



## First report of *Tomato brown rugose fruit virus* in tomato in the United Kingdom

A. Skelton\*, A. Buxton-Kirk, R. Ward, V. Harju, L. Frew, A. Fowkes, M. Long, A. Negus, S. Forde, I.P. Adams, H. Pufal, S. McGreig, R. Weekes and A. Fox

Fera Science Ltd, Sand Hutton, York, YO41 1LZ, UK

\*E-mail: [anna.skelton@fera.co.uk](mailto:anna.skelton@fera.co.uk)

Received: 21 Sep 2019. Published: 24 Sep 2019.

In July 2019 a sample of tomato leaves (*Solanum lycopersicon* cv. Piccolo) was submitted to Fera Science Ltd, from a grower in the South of England. The sample was sent in following the appearance of mosaic symptoms, which had spread throughout the crop in the affected glasshouse. Symptoms were consistent with a viral infection and had emerged following inoculation with a mild strain of *Pepino mosaic virus* (PepMV) as a cross-protection treatment, however symptoms had persisted post-inoculation.

The sample was tested using ELISA kits for the presence of PepMV (Bioreba, Switzerland) plus *Tobacco mosaic virus*, *Tomato brown rugose fruit virus* (ToBRFV) and *Tomato mosaic virus* (DSMZ, Germany), according to the manufacturers' instructions. The sample tested positive for the presence of ToBRFV (*Tobamovirus*) and PepMV but negative for the other viruses. The ToBRFV result was confirmed by conventional RT-PCR using ToBRFV-specific primers ToBRFV-F/ToBRFV-R (Alkowni *et al.*, 2019) and with generic tobamovirus primers 514 Tombamo-s1/515 Tobamo-as1 (Menzel *et al.*, 2019). PCR products of the expected sizes (560 bp for both primer sets) were obtained, sequenced and confirmed to be ToBRFV by nucleotide sequence comparison (GenBank Accession No. MN210325 and MN210326 respectively). Genome sequences for ToBRFV and PepMV in the sample were also obtained by sequencing a TruSeq ribosome depleted plant leaf library (Illumina, UK) on a MiSeq sequencer (Illumina, UK). Sequencing and analysis were done as described previously (Adams *et al.*, 2014). The genome of ToBRFV (MN182533) had between 99.7-99.9% identity to genomes of ToBRFV isolates from Israel (KX619418.1), Jordan (KT383474.1), Germany (MK133095.1, MK133093.1), Mexico (MK319944.1) and Palestine (MK165457.1). The genome of PepMV (MN182534) had high identity (99.6%) to that of an isolate of PepMV commonly used for cross protection (Menzel *et al.*, 2019).

ToBRFV was first reported from symptomatic crops in Israel in 2014, with

the presence of the virus being confirmed following a similar outbreak in Jordan in 2015, with recent reports from Germany (2018) and Turkey (2019) (EPPO, 2019) and China (Yan *et al.*, 2019). The virus overcomes the tomato tobamovirus-resistance gene TM-2<sup>2</sup>. Fruit from ToBRFV-infected plants are known to mature irregularly and can be mottled with yellow or brown spots making fruit unmarketable. The virus may also pose a risk to pepper crops (EPPO, 2019).

Following reporting of the presence of ToBRFV the grower voluntarily removed all plants from the affected glasshouse and destroyed these in accordance with guidance from the UK National Plant Protection Organization. Work is being conducted to investigate the possible source of the outbreak.

### Acknowledgements

This work was funded under the Defra-Fera Long Term Service Agreement

### References

- Adams IP, Skelton A, Macarthur R, Hodges T, Hinds H, Flint L, Nath PD, Boonham N, Fox A, 2014. *Carrot yellow leaf virus* is associated with carrot internal necrosis. *PLoS ONE* **9**, e109125. <http://dx.doi.org/10.1371/journal.pone.0109125>
- Alkowni R, Alabdallah O and Fadda Z, 2019. Molecular identification of tomato brown rugose fruit virus in tomato in Palestine. *Journal of Plant Pathology* **101**, 719-723. <http://dx.doi.org/10.1007/s42161-019-00240-7>
- Menzel W, Knierim D, Winter S, Hamacher J and Heupel M, 2019. First report of *Tomato brown rugose fruit virus* infecting tomato in Germany. *New Disease Reports* **39**, 1. <http://dx.doi.org/10.5197/j.2044-0588.2019.039.001>
- Yan Z, Ma H, Han S, Geng C, Tian Y, Li X, 2019. First report of tomato brown rugose fruit virus infecting tomato in China. *Plant Disease*, in press. <http://dx.doi.org/10.1094/PDIS-05-19-1045-PDN>

**To cite this report:** Skelton A, Buxton-Kirk A, Ward R, Harju V, Frew L, Fowkes A, Long M, Negus A, Forde S, Adams IP, Pufal H, McGreig S, Weekes R, Fox A, 2019. First report of *Tomato brown rugose fruit virus* in tomato in the United Kingdom. *New Disease Reports* **40**, 12. <http://dx.doi.org/10.5197/j.2044-0588.2019.040.012>

©2019 The Authors

This report was published on-line at [www.ndrs.org.uk](http://www.ndrs.org.uk) where high quality versions of the figures can be found.