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 ISSN: 2456-2904

INTEGRATED PLANT DISEASE MANAGEMENT, ITS CONCEPT, COMPONENT AND ADVANTAGES

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Introduction:

Plant disease is defined as abnormal changes in the physiological processes which disturb the normal activity of plant organs and result in significant crop losses. IPDM involves management systems which utilize compatible combinations of all the available techniques to keep the pathogen population below the economic threshold level (ETL) which would not result in economically unacceptable damage to the crop. Integrated plant disease management can be defined as a decision-based process involving coordinated use of multiple tactics for optimizing the control of pathogen in an ecologically and economically. IPDM is based on five principles of plant disease management and integrates multidisciplinary approaches for the management of plant diseases. These may include site selection and preparation, utilizing resistant cultivars, altering planting practices, modifying the environment by drainage, irrigation, pruning, thinning, shading, etc., and applying pesticides, if necessary. But in addition to these traditional measures, monitoring environmental factors (temperature, moisture, soil pH, nutrients, etc.), disease forecasting, and establishing economic thresholds are important to the management scheme (Khoury and Makkouk, 2010).

Concept and Philosophy The term, pest management was first envisaged at the beginning of the 1950s as a concept of integrating the use of biological and other methods of pest control. This was later broadened to include the coordinated use of available biological, cultural and chemical methods.

- In IPDM , all methods combined must be compatible with each other.
- The effect of combination of methods is more than any individual method.
- The aim of IPDM is to keep the pathogen population below the level of economic threshold.
- IPDM is based on ecological and economic principles.
- The cost- benefit ratio is high in IPDM than in the case of any single method adoption.
- More often IPDM is directed against all the diseases of the crop rather than a single disease.
- IPDM follows a system approach. A system approaches wherein there is a meeting of minds, materials and methods. The IPDM system is ecologically safe, as it emphasizes judicious use of fungicides along with non- chemical methods like cultural practices and biological control (Chaube and Pundhir, 2009).

Aims or Objectives The basic objectives of any IPDM program should be to achieve at least the following:

- 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, suppressive tactics.
- To eliminate or reduce the initial inoculums,
- To reduce the effectiveness of initial inoculums,
- To increase the resistance of the host,
- To delay the onset of disease, slow the secondary cycle (Agrios, 2005).

Main strategies of IPDM 1. Need based application of pesticides.2. Encouragement and enhancement of biocontrol agents.3. Use of resistant or tolerant cultivars of plants.4. Modification of cultural practices.5. Use of any other strategies that interrupts host-pathogen interactions.

Components of IPDM: The major components of disease management are: host-plant resistance, cultural practices, biological control and chemical control.

Host-plant resistance:

Resistance is the character of a plant which suppress pathogen and disease development. The use of resistant genotypes is a highly effective approach to suppress disease to tolerable levels. Resistance alone is sometimes sufficient to suppress disease to tolerable levels. In resistant genotypes, disease appears late, build up slowly and results in little damage to the crop. Late leaf spot caused by *Phaeoisariopsis personata* and rust caused by *Puccinia arachidis* are twomost destructive foliar diseases of peanut worldwide. Host plant resistance has been used recently as one control component and a number of peanut cultivars such as ICGV 89104 and ICGV 91114 are now available. Field trials conducted in India showed that these cultivars yield 55-60% more than local cultivar, and the severity of both diseases is significantly lower in these than in the local cultivar (Pande *et al*., 2001).

Cultural control: Adjustment in crop management practices to prevent or minimize disease development represent the oldest and most broadly applicable approach to plant disease control. This involves deliberate manipulation of the crop environment to make it less favorable to harmful organism e.g., by disrupting their reproduction cycles, eliminating their food sources, or encouraging their natural enemies. This method includes practices such asfield sanitation, intercropping, crop rotation, mulching, plant density, , manipulation of sowing dates ,strip farming, timing of harvest, barrier crops, crop mixtures, rouging, healthy planting material, soil solarization, soil amendments, fertilizer management and water management have been used singly and in combination as tools for disease management. Some of these techniques provide only small benefits but when integrated with other techniques, they significantly improve disease management.

Biological control: The use of naturally occurring bio-control agents (antagonists)of plant pathogens can be traced back to many centuries through the traditional practice of crop rotations that primarily permit the reduction of pathogens' inoculum potential in the soil below injury level. In this method the pathogen actively is reduced through the use of other living organisms e.g., hyper-parasites, resulting in a reduction of disease incidence and severity. This process is often accelerated by adding composts or manures, which enrich the soil with antagonistic microflora.

Chemical control: Chemical plays an important role in disease management. In IPDM programme chemical control implies the judicious and need based use of pesticides (fungicides, insecticides and herbicides). Chemical control is essential in areas where diseases appear in the early stage of plant growth and environmental conditions are likely to spread them fast. Experience accumulated over the last few decades clearly showed that fungicidal application had a better impact when used within an IDM strategy (De Waard *et al*., 1993).

Advantages of IPDM:

Integrated approach integrates preventive and corrective measures to keep pathogen from causing significant problems, with minimum risk or hazard to human and desirable components of their environment. Some of the benefits of an integrated approach are as follows:

- It is an eco-friendly strategy for management of plant diseases.
- It is an economically feasible approach
- Promotes sound structures and healthy plants.
- Promotes the sustainable bio based disease management alternatives.
- Reduces the environmental risk associated with management by encouraging the
- Adoption of more ecologically benign control tactics.
- Reduces the potential for air and ground water contamination.
- Protects the non-target species through reduced impact of plant disease management activities.
- Reduces the need for pesticides and fungicides by using several management methods.
- Reduces or eliminates issues related to pesticide residue.
- Reduces or eliminates re-entry interval restrictions.
- Decreases workers, tenants and public exposure to chemicals.
- Alleviates concern of the public about pest & pesticide related practices.
- Maintains or increases the cost-effectiveness of disease management programs.
- Avoids development of resistance in the plant pathogens against fungicides.

Thus IPDM, a greener alternative to the conventional use of chemicals, is an attempt to promote natural, economic and sociological farming methods through the most effective combination of farming techniques and judicious and limited use of fungicide.

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