

# Strategies for Preventing the Introduction and Spread of Tomato Brown Rugose Fruit Virus

## Overview

Tomato brown rugose fruit virus (ToBRFV) is a virus of tomatoes and peppers. The virus is easily spread when healthy plants come in contact with contaminated equipment, hands, clothing, or infected plants or plant parts. Because the virus is difficult to control or eradicate, prevention is critical. This document details strategies to reduce your operation’s likelihood of exposure to ToBRFV. It also offers strategies for responding to ToBRFV detections, reducing spread in facilities, and preventing reinfection.



Left: Symptomatic tomato leaves  
(*Neta Luria*)

Right: Symptomatic tomato fruit  
(*EPPO.int, Prof. Salvatore Davino*)

## Preventing the Introduction of ToBRFV

To reduce the risk of introducing ToBRFV into your operation, use the following sanitation and preventive practices:

- Use seed, seedling, and graft material that are certified virus-free.
- Minimize crop handling and other procedures that may wound the plants, especially early in the growing season. Early infections may result in the most severe yield losses.
- Treat each greenhouse as a separate unit, and follow the sanitation measures listed on page 3.
- Report any signs or symptoms of this disease to your State Plant Regulatory Official or to your local USDA Plant Protection and Quarantine Office.

## Response Strategies if ToBRFV is Detected

### Treatment Measures

At this time there are no chemical controls available to treat ToBRFV infected plants. Remove all infected plant material from the greenhouse—including cull piles and other plant debris—and use the following APHIS-approved disposal method:

- Apply a heat treatment (steam/autoclave) with an internal temperature of 100 °C (212 °F) for a minimum of 30 minutes to all plant material (i.e. plant parts, soil) that may contain ToBRFV. After completing the heat treatment, the material can be buried in a landfill. Use the same treatment for compost piles or incinerate.

OR

- Double bag all Infected plants, associated growth media, associated containers including pots and trays, all leaf debris in and around the area where plants were stored using plastic bags of 2 mil thickness or greater. Bury to a depth of no less than 6 feet (1.83m). The material must be buried onsite, at a USDA-approved site, or municipal landfill, which is expected to remain undisturbed. Make every effort to prevent plant debris or soil from being dislodged from the plants.

### Disinfection Measures

- Pressure wash (with detergent) large machinery or equipment (scissor lifts, etc.), that may have come in contact with infected plant material. Follow the two-step process below:
  1. Power wash or steam clean equipment to remove all soil and debris before it leaves infected areas; AND
  2. Disinfect all equipment (see below).
- Use one of the following disinfectants, with an exposure period of at least 15 minutes, on anything that may have come into contact with infected plants and plant material:
  - 10% bleach solution: 1 part bleach (any commercial bleach) to 9 parts water
  - Use 20.4% potassium peroxydisulfate, 1.5% sodium chloride applied at 2.0% (20 g/L or 0.17 lb/gal)
  - 20% solution (wt/vol) of non-fat dry milk plus 0.1% polysorbate nonionic surfactant

## **Sanitation Measures**

- Limit facility access to authorized personnel.
- Wear only clean clothing, and wash all clothing in hot water with soap prior to wearing again.
- If possible, use disposable protective clothing and gloves.
- Do not move protective clothing and tools from one area to another.
- Pull off gloves from the wrist upwards so that the glove turns inside out.
- Put all clothing into a hermetically sealed bag prior to exiting the area for washing or disposal.
- Put disposable clothing in the appropriate bin for immediate destruction.
- Use disinfectant mats at entrances for footwear and wheeled equipment and disinfect before entering and leaving areas.
- Disinfect tools before use on each plant (refer to the disinfection measures on page 2).
- Wash hands with soap or disinfectant before and after handling plants and putting on gloves.

## Measures for Reducing Spread from Infected Areas

- Restrict movement:
  - Treat each infected area as a separate unit, and follow the sanitation measures listed on page 3.
  - Minimize movement between sites and move from a non-infected area to an infected area.
  
- Follow treatment measures on page 2:
  - Turn off irrigation water one day before plant removal to decrease the risk of sap transfer.
  - When removing plants and plant material, do not touch other plants or surfaces in greenhouses.
  
- Clean and disinfect susceptible materials and surfaces.
  - Follow disinfection measures on page 2 for anything that may have come into contact with infected plants and plant material including:
    - Tools,
    - Plant trays, which can also be treated by soaking in hot water at 90 °C (194 °F) for 5 minutes, or destroyed,
    - Drains, water storage areas, and irrigation system as the virus can survive in water; and
    - All agricultural machinery and equipment before moving between greenhouses.
  - Do not bring anything into an infected or suspected infected area that is not needed (jewelry, watches, phones, etc.) as everything will need to be disinfected before exiting the site.
  - Clean eye glasses with alcohol tissues after leaving infected areas.
  - Limit visitor access to a secure place with cleaning and disinfection facilities near the entrance to the greenhouse.

- Follow cultural practices that reduce risk of ToBRFV spread:
  - Use naïve (young) bee hives for pollination. Avoid the use of bee hives in greenhouses if infection is found prior to flowering.
  - Keep records of seed and transplant sources for 3 years so they can be traced if necessary.
  - Eliminate potential ToBRFV reservoirs such as weeds. Follow treatment and disinfection measures on page 2 for any potential host material.
  - Scout plants for ToBRFV symptoms; take tissue samples and have diagnostic testing done on suspect plants.
  
- Inform workers:
  - Institute hygiene and worker training programs that include sanitation of boots, clothing, hands, and tools in production areas.
  - Post informative materials on ToBRFV in production areas.

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