Received: 13 January 2023 | Accepted: 6 May 2023

DOI: 10.1002/ndr2.12180

New Disease Reports Open Access BSPP WILEY

NEW DISEASE REPORT

First report of Tomato leaf curl New Delhi virus in Türkiye

H. Fidan[1] | **K. Yildiz**[1,2] | **P. Sarikaya**[1] | **O. Calis**[1]

[1]Department of Plant Protection, Faculty of Agriculture, Akdeniz University, The Campus, Antalya, Türkiye

[2]Department of Plant Health, West Mediterranean Agricultural Research Institute, Aksu, Antalya, Türkiye

Correspondence
P. Sarikaya, Department of Plant Protection, Faculty of Agriculture, Akdeniz University, The Campus, 07059, Antalya, Türkiye.
Email: pelinsarikaya75@gmail.com

KEYWORDS
Cucurbitaceae, Geminiviridae, Viral plant disease

A leaf curl disease has been observed frequently in greenhouses where cucumber (*Cucumis sativus*), melon (*Cucumis melo*) and squash (*Cucurbita pepo*) are produced in Antalya since 2019. The infected plants showed symptoms including apical leaf curl, vein swelling, severely stunted, wrinkled leaves, fruit shape and texture disorder and a conspicuous mosaic pattern (Figure 1–5). These symptoms are similar to those caused by *Tomato leaf curl New Delhi virus* (ToLCNDV), an important member of the genus *Begomovirus*, family *Geminiviridae*. ToLCNDV is transmitted by *Bemisia tabaci* in a persistent circulative manner, causing serious damage to a wide variety of plant species, especially in the Solanaceae and Cucurbitaceae families (Briddon, 2015). ToLCNDV was first identified on solanaceous crops in India (Padidam et al., 1995) but the virus is recognised as an emerging threat worldwide due to the severity of the disease and its increasing prevalence. Outbreaks have recently occurred in countries in Africa, Asia and Europe (European and Mediterranean Plant Protection Organization, 2023).

Samples were collected from eight adjoined greenhouses in Antalya, four growing cucumber, two melon and two squash. Three leaf samples and one fruit sample were collected individually from a diseased plant in each of the greenhouses, that is 32 samples in total. Total nucleic acid was extracted from the leaf and fruit samples and analysed by PCR with specific ToLCNDV primers (ToA1-F and ToA1-R) which amplify a 504 bp fragment of viral DNA-A (Saez et al., 2016). The following conditions were used for PCR: 95°C for 5 min; 35 cycles of 30 s at 95°C, 45 s at 55°C and 45 s at 72°C, followed by a final 72°C extension step for 10 min. Sequences were obtained from samples from each of the



FIGURE 1 Typical *Tomato leaf curl New Delhi virus* symptoms on squash leaves



FIGURE 2 Typical *Tomato leaf curl New Delhi virus* symptoms on squash fruits

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.
© 2023 The Authors. *New Disease Reports* published by British Society for Plant Pathology and John Wiley & Sons.

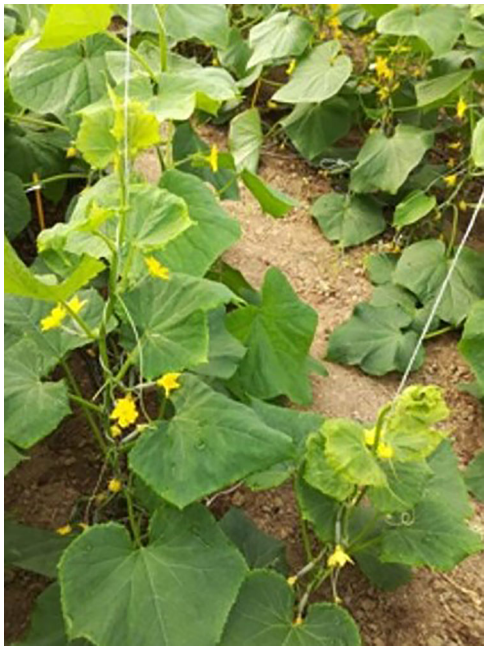

FIGURE 3 Symptoms caused by *Tomato leaf curl New Delhi virus* in cucumber plants



FIGURE 4 Symptoms caused by *Tomato leaf curl New Delhi virus* in cucumber leaves

eight plants and were found to be identical (GenBank Accession No. MZ458535). BLAST analysis showed that there was 99% identity with a ToLCNDV isolate (MH475397).

Antalya is a major area of greenhouse and seed production in Türkiye and the Mediterranean basin. ToLCNDV and other plant viruses are serious threats to solanaceous and cucurbit crops grown in the region since these crops may be infected through mechanical contact, seeds and insects (Kil et al., 2020). Quarantine remains the most effective way to prevent and control such viral infections.



FIGURE 5 Symptoms caused by *Tomato leaf curl New Delhi virus* in cucumber fruit

Diseased plants in the affected greenhouses were destroyed and the houses sanitised using solarization and disinfectant. Further surveys were done in 2020 and 2021 in the affected and neighbouring greenhouses and potentially virus-infected plants (~ 84 cucurbit samples) were tested by PCR as described above. No ToLCDV infection was found indicating that the virus had been eradicated. To our knowledge, this is the first report of ToLCNDV in Türkiye.

ORCID

P. Sarikaya https://orcid.org/0000-0002-6133-6128

REFERENCES

Briddon, R.W. (2015) *Geminiviridae*. Available at: https://doi.org/10.1002/9780470015902.a0000750.pub3 [Accessed 12 December 2023]

European and Mediterranean Plant Protection Organization. (2023) *Tomato leaf curl New Delhi virus*. Available at: https://gd.eppo.int/taxon/TOLCND/distribution. [Accessed 12 December 2023]

Kil, E.J., Vo, T.T.B., Fadhila, C., Ho, P.T., Lal, A., Troiano, E., *et al.* (2020) Seed transmission of Tomato leaf curl new Delhi virus from zucchini squash in Italy. *Plants*, 9, 563. https://doi.org/10.3390/plants9050563

Padidam, M., Beachy, R.N. and Fauquet, C.M. (1995) Tomato leaf curl geminivirus from India has a bipartite genome and coat protein is not essential for infectivity. *Journal of General Virology*, 76, 25–35. https://doi.org/10.1099/0022-1317-76-1-25

Sáez, C., Martínez, C., Ferriol, M., Manzano, S., Velasco, L., Jamilena, M. *et al.* (2016) Resistance to Tomato leaf curl New Delhi virus in *Cucurbita* spp. *Annals of Applied Biology*, 169, 91–105. https://doi.org/10.1111/aab.12283

How to cite this article: Fidan, H., Yildiz, K., Sarikaya, P. & Calis, O. (2023) First report of Tomato leaf curl New Delhi virus in Türkiye. *New Disease Reports*, 47, e12180. https://doi.org/10.1002/ndr2.12180