



First report and molecular characterization of citrus dwarfing viroid (CDVd) and citrus bark cracking viroid (CBCVd) on *Citrus volkameriana* in Egypt

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Following the findings of hop stunt viroid (HSVd) variants associated to citrus gummy bark and cachexia diseases on *Citrus volkameriana*, evidencing stem pitting and bark gummosis in Egypt (Sofy and El-Dougdoug 2014), further studies were performed on 45 *C. volkameriana* plants, in order to investigate the putative presence of other viroids. During the summer season of 2016, sampling was carried out on citrus plants located in new reclaimed land (Nile river side banks). Leaves and budstick samples from different sweet orange varieties, grafted on *C. volkameriana* rootstock, were collected from different regions (Cairo – Alexandria desert road, Beni Suef, Benha). Total nucleic acids were extracted using the silica trap method, according to the protocol described by Foissac et al. (2001). The samples were subjected to reverse transcription and polymerase chain reaction (RT-PCR) for CDVd and CBCVd, using specific primers sets (Wang et al., 2013). The RT-PCR assays revealed a high prevalence (79%) of CBCVd on *C. volkameriana* trees expressing stem pitting and bark gummosis symptoms, whereas CDVd was found in a low number of trees (32%). Since CDVd and CBCVd were not previously reported in *C. volkameriana* in Egypt, special

attention was paid to characterize molecularly both viroids detected. The RT-PCR product was cloned and analysed by sequencing; the retrieved sequences of CDVd and CBCVd were deposited in GenBank under the accession numbers [MF421245.1-MF421247.1] and [MF421250.1-MF421255.1]. The CDVd and CBCVd revealed 99% nucleotide homology to the Cuban E77 isolate (AJ630358.1) and 98% nucleotide identity to the Cypriote CY305 isolate (KX819247.1) respectively. Considering that Al-Harathi et al. (2013) reported the presence of these viroids in other citrus species from the Middle East countries, including Egypt, to our knowledge this is the first report of the natural occurrence and characterization of CDVd and CBCVd on *C. volkameriana* in Egypt.

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