

Integrated Disease and Pest Management Strategies: A Holistic Approach for the Sustainable Production of Papaya

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Introduction

Integrated plant disease management (IDM) 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. In most cases IDM consists of scouting with timely application of combination of strategies and tactics. The integrated disease management (IDM) involves the need-based use of pesticide only when the disease incidence reaches economic threshold levels and this will promote the buildup of many bio-control agent the crop ecosystems. Thus IDM, 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. In other words, IDM programme implies all the available disease management approaches including cultural, biological and chemical control with the main objective to keep the disease incidence below economic threshold level.

Why IDM is important

- Plant disease management determines the effectiveness of other inputs (seeds, fertilizer, water, and growth hormones) in crop production.
- Exclusive relevance on fungicides, nematicides, bactericides or viricides resulted in pathogen
- Resistance,
- New pathotype development,
- Residues and
- Environmental pollution,




- This led to development of integrated plant protection strategies, which are components of sustainable agriculture with a sound ecological foundation.


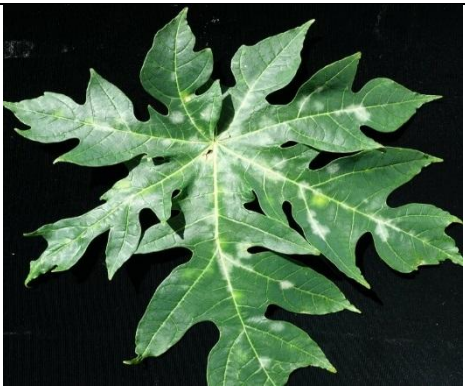


Objectives





The basic objectives of any IDM 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.

List of disease of papaya: -

Sr. no.	Category	Name of diseases	Causal organism	symptoms
A	Fungal			
1		Anthracnose & charcoal spot	<i>Colletotrichum gleosporoides</i>	
2		Black rot	<i>Mycosphaerella caricae</i>	
3		Black spot	<i>Asperisporium Caricae</i>	 <small>Host: Papaya (lower leaf surface) Disease: Black spot Pathogen: Asperisporium caricae (fungus)</small>

4		Cercospora Black spot	<i>Cercospora Papaya</i>	
5		Powdery mildew	<i>Oidium caricae</i>	
B	Bacterial			
1		Bacterial canker	<i>Erwinia spp.</i>	
2		Internal yellowing	<i>Enterobacter cloacae</i>	
C	Viral			

1		Bunchy top	<i>Rickettsia bacteria</i>	 <p>5357070</p>
2		Papaya ring spot	<i>Papaya ring spot virus</i>	 <p>UGA1483029</p>
D	Oomycete			
1		Phytophthora fruit rot	<i>Phytophthora palmivora</i>	 <p>Host: Papaya Disease: Phytophthora blight Pathogen: Phytophthora palmivora (Stramenopiles)</p>
2		Phytophthora stem rot	<i>Phytophthora palmivora</i>	

IDM- Package to papaya for different diseases





- Papaya should not be planted in waterlogged areas.
- There should be proper drainage system in the papaya garden.
- If spots are visible in the stem, then the solution of Ridomil (Metaloxyl) or Mancozeb (in 2 g/Liter of water) should be well irrigated by removing the soil from 5 cm depth near the stem of the plants.
- Uproot the disease-affected plants and bury them in the ground or burn them out of the field.
- Irrigate the soil around the plant thoroughly with one percent Bordeaux mixture. Do this work 2-3 times in June-July according to the severity of the disease.
- Before planting, use Trichoderma 1 kg per 100 kg in pits and 5-6 kg in each pit after mixing it well in compost or compost. By doing this, the severity of the disease decreases and the growth of plants is good.
- The measures used to prevent the disease called damping off should also be kept in mind. To prevent this, before sowing the nursery soil should be treated with 2.5 percent solution and covered with polythene for 48 hours. This work should be done 15 days before planting nursery.
- Seed should be sown after treatment with Thiram, captan (2 gm per 10 gm seed) or Trichoderma (5 gm/10 gm seed).
- Spraying of Ridomil (Metaloxyl) M-Z-78 (in 2 grams per liter of water) should be done at an interval of one week to prevent this disease in the nursery.
- Keep the nursery covered with plastic in the rain.
- The location of the nursery should be changed.


Integrated Pest Management (IPM)**Introduction**

IPM is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism.

Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment.

List of pests of papaya: -

Sr. no.	Name of pest	Scientific Name	Symptoms	Images
1.	White fly:	<i>Bemisia tabaci</i>	Nymphs and adults suck the sap from undersurface of the leaves Yellowing of leaves.	 
2.	Fruit fly:	<i>Bactrocera (Dacus) dorsalis</i>	Maggot puncture into semi-ripe fruits with decayed spots. Oozing of fluid and brownish rotten patches on fruits. Dropping of fruits	
3.	Ash weevils	<i>Mylokerus spp</i>	<ul style="list-style-type: none"> • Grub feed on the roots • Wilting of young saplings • notching of leaf margin by adults 	

4.	Green peach aphid	<i>Myzuspersicae</i>	<ul style="list-style-type: none"> • Nymphs and adults suck the sap from leaves, petioles and fruits • Leaf curling and falling • Premature fruit drop 	
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IPM- Package to papaya for different Pests: -

A. Cultural practices:

1. Frequent ploughing around the tree will destroy different stages of insect viz., Ak grasshopper, mealy bug, etc. and rapping of alkathene bands round the tree trunk during November-December prevents climbing mealy bug. Apply Neem Seed Cake after ploughing @4 Kg/tree.
2. Repeated hoeing/weeding around the plant.
3. Avoid nearby cultivation of all cucurbitaceous plants since they are alternate hosts of the virus infecting papaya.
4. Grow virus resistant varieties of papaya viz., 'Godakavella', 'Bangalore', 'Coimbatore', etc.
5. Soil solarization should be adopted in nursery bed to minimize insect and nematode damage.
6. Proper drainage should be maintained.

B. Mechanical control practices:

1. The mite affected leaves and twigs should be cut and burnt.
2. Proper sanitation should be maintained in the orchard by destroying all infected plant parts.
3. Plants having mature fruits should be covered with gunny bag keeping one end open in below portion to collect ripe fruits and hence protecting them from birds. Over ripening should be avoided.

- There should not be any scratch while picking fruits to save them from fungal infection.

C. Biological control practices:

- Conservation: Number of effective parasites, predators and pathogens are used against pests of Papaya e.g., Spiders, Coccinellids, *Lindoruslophanthae*, *Chilocorusbijugus*, *Cryptognathanodiceps*, *Chrysoperlalacciperda* (Egg predator of whitefly), *Tryllographadaci*, *Spalangiaspp.* *Pachycrepoidesisdubiers*, *Opius spp.* *Gitonidesperspicax*. *Dirbinusgiffardi* (all parasites of scale insect), *Rodoliafumida* (Predator of Mealy bug) *Phygadeum spp.* (Nymphal parasite of Mealy bug), *Eretmocerasmassil* (Parasite of white fly), *Azyatrinalis* (predator of scale insect) could be conserved by using various conservation methods.

D. Botanical pesticides:

- Neem Seed Kernel Extract (NSKE) @ 5% helps in reducing the pest population.
- Spraying of ground nut oil in nursery @ 1 ml./liter of water and on papaya plant @ 2 ml/literof water deters insect vector.

E. Chemical control practices:

- Dicofol 18.5% or Kelthane 1.5-2.0 ml in 1000 ml. of water per hectare should be sprayed against red spider mite.
- Alternate foliar spray with Tridomorph (0.1%)/Dinocap (0.1%) at 15 days interval to control powdery mildew.
- Application of Mancozeb or Zineb (0.25%) controls anthracnose.
- In foot rot and root rot prone area, 1 kg. lime along with 100 gm. Copper sulphate per pit should be applied. Spray the crop with Malathion @ 2 ltr/ha or Endosulphan @ 1.25 ltr/ha.
- A poison bait (20 gm. Malathion 50% WP or 50 ml of Diazinon +200 gm of gur or molasses in 2 literof water) should be kept in flat containers if fruit fly damage is observed.

Conclusion

Maintaining sustainability and ecological balance in the environment is the most effective way to achieve effective control through IDM. As part of this approach, all available management strategies are used to maintain disease pressures below an



economic injury threshold. To prevent disease, it does not advocate the use of routine chemical applications, but promotes the integration of cultural, physical, biological, and chemical strategies.

Fungicides and insecticides used routinely for insurance purposes are not appropriate as they do not address the real problem and can result in resistance and environmental problems. Added benefits of IDM are that disease control is greater than that achieved by individual method.

References

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