



Sharing best management practices to counter **ToBRFV**

in glasshouse tomato



Lessons learned in the Netherlands

have proven that it is possible to be effective in battling ToBRFV infection. These guidelines and best management practices (BMPs) can help you to successfully grow non-ToBRFV and intermediate (IR) resistant ToBRFV varieties.

1 Prevent

How to help
infection from ToBRFV?

Prevention for
employees as well
for visitors:



Do not allow employees and visitors to bring tomatoes and peppers on site.



Wash hands with water and soap before entering the glasshouse.



Have at least one hygiene lock before entering the glasshouse.



All employees should use company clothing which should be washed daily after use. Employee working shoes should not leave the company and should not be used in different glasshouses/crops.



Have one working direction in your glasshouse and do not work in multiple glasshouses on one day.



Limit the number of visitors to your company. Ensure they always wear protection gear.



Prevent phone usage by employees/visitors. Ensure phones are in disposable plastic covers.



No jewelry or watches should be worn inside the glasshouse and glasses should be cleaned before entering the glasshouse.



Prevent usage of external tools. If it's necessary to use their own tools these should be disinfected before use.

External workers, (for instance mechanics), should wear clothing issued on-site during work (not their own).

Create awareness of ToBRFV with your employees:

- **Educate** them in recognizing ToBRFV symptoms (marbling of leaves, discolored fruits, vigor loss in heads)
- **Emphasize** impact (additional costs, jobs at risk and increased hygiene measures).

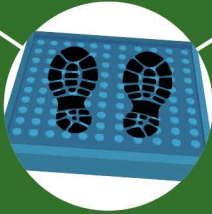
Prevention measures for Equipment:

Preventing infection from ToBRFV

Each individual glasshouse should have its own toolbox for maintenance which should be disinfected after each use.

Limit exchange of materials and equipment between compartments as much as possible.

In case materials and equipment are exchanged, disinfect it before entering to another compartment.



Mats with disinfection solution should be placed at doors, for entering and leaving outside, as well inside between compartments.

Use only 1 knife per gutter and disinfect with example given 2% Virkon after usage.

Use only 1 pair of gloves per path and throw them away after usage in designated bins.

Early detection

2

Early detection can help to prevent and or limit the spread of the virus. Detection can be done visually as well by taking samples before any symptoms are observed.

Regular visual inspection

must be done to look for plants which are:

smaller, lacking in growth, and plants which are showing thinner heads or yellowing in the top. These are the first signs of an infection.

Take samples regularly

(at least every 2 weeks):

Take leaf samples and/or sample drain water for ToBRFV. When tested positive, directly increase hygiene protocols.

3

Finding, Isolating and Crop Handling of ToBRFV

Early detection is key in preventing spread of the virus. By taking the right measures you can significantly lower ToBRFV pressure and spreading which helps to potentially exterminate it. All employees should be aware of ToBRFV symptoms and should notify the manager immediately when a suspicious plant has been found.



Please be aware that as long as the quarantine status is active in the EU, any company analyzing samples resulting in a positive result must alert governmental institutions

What to do

once a suspicious plant has been found or when a positive test result is obtained:

symptoms are observed

- **Close path for crop work directly:**
 - one path before the working direction
 - two paths after the spot
- Find out how far the spreading is in the glasshouse: take leaf samples.
- ToBRFV self-test can be used: less sensitive but results available in minutes.
- qPCR tests can be used: more sensitive but results available a few days (laboratory).

symptoms are not observed

- When no symptoms are observed yet, the infected spot need to be found as soon as possible.
- Find the exact location of the infection. Use ToBRFV self-tests or qPCR tests.
- **When the spot(s) are located: close one path before and two paths after the spot.**

When spot(s) are located and paths are closed:



Remove drippers from the closed paths



When plants are wilted, they should be taken down, put in plastic bags and sealed.



Dedicated people wear additional hygiene gear: shoe covers, gloves, hair net, overall.

5%

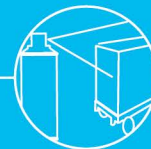
Continue removing complete rows before and after the spot till 5% of the plants in that department are removed.

30 plants

When new spots occur and when more than 5% of the plants are already removed, only remove 30 plants before and after the new spot.



Trolleys should be sprayed with disinfection fluid before moving to another path.



Harvest trolleys, crates are disinfected after delivering the fruits to the storage/packaging facility.



Pruning knives should be dipped in f.e. 2% Virkon after every plant.



Employees working in contaminated areas should not work in clean areas of the glasshouse.



Crop workers also use gloves, dip their hands in f.e. 2% Virkon after every plant. Dispose after each path.

Cleaning and sanitation are critical processes after a ToBRFV infection. ToBRFV is known to be infectious longer on organic waste attached to surfaces.

Drain water and drain water silos have also been found to be contaminated with ToBRFV in infected glasshouses, so ensure proper cleaning of these areas as well.

Cleaning after ToBRFV infection



Recommended period for cleaning at least

3.5 to 4 weeks

prevent cross contamination of material/areas

Focus points:

Crop removal

cleaning the drainpipes and drain silo

cleaning the interior of the glasshouse, shed, cantinas and offices

Starting new:

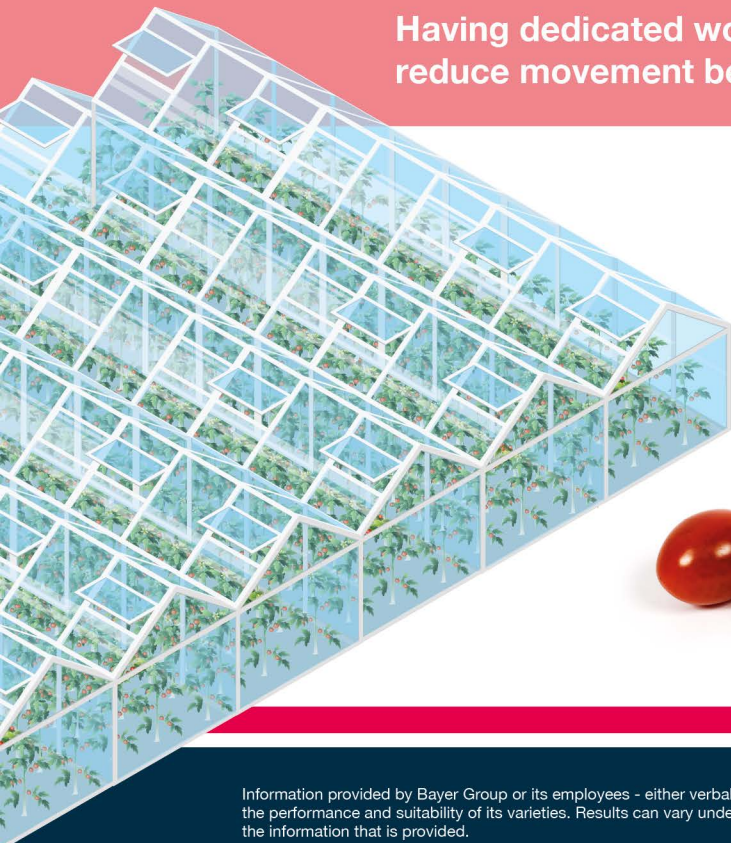
Start your crop with increased hygiene measures



General

Where possible avoid combining lit with un-lit crops in one location: making effective cleaning possible by having periods of the year with no plants in the glasshouse

Having dedicated working areas for the employees helps to reduce movement between compartments within the glasshouse.



Check the correct application and dosage of cleaning detergents before use: some detergents can have a negative impact on glass coatings, gutters, metal, cloth, screens, insect netting etc.



/// Vegetables by Bayer