



## First report of *Tomato Leaf Curl New Delhi virus* in Morocco

N. Radouane<sup>1,2</sup>, A.Tahiri<sup>1\*</sup>, L. El Ghadraoui<sup>2</sup>, J. Al Figuigui<sup>2</sup> and R. Lahlali<sup>1</sup>

<sup>1</sup> Department of Plant Protection, Phytopathology Unit, Ecole Nationale d'Agriculture de Meknès, BPS 40, Meknès, Morocco;

<sup>2</sup> Laboratory of Functional Ecology and Environment, Sidi Mohamed Ben Abdellah University, PO Box 2202, Route d'Imouzzer, Fez, Morocco

\*E-mail: atahiri@enameknes.ac.ma

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In many Mediterranean countries, including Morocco, the environmental conditions are favourable for cucurbit crops and therefore such crops are of economic significance. In Morocco, the surface seeded with vegetable crops, which included cucurbit crops, increased to 260,000 ha in 2011 with an annual production of 7 million tonnes of which 750,000 tonnes were for export. Unfortunately, over the past four years, cucurbit production has been reduced in many countries by infection with the bipartite begomovirus *Tomato leaf curl New Delhi virus* (ToLCNDV). The virus was first described in plants from Asia, but recently it has also been reported from cucurbits in the Mediterranean region, namely Spain (Juárez *et al.*, 2014), Tunisia (Mnari-Hattab *et al.*, 2015) and Italy (Panno *et al.*, 2016). Disease symptoms resembling those described from Spain and Italy and attributed to ToLCNDV were observed in zucchini (*Cucurbita pepo*) crops growing in the Agadir and Taroudant regions of Morocco in 2017. The incidence of disease was significant, with severe yellow mosaic symptoms accompanied by leaf curling and roughness of the fruit skin (Fig. 1). The infected plants had smaller and fewer fruits when compared to healthy ones and in most cases fruit bursting was observed.

Fifteen zucchini samples were collected from open fields in the affected regions: nine samples from Agadir (zone Soud Khmiss) and six from Taroudante (zone Boudmass). Diseased leaf tissue from individual plants (7 mg) was crushed in 500 µl TE buffer and DNA was extracted as described previously (Doyle & Doyle, 1990). The quality of the DNA was checked on a 1% agarose gel and stored at -20°C until further use. To detect the presence of a begomovirus, extracted DNA was analysed by PCR with degenerate primers designed to amplify the coat protein gene (A1GemCP-V-5': GGRTTNGANGCRTGHGTACAYG-3' and A2GemCP-V-5': GCCYATRTAYAGRAAGCCMAG-3') (Juárez *et al.*, 2014). A second amplification was done using a ToLCNDV-specific primer pair (ToLCNDV-A1F:5'-ACCAACAGGCCGATGAACA-3' and ToLCNDV-A1R: 5'-TTCCCACTATCTTCTGTGCA-3') (Mizutani *et al.*, 2011). In

both amplifications, DNA fragments of the expected size, c. 750 bp, were amplified. All nine samples collected from Agadir were positive in both PCRs, while four samples out of the six collected from Taroudante were positive for both assays. The DNA sequences of these amplicons (GenBank Accession No. MF539617) shared the greatest nucleotide identities (98%) with isolates of ToLCNDV described from Italy (Sardinia; KX826050) and Spain (Almeria, KF891468; and Murcia, KF749224).

To our knowledge, this is the first report of *Tomato Leaf Curl New Delhi virus* in Morocco.

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Figure 1

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