

# Basic hygiene: prevention spread of pests and diseases

Jordan Hydroponic Agriculture and Employment Development Project:

Experiences 2018 - 2019 no. 7-1

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Ministry of Foreign Affairs



## Introduction

Following some basic hygiene measures will help you prevent diseases, pests and viruses entering your greenhouse. Diseases can spread by different vectors:

- Humans: workers & visitors.
- Insects & animals.
- Plants function as hosts of insects & viruses.

The purpose of this factsheet is to inform you about the process of spreading and which measures you can take to minimise spreading. In Jordan, many viruses are present and it is very difficult to keep them out but good hygiene will greatly reduce the risk of infection. It is essential to carefully implement all aspects of your hygiene plan, if one of the actions is weak, it will negate all other actions.



Figure 1: Disinfecting shoes before entering the greenhouse. Left: with containers filled with disinfection liquid. Right: With a disinfection mat.

## Spread by humans

Pests and diseases can be moved on contaminated clothing, infected soil particles on shoes (figure 1) and even on mobile phones. It should be encouraged that workers only work within one farm site per day to prevent potential pest and disease spread. Also, visitors can bring in pests and diseases from outside the farm.

First, try to prevent diseases from coming in and secondly prevent spreading within your greenhouse. To prevent diseases from entering, the greenhouse needs to be equipped with a double door, disinfection mat and hand sanitizer. In order to prevent spread within the greenhouse, workers should always stick to the same work direction and regularly disinfect tools.

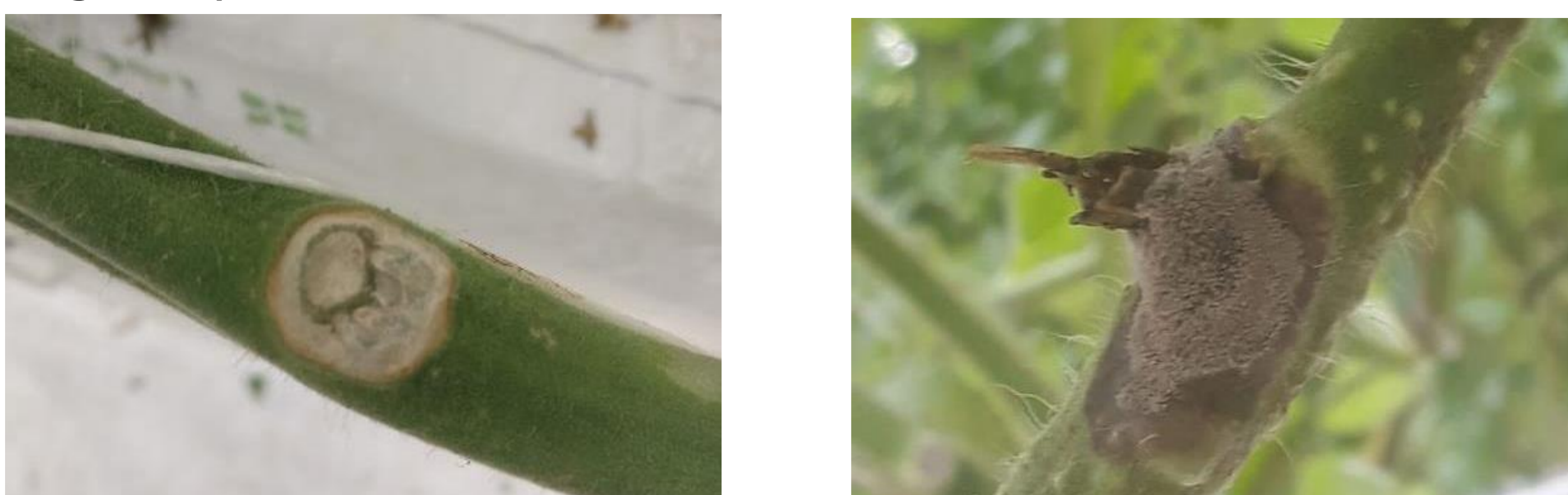


Figure 2: Left: Clean and straight cut; it will heal quickly. Right: Incorrect cut; it stays wet for a long time and allows fungal diseases to manifest and enter plant.

## Visitors

- Visitors should wear disposal overalls or other over clothes (figure 3).
- Use only one part of the complex for visiting, use only one or two rows for closer examination.
- Visitors are not allowed to touch plants.
- Keep the number of visitors limited.
- Visitors can only enter under guidance.



Figure 3: Visitors should wear disposal overalls or other over clothes.

## Work direction

- Within the greenhouse: start working close to the entrance on the left side of the main path, continue following the left rows towards the end, come back along the right rows of the main path.
- Within the row: start left and move backward, return on right side.
- Left and right can be changed but maintain the same work direction during entire cropping period.
- Use one knife per path. Place knife in bucket with disinfectant after use.
- Appoint one person to clean and refresh the buckets once a week.
- Encourage your employees to report sick plants and educate them on identification of common diseases.
- Avoid injury to plants; cuts, bruises and cracks are often sites of infection.
- Cut off shoots, stalks and leaves as straight and as close as possible to the plant. Leaving small part standing out can result in fungal diseases (figure 2).
- Eating food and smoking are not allowed in the greenhouse. After smoking/eating always disinfect your hands.

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## Spread by insects

Besides harming your crops, insects can also spread diseases. If they are infected with a disease and move from one plant to another, they can quickly spread a disease through your greenhouse, for example whitefly can transfer tomato mosaic virus. First of all, try to keep them out by using insect nets and double doors. Secondly, closely monitor which insects are in your greenhouse, this is called scouting. Early detection will allow you to take action before insects get the chance to increase their number. Make sure the area around your greenhouse is free from host plants.

## Managing insects

- Use sticky cards (figure 5) to trap and detect which insects are present in your greenhouse. Place 1 to 4 cards per 100 m<sup>2</sup>. By using sticky cards, you can keep track of insect population trends, and make more informed and timely pest management decisions. Inspect and count the insects that got trapped on the sticky cards weekly. Register which insects and how many of them are present in the greenhouse and put this information in a map of the greenhouse.
- Additionally, plant inspection is needed to detect insects: examine the underside of leaves and flowers.
- Biological control can be used. It means introducing natural enemies. This requires knowledge and management.
- Promote proper ventilation to minimize wet areas conducive to fly breeding.



Figure 4: Above: No weeds around greenhouses. Beneath: Many weeds between greenhouses which are hosts of pests and diseases.



Figure 5: Sticky cards allow you to count and identify the insects that are present in your greenhouse.

## Spread by plants

Weeds and plant debris in and around the greenhouse can act as hosts for a number of insect species and can harbour viruses, allowing the quick and easy spread of viruses and diseases into crops. Keep the area around the exterior and interior of the greenhouse free from weeds and other plants that could harbour pests to reduce the pest pressure. You could think of planting banker plants, hosting natural predators of your most common pests. Remove infected plants rapidly and dispose them in closed plastic bags to avoid spreading infected particles.

## Weeds and organic matter

- Keep the interior and exterior of your greenhouse free of weeds (figure 4). If there are weeds in and around the greenhouse, remove them manually
- Fix leaks in your irrigation system and drain system, the nutrient rich water provides fertile spots in your greenhouse for weeds, mosses and algae to grow. They can be sources of fungus, gnat and other pests.
- Organic debris can attract insects so remove it from the greenhouse. However, if you use biological control you need it to provide a shelter for your natural enemies. Diseased plant material should always be removed from the greenhouse.
- Organic debris should not stay longer than 24 hours near to the greenhouse as detached leaves will attract pests.

## Concluding remark

Regularly evaluate all aspects of your hygiene plan to be as effective as possible. It is like a boat; every part of the bottom construction counts.