

## **EPPO Alert List – Tomato brown rugose fruit virus (*Tobamovirus* - ToBRFV)**

### **Why**

*Tomato brown rugose fruit virus* (*Tobamovirus*, ToBRFV) was first identified on tomatoes in Jordan in 2015 (EPPO RS 2016/024), outbreaks have recently occurred in Italy (EPPO RS 2019/013), Mexico (EPPO RS 2019/014), **Turkey (EPPO RS 2019/123)**, China (EPPO RS 2019/143), United Kingdom (EPPO RS 2019/163), the Netherlands (EPPO RS 2019/209), Greece (EPPO RS 2019/210), Spain (EPPO RS 2019/238) and France (EPPO RS 2020/037) where the virus causes major concerns for growers of tomato and capsicum. As ToBRFV is an emerging virus and tomato is an important crop in the EPPO region, the EPPO Secretariat decided to add it to the EPPO Alert List. Since November 2019, the EU Commission has established emergency measures to prevent the introduction into, and the spread within the EU territory.

### **Where**

In Germany and the USA (California), isolated outbreaks were detected in 2018 in glasshouse tomato crops and were subsequently eradicated.

**EPPO region:** France (first found in 2020), Greece (first found in 2019), Israel (first disease symptoms in 2014), Italy (eradicated from Piemonte, Sicilia), Jordan (first identified in 2015), Netherlands (first found in 2019), Spain (first found in 2019), **Turkey (first found in 2019)**, United Kingdom (Kent, first found in 2019).

**North America:** Mexico (under eradication).

**Asia:** China (Shandong), Israel, Jordan, Turkey.



### **On which plants**

Tomato (*Solanum lycopersicum*) and capsicum (*Capsicum* sp.) are the main hosts. Inoculation experiments showed that *Nicotiana benthamiana*, *N. glutinosa*, *N. sylvestris*, *N. tabacum* (tobacco) develop symptoms and that weeds such as *Chenopodium murale* and *Solanum nigrum* may act as reservoirs for ToBRFV. In one study, aubergine (*Solanum melongena*) and potato (*S. tuberosum*) did not show symptoms after inoculation of the virus and ToBRFV was not found when the plants were subsequently tested by ELISA. (Luria *et al.*, 2017). More recently, it was reported that ToBRFV was detected in a sample of aubergine collected from the state of Sinaloa, Mexico (Senasica, 2019).

## Damage

On tomatoes, symptoms vary depending on varieties. Tomato cultivars with the Tm-22 resistance gene (used against other tobamoviruses) are susceptible to ToBRFV. On tomato, foliar symptoms include chlorosis, mosaic and mottling with occasional leaf narrowing. Necrotic spots may appear on peduncles, calyces and petioles. Fruit show yellow or brown spots, with rugose symptoms rendering the fruits non-marketable. Fruits may be deformed and have irregular maturation. In the paper describing the first finding in Israel, diseased plants had 10 to 15% symptomatic fruit. In Jordan, in the first reported outbreak, disease incidence reached almost 100%. On capsicum, foliar symptoms include deformation, yellowing and mosaic. Capsicum fruits are deformed, with yellow or brown areas or green stripes.



**Yellow spots on tomatoes**

**Courtesy: Dr Aviv Dombrovsky**



**Rugosis on leaves**  
Courtesy: Diana Godínez (MX)



**Symptoms on a tomato**  
Courtesy: Diana Godínez (MX)

### **Transmission**

ToBRFV is transmitted by contact (contaminated tools, hands, clothing, direct plant-to-plant contact) and propagation material (grafts, cuttings). Seed transmission of ToBRFV is suspected but needs to be verified. Tobamoviruses can remain infective in seeds, plant remains and contaminated soil for months. They are found in the seed coat and the endosperm, which could

explain why conventional seed disinfection treatments are not fully effective to control them. Even if transmission from seed to seedling is low, further dissemination by contact (e.g. during transplantation of seedlings or regular handling of the crop) allows a rapid spread within a glasshouse. Recent glasshouse experiments have shown that ToBRFV could be carried by bumblebees (*Bombus terrestris*) and transmitted to healthy tomato plants during pollination (mechanically). The disease was first observed in autumn 2014 in Israel and further spread occurred across the entire country within one year, because of human-assisted spread and trade of infected seeds or seedlings.

### **Pathway**

Plants for planting, seeds? from countries where ToBRFV occurs. The virus is also spread locally by contact.

### **Possible risks**

Tomato and capsicum are important crops grown in the entire EPP0 region under protected conditions. Symptoms of the disease makes the fruit unmarketable. Once the virus is introduced in an area, control measures are very limited and mainly rely on elimination of infected plants and strict hygiene measures. Testing methods (ELISA, RT-PCR) are available to detect the virus in the seed. It therefore seems desirable to avoid its further introduction and spread within the region.