Disease Control in Organic Agriculture

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What is a plant disease

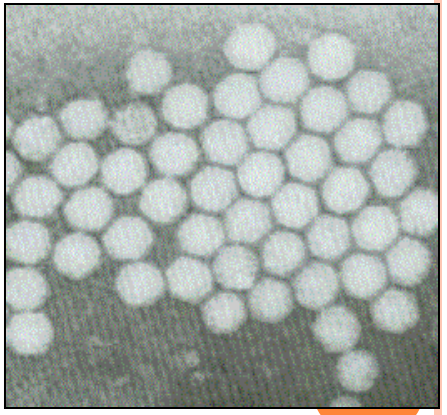
Plant disease is a continuous disturbance by some causal agent that results in an abnormal physiological process that disrupts the plant's normal structure, growth, function or other activities

Causal agents

- Micro organisms
  - Fungi
  - Bacteria
  - Virus
  - Phytoplasma
- Nutrient deficiencies
- Environmental factors

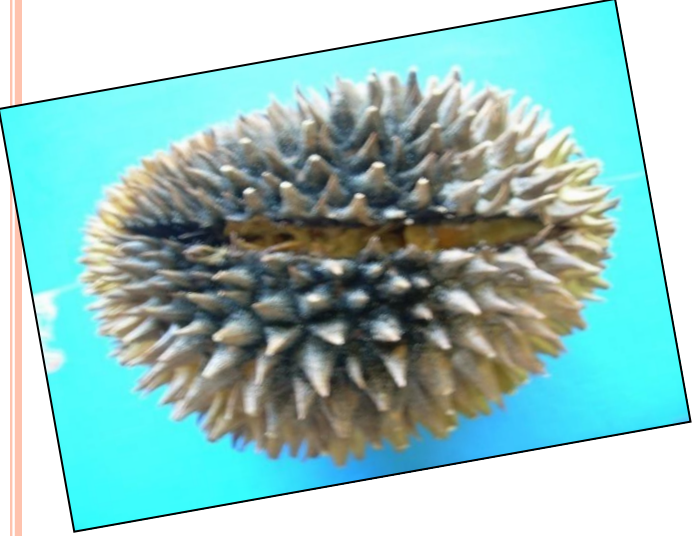
Fungi

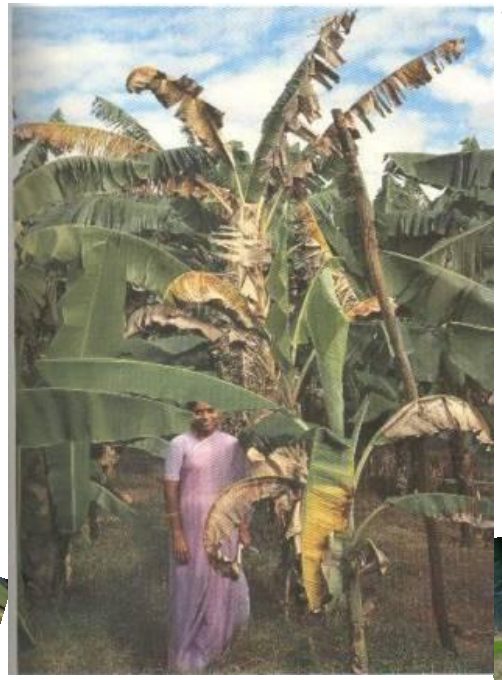
Bacteria



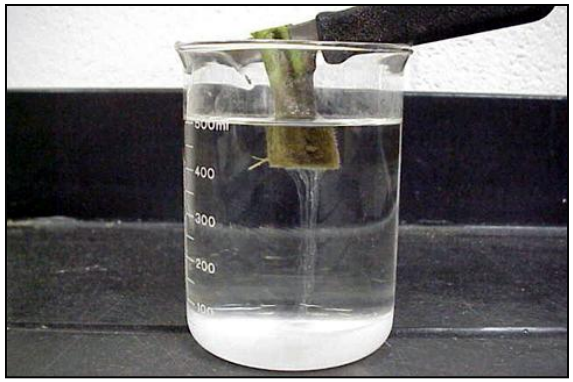
Virus

Fungal diseases





Bacterial diseases



Viral diseases

Phytoplasma diseases

Nutrient deficiencies

Organic Agriculture

- No pesticide application

Disease control strategies in Organic Agriculture

-Protect plants from harmful microorganisms

-Suppress or eradicate of pathogens

Integrated Disease Management

- Resistant varieties
- Use of healthy seeds – control seed borne diseases
- Good nursery management – control damping off
- Agronomic practices
  - Land preparation
    - Drainage – control soil-borne diseases
    - Aeration
  - Crop rotation
  - Proper spacing
  - Nutrient management – organic/microbial fertilizers
  - Water management
- Field sanitation – removal of host plants
- Biological control – suppress or eradicate the pathogens

Resistant varieties

Brinjal -Padagoda –resistant for BW
Tomato – Tharindu - resistant for BW

Use of healthy seeds

Seeds may carry several fungi, bacteria and viruses

eg. *Colletotrichum* spp., *Alternaria* spp.,
Viruses – TMV, TSWV, CGMMV

AGRONOMIC PRACTICES

- Clean cultivation –

  Removal of infected plants – virus control
- Plant spacing – control collar rot, Anthracnose, Sap transmitted viruses (CMV)
- Plant type – taller plants protect their fruits from pathogens – Anthracnose
- Mixed cropping – Panama control – Ambul and Kolikuttu
- Barrier crops – maize for control virus diseases
- Nutrient management – improve immunity in plants
- Weed control – Kirihanda, Galkura, Wal rubber, Hulanthala- host plants for viruses
- Use of natural extracts for pest control

Use of plant extracts

1. Neem –

   Neem seed extract - control powdery mildew of Rambutan

2. Cinnamon

   - Cinnamon oil – control fruit rot of papaya
   - Cinnamon leaf extract - control powdery mildew of Rambutan

3. Clove

   Clove leaf extract - control powdery mildew of Rambutan

Disease control by biological control agents

Microbial Biological control agents

- *Trichoderma* spp
- Fluorescent *Pseuodomonas*
- *Gliocladium virens*
- *Agrobacterium radiobactor*
- *Baccillus subtilis*

Disease control by biological control agents.....

Trichoderma harzianum and *Trichoderma viridae* control mycelia growth of

- *Colletotrichum gloeosporioides*
- *Fusarium oxysporum* f.sp. *cubense*
- *Aspergillus flavus*,
- *Penicillium* spp.
- *Alternaria porri*
- *Alternaria* spp.
- *Rhizoctonia solani*

Disease control by biological control agents.....

1. **Management of corm rot of Kiriala (*Xanthosoma sagittifolium*)**

Repeated applications of *Trichoderma harzianum* isolates and Homai are equally effective in controlling corm rot of Kiriala in the field (Rajapakse *et al*., 2006).

2. Control Panama disease of banana

Banana plants treated with Carbendazim (0.7g/1l) + Inoculation of *Trichoderma* (500g/plant) produces plants without *Fusarium* wilt symptoms.

Disease control by biological control agents.....

3.Nursery disease management of tomato

Mixture of Trichoderma viridae and* Fluorescent *Pseuodomonas

- Improve the seed germination %
- Reduce damping of incidence
- Increase the No. of vigorous plants

Kiriala corm rot

Damping off

Panama disease of banana

Disease control by biological control agents.....

Advantages of *Tricoderma* spp. as bio control agent

1. Colonization of the rhizosphere
2. Control of pathogenic microflora using a variety of mechanisms
   - *Trichoderma* identify host fungi by lectin
   - Host cell wall degrade by using chitinase
   - Produce antibiotics and inhibit growth of other microorganisms
3. Improving of plant health
4. Stimulation of root growth

Use of natural compounds

1. **Vermicompost and vermiwash**

Soil application of Vermicompost & alternative spraying of vermiwash and neem seed extract could be recommended for pest control and improve yield of tomato

In Vemiwash

- No pathogenic microorgaisms
- Contain enzymes – stimulate growth & disease resistance
- Contain plant growth regulators

Use of natural compounds.....

2. Irradiated chitin (Chitosan compounds)

- **Growth reduction of fungal mycelia observed**

Colletotrichum gloeosporioides

Fusarium oxysporum f.sp. *cubense*

Aspergillus flavus,

Penicillium spp.

Alternaria porri

Alternaria spp.

Rhizoctonia solani

Sclerotium spp.

Erysiphe spp

Use of natural compounds…..

- Seed treatment and foliar application of chitosan control leaf diseases of tomato, powdery mildew of okra and increased plant growth and yield of tomato.
- Foliar application of chitosan control powdery mildew of rambutan caused by *Oidium* sp

Conclusion

More attention is essential to control of diseases in organic agriculture

THANK YOU