties is eco friendly solution. Due to fallen of resistant variety itself to a new races and therefore breeding for resistance is a continuous programme. In several of the presently grown resistant varieties the resistance has been brought from wild spp. Resistant varieties have been a great success for disease resistant.

Biological control:

Biological control is the reduction of the amount of inoculum or disease producing activity of a pathogen accomplished by or through one or more organisms other than main organism. Antagonists are biological agents with the potential to interfere with the life process of plant pathogens. Mycoparasites are used in biological control of fungi. *Agrobacterium radiobacter* K84 (Kerr, 1980) and *Trichoderma harzianum*, *Gliocladium virens*, and *Streptomyces griseus* were successful in controlling *Pythium* and *Rhizoctonia*-caused seedling blights and crown gall, respectively. A necrotrophic mycoparasite kills its host, sometimes without infecting it and then uses the nutrients released from the dead hyphae. A microorganism may produce a siderophore that is antibiotic in the sense that the compound produced inhibits the growth of another microorganism nearby.

Transgenic plants:

Transgenic plants are also used to control a disease in eco friendly manner. A desired foreign gene is introduced into a plant for a particular trait and this yields a transgenic plant. Biotechnology plays a key role in the management of crop diseases. Many transgenic plants have been developed that are used against viral pathogens.

Advantages of Integrated disease management approach:

The integrated disease management preventive and corrective measures to keep pathogen from causing significant problems, with minimum risk or hazard to human and desirable components of their environment. Benefits of an integrated approach are Promotes sound structures and healthy plants, Develop to the sustainable bio based disease management alternatives, Protects to the non-target species through reduced impact of plant disease

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management strategies, Reduces the use of pesticides and fungicides by using several management methods and eliminates to pesticide or chemical residue.

REFERENCES

1. Gullino M.L., Leroux, P. and Smith, C.M.(2000). Uses and challenges of novel compounds for plant disease control. *Crop Protection* 19: 1-11.
2. Kerr A. 1980. Biological control of crown gall through production of agrocin 84. *Plant Disease* 64: 25-30.
3. Khoury, W. E. and Makkouk, K. (2010). Integrated plant disease management in developing countries. *Journal of Plant Pathology*, S35-S42.
4. Lodha, S. and Mawar, R. (2017). Population dynamics of *Macrophomina phaseolina* in relation to disease management: A review. *Journal of Phytopathology*, 168(1): 1-17.
5. Sharma, M., Tarafdar, A., Ghosh, R. and Gopalakrishnan, S. 2017. Biological Control as a Tool for Eco-friendly Management of Plant Pathogens. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, Telangana, India-153.
6. Thomas, M.B. (1999). Ecological approaches and the development of “truly integrated” pest management. *Proceedings of the National Academy of Science USA* 96: 5944-5951.