



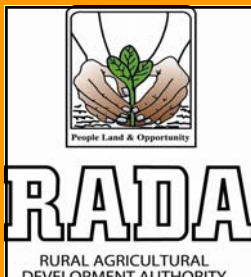
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## Quick Tips

- Keep the outside of your greenhouse **WEED FREE**, as the weeds attract unwanted insects and diseases.
- Keep proper records of pests and disease, and mitigation practices.
- Inspect plants regularly for any signs of disease or pests to avoid an outbreak.



Citizens Development  
Corps



# Crop Bulletin # 5

## Pest and Disease Management inside the Greenhouse

### *Introduction*

- The management of crop diseases is directed at protecting crops from the development, spread, and establishment of diseases.

Typical disease problems inside the greenhouse include but are not limited to: *Damping Off*, *Botrytis Gray Mold*, *Gemini Virus*, *Early Blight*, and *Bacterial Speck*. The best prevention of viral diseases is to control or exclude the silver leaf whitefly, which is the main vector.

- Managing pest problems is directed at excluding pest organisms and preventing pest populations from becoming too large and uncontrollable.

Typical pest problems in greenhouses include: *whiteflies*, *mites*, *thrips*, *aphids*, and *leaf miners*.

**Pests** and **Diseases** may be managed through a combination of the following measures:

- Greenhouse sanitation
- Cultural controls
- Biological controls
- Crop monitoring
- Resistant varieties
- Chemical control



**Yellow Sticky Traps** used inside a greenhouse. Sticky traps allow you to monitor pest levels inside the house

## Pictorial of COMMON PESTS



Aphids feeding on a leaf. Aphids are sucking insects and are normally found on the underside of the leaf



Whiteflies have piercing sucking mouth parts; they remove fluids from the leaves and produce honeydew that also results in sooty mold fungi. They are the main vectors for virus transmission



Mites are found on new growth and cannot be seen with the naked eye. Look for malformed terminal buds and stunted growth. You need a 10X or stronger hand lens to detect

## Greenhouse Sanitation

- Cleaning and disinfection of greenhouse at the end of each production cycle: all structures, irrigation infrastructure, clips, and truss support systems should be cleaned with a 10% bleach solution.

## Crop Monitoring

- Continued surveillance to detect the presence of a pest or a disease at the early stages of development before economic damage has occurred.
- Begin monitoring at the seedling stage.

## Cultural Control

- Cultural control involves the provision of conditions that favour the growth and health of the crop, while working against pests and diseases

### Measurements include:

- Proper ventilation and air movement;
- Optimal plant spacing;
- Relative humidity below 85%;
- Avoidance of free water or condensation of water droplets on leaves;
- Prompt removal of all crop debris and weeds from the house;
- Regular cleaning and disinfection of tools/equipment;
- Regular changing of work clothes and frequent hand washing.

## Resistant Varieties

- The selection of crop varieties that are tolerant/resistant to the prevalent disease problems.
- The common greenhouse varieties containing genetic resistance or tolerance to diseases (read packaging carefully and select seeds accordingly)







## Biological Control

- The use of beneficial organisms, primarily parasites and predators to control pest populations below economically important levels.
- Parasitic wasps and lady bird beetles are some common examples of beneficial insects.
- Bio-pesticides such as *Entomo Pathogenic Fungi B. Bassiana* used in whitefly control. *Trichoderma* used to protect plants against *Botrytis* infestation has been used as a biological control agent.
- Natural insecticides derived from plant extracts such as neem oil and garlic extracts have also been found to be effective biopesticides.

## Chemical Control

- Not many chemicals have been registered for greenhouse use.
- Pesticides are valuable tools when used as a component of an integrated pest management program. They should be applied only in support of biological control programmes to suppress localized pest outbreaks.

## DISEASE MONITORING

Key Disease	How to Control Disease	Where to Look
<p><b>Botrytis Gray Mold (Fungus)</b></p> 	<ul style="list-style-type: none"> <li>• Keep humidity below 90%</li> <li>• Avoid overhead watering</li> <li>• Inspect leaves and remove faded flowers</li> <li>• Improve air circulation</li> </ul>	<p>Look for light-tan or grey spots on infected leaves. These areas become covered with a brown or grey fuzzy mass of fungus growth and the leaf collapses and withers. Other sites of infection include dying flowers and the calyx area of fruit.</p>
<p><b>Leaf Mold (Fungus)</b></p> 	<ul style="list-style-type: none"> <li>• Use disease resistant varieties of seeds</li> <li>• Leaf mold can be kept under control if there is good air ventilation and air circulation</li> <li>• Keep humidity below 90%</li> </ul>	<p>Look for pale-green or yellowish areas with irregular margins on upper leaf surfaces. Beneath, the yellow spots areas of olive green velvet growth are visible. Infected leaves become yellow-brown and drop prematurely.</p>
<p><b>Powdery Mildew (Fungus)</b></p> 	<ul style="list-style-type: none"> <li>• Provide good air circulation</li> <li>• Avoid excess spraying of fertilizers</li> <li>• Spacing between plants and rows must be adequate</li> <li>• All production areas should be thoroughly cleaned and plant debris removed between crops and production cycles. This includes removing all weeds in and around the greenhouse</li> </ul>	<p>Powdery mildew is identified by white patches of fine, powdery growth on the upper sides of leaflets. Patches are up to 2in in diameter and generally appear on the oldest foliage. Severe cases weaken the plants and lead to lower yields.</p>
<p><b>Bacterial Wilt (Bacterial)</b></p> 	<ul style="list-style-type: none"> <li>• Control cucumber beetles, as they transmit the bacteria</li> <li>• Remove all infected vines; wilted vines cannot be saved</li> <li>• Control weeds in and around the greenhouse as they can easily help transmit bacteria</li> </ul>	<p>Symptoms of the disease first appear on a single leaf which suddenly wilts and becomes dull green.</p>
<p><b>Tomato Mosaic Virus (Virus)</b></p> 	<ul style="list-style-type: none"> <li>• Choose resistant varieties</li> <li>• Use fresh soil after each crop, as this virus can be transferred through the soil</li> <li>• Make sure your hands and clothes are always clean; this virus spreads through touch and some types of tobacco</li> <li>• Carefully clean all plant growing equipment and all greenhouse structures that come into contact with plants</li> </ul>	<p>Plants become stunted and leaves develop mild to severe yellow-green spots, crinkles, ridges, strings, or curls. Stems may develop streaks of dead plant tissue. Generally, fruit shows no symptoms, although severe strains may cause internal browning, pitting, or severe mottling. If you suspect the disease, you need to get an accurate diagnosis and remove diseased plants promptly.</p>
<p><b>Tomato Spotted Wilt (Virus)</b></p> 	<ul style="list-style-type: none"> <li>• Tomato spotted wilt is one of a few viruses transmitted by thrips and is by far the most important; control thrips in the greenhouse</li> <li>• Eliminate weeds from inside the greenhouse and adjacent exterior</li> <li>• Greenhouse workers should avoid wearing yellow or blue clothing to deter the spread of thrips</li> </ul>	<p>Look for small, dark-brown leaf spots in the upper portion of the plant, which may be arranged in a "ring-spot" pattern, dark streaking in petioles and stems, stunted growth terminals, and brown or black lesions on distorted fruit</p>