# State of the art of Citrus tristeza virus (CTV) in Egypt

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# State of the art of *Citrus tristeza virus* (CTV) in Egypt

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**Abstract**. Citrus industry is the major fruit crop in Egypt; *Citrus tristeza virus* (CTV) was reported in the country in 1957, where 4 trees were found to be infected. In 2000, a large-scale CTV survey was carried out, reporting several other CTV outbreaks, in different governorates. Preliminary data based on CTV molecular characterization suggest that some CTV isolates are very similar to the severe strain from Florida, that causes quick decline and stem pitting. In contrast, sthe seedling yellows component seems not be present. The possible entrance of *Toxoptera citricidus* and the use of a CTV susceptible rootstock (sour orange) pose today a major threat to the Egyptian citrus industry.

**Keywords.** Citrus – Citrus tristeza virus – Egypt – Sour orange.

***Le CTV en Egypte: état de l'art***

***Résumé.*** *Les agrumes constituent la principale culture fruitière en Egypte ; le virus de la tristeza des agrumes (CTV) a été signalé pour la première fois en 1957 dans ce pays, où quatre arbres étaient infectés. En 2000, une enquête sur le CTV a été réalisée sur une grande échelle, permettant de déceler plusieurs autres foyers d'infection dans de nombreux gouvernorats. Les données préliminaires, basées sur la caractérisation moléculaire du CTV, indiquent une similitude entre certains isolats de CTV et la souche sévère connue en Floride, induisant le quick decline et le stem pitting. En revanche, la souche qui cause le seedling yellows semble ne pas être présente. La possible introduction du Toxoptera citricidus et l'utilisation d'un porte-greffe sensible au CTV (le bigaradier) semblent représenter une menace considérable pour l'agrumiculture égyptienne.*

***Mots-clés.*** *Agrumes – Virus de la tristeza des agrumes – Egypte – Bigaradier.*

## I – Introduction

Citrus industry is the major fruit crop in Egypt. It covers about 380,000 acres along the Delta of the Nile region and the new cultivated areas (new modern farms in desert areas), with a total production of 3,200,000 tons and export about 796,000 tons in 2007.

Several graft-transmissible pathogens were reported in Egypt, including citrus psorosis, stubborn, citrus variegation, concave gum, citrus tristeza, citrus exocortis and citrus cachexia. Among all of them, still citrus tristeza is considered the main threat to the Egyptian citriculture,

Sweet orange (*Citrus sinensis* L.) grafted on sour orange (*C. aurantium* L.) rootstock, represents the first citrus growing combination. Although the absence of natural spreading and the main vector *Toxoptera citricidus*, the CTV infected trees were uprooted.

In 2000, the Egyptian Ministry of Agriculture and Land Reclamation (MALR) established a program for citrus development and certification in cooperation with the the German Cooperation (GTZ) and the technical support from CIHEAM- Mediterranean Agronomic Institute of Bari (MAIB). Infrastructure have been established in Bahteem area that includes conservation and premultiplication facilities besides diagnostic units (serology , molecular techniques). A Ministerial

decree that organizes the production of certified material and requirements through the nurseries, has been issued. The CTV monitoring was also included.

## II – Historical review of citrus tristeza in Egypt

In **1957**, CTV presence in Egypt was reported for the first time by Nour-Eldin and Bishay (1958). Four trees, belonging to a varietal collection of the MALR at Kanater, were found infected after indexing. Two of them were Bergamot orange grafted on sour lime rootstock, the third was a Tenerife orange grafted on sour lime rootstock, while the fourth was a Valencia orange.

All were indexed onto Mexican lime and Baladi lime, which developed vein clearing symptoms, typical of CTV (Nour-Eldin,1957; Nour-Eldin *et al.*,1958).

Later, another four trees were discovered in two varietal collection farms at Giza and also on the same farm of the first report; the CTV infected trees were eradicated.

In **1961**, Knorr detected 41 trees showing CTV symptoms at Giza and Kanater and these trees were uprooted (Knorr,1961).

In **1984**, four CTV infected trees were discovered at the Horticulture Research Institute - Agricultural Research Center (HRI-ARC, Giza), three of them being sweet orange (Thompson navel, Tenerife and Clean William), the fourth a Cleopatra mandarin. All these trees were grafted on sour orange and showed typical symptoms of honeycombing below the bud union (Eid *et al.*,1984a).

The same authors reported other 33 infected trees in Sharkia Governatorate where they described symptoms of two other types of stem pitting on Navel sweet orange trees grafted on sour orange rootstocks. In the first type, pegs and pits were observed only on rootstock, whereas in the second type the pitting extended to the Navel scion (Eid *et al.*,1984b).

In **1990**, CTV infected trees were found in Anshas and Beni Suef regions, on Navel orange and Valencia (Abou-Zeid *et al.*,1990). All infected trees showed typical symptoms. However, CTV-infected trees were not found in any commercial orchards or among any of the varieties of local origin (Eid *et al.*,1984a; Bové,1995).

In **2000**, by using ELISA tests for the first time in a large scale, 43 CTV infected trees were found in the varietal collections of theHorticultural Research Institute, Giza and Kourashia varietal collection farm (Ministry of Agriculture) on Navel orange and Valencia (Fahmy, 2000; D'Onghia, 2001). The infected trees were symptomless but the results were confirmed by indexing to Mexican lime. Vein clearing and leaf cupping symptoms appeared about 25 days after inoculation. None of the assayed CTV sources induced symptoms (stem pitting, stunting or yellowing) on Duncan grapefruit, Madam vinous orange and Sour orange seedlings. These sources apparently show differences from other CTV sources characterized in the previous work by Abdel Salam (1998), which induced stem pitting in sour orange. Preliminary data suggest that seedling-yellows component is not present in the Egyptian sources.

In **2002**, in the framework of the project “Improvement of the citrus production in Egypt” sponsored by GTZ, 13000 plants were tested for CTV from which 2% were found infected (Cambra, 2002).

In **2006**, CTV characterization was completed (Amin *et al.*,2006). Three Egyptian isolates of CTV were collected at 2 locations from rough lemon trees (*C. jambhiri*) grafted on sour orange, showing symptoms of decline. The capsid protein gene was amplified by RT-PCR, and analysed by SSCP (single stranded conformation polymorphism) and coat protein gene sequencing.

Comparison with reference sequences (of isolates coming from other parts of the world) showed that the Egyptian isolates were very similar to a severe strain from Florida which causes quick

decline and stem pitting. These results suggested that isolates causing severe quick decline are present in Egypt.

In the same year, a complete nucleotide sequence of the Qaha isolate with 19296nt was submitted to the genebank (Abdelmaksoud, and Gamal El-din, unpublished) under the accession number AY340974.

## III – Conclusion

Citrus tristeza is still a major threat to the citrus industry in Egypt although an epidemic has not been reported and only very small foci have been discovered. The presence of *A. gossypii* and sweet orange grafted on sour orange could change the situation in the future as happened in other countries around. It is therefore clear that strengthening the quarantine measures, surveying coupled to an eradication program besides exchanging information with other countries which face a similar situation is the only way to prevent the threat of citrus tristeza disease.

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