



# VIRTIGATION – Emerging viral diseases in tomatoes and cucurbits: Implementation of mitigation strategies for durable disease management

## Deliverable 3.1 Defined ToBRFV-resistant tomato varieties

<b>Due Date:</b>	30 November 2022
<b>Submission Date:</b>	30 November 2022
<b>Dissemination Level:</b>	Not PUBLIC yet (need to be published beforehand)
<b>Lead beneficiary:</b>	VC
<b>Authors:</b>	Yuling Bai ( <a href="mailto:bai.yuling@wur.nl">bai.yuling@wur.nl</a> ) Aviv Dombrovsky ( <a href="mailto:aviv@agri.gov.il">aviv@agri.gov.il</a> )
<b>Project acronym:</b> VIRTIGATION	<b>Project Number:</b> 101000570
<b>Start date of project:</b> 1 <sup>st</sup> June 2021	<b>Project duration:</b> 48 months, until 31 <sup>st</sup> May 2025



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101000570. This output reflects only the author's view and the European Union cannot be held responsible for any use that may be made of the information contained therein.

## 1 PUBLISHABLE SUMMARY

ToBRFV belongs to the genus of tobamoviruses, having a host range containing tomato, pepper plants (with no *L* resistance allele) and some Solanaceae weeds. As all the tobamoviruses, ToBRFV is a mechanically transmitted seedborne virus. Infected tomato plants with ToBRFV show symptoms on the leaves, such as interveinal yellowing, mosaic patterns, shape abnormalities and necrosis, and on the fruits, such as discoloration, shape abnormalities and eventually necrosis. ToBRFV was detected in a cultivation of tomato hybrids carrying *Tm-2<sup>2</sup>* *R* gene, indicating the ineffectiveness of this gene against ToBRFV. After the first identification in Israel and in Jordan in 2014, ToBRFV has been reported in the recent years in Germany, Italy, the UK, Greece, the Netherlands, Spain, Turkey and Italy. In 2019 the virus was added to the EPPO alert list and emergency measures are currently in force in the EU. The severity of the disease caused by ToBRFV, the scarcity of available resistance genes, and the rapid spread of ToBRFV around the world make this virus a worldwide threat for tomato production.

Aiming to identify ToBRFV resistance in tomato wild relatives and to introgress them into tomato cultivars, WU has set up a disease assay at seedling stage to test tomato plants with ToBRFV. After screening about 60 accessions of 12 different *Solanum* species, two *S. pennellii* accessions have been identified resistant to ToBRFV.

In order to find ToBRFV-resistant rootstocks to prevent root mediated plant infections with ToBRFV, in VC we have screened 142 tomato plant accessions provided by Prof. Dani Zamir and NewBreed LTD. The tests were conducted by ToBRFV leaf inoculations of the tomato accessions analyzed phenotypically and by ELISA test using ToBRFV specific antibodies, which were raised against ToBRFV virions purified from *Tm-2<sup>2</sup>* resistant tomato plants. The efficiency of the rootstocks in hindering root mediated ToBRFV infection was tested under stringent conditions of truncated roots dipped in a ToBRFV inoculum before planting the grafted plants, which had scions of *Tm-2<sup>2</sup>* resistant tomato plants.