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Historical review of *Citrus tristeza virus* (CTV) in Libya

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Abstract. Citrus orchards in Libya are known to have been affected by *Citrus tristeza virus* (CTV) for nearly 35 years. However, since the first findings, no further investigation has been carried for several years. During the spring 2008, citrus growing areas were surveyed to assess the presence and distribution of CTV. The results highlighted the wide distribution of the virus in the most important Libyan citrus-growing areas. A historical review of CTV in Libya is presented with a special reference to the surveys carried out in 2008.

Keywords. Libya – Citrus – Citrus tristeza virus – Survey.

Bref historique du CTV en Libye

Résumé. *En Libye, les vergers d'agrumes sont censés être infectés par le virus de la tristeza des agrumes (CTV) depuis presque 35 ans. Cependant, après les premiers signalements, aucune autre enquête n'a été réalisée pendant de longues années. Au cours du printemps 2008, les principales régions agrumicoles ont fait l'objet d'une prospection pour évaluer la présence et la distribution du CTV, ce qui a permis de confirmer la vaste distribution du virus. Dans le présent travail, on va parcourir l'histoire du CTV en Libye, en mettant l'accent sur les enquêtes menées en 2008.*

Mots-clés. *Libye – Agrumes – Virus de la tristeza des agrumes – Prospection.*

I – Introduction

Citrus is considered the only winter fruit produced in Libya. The total area devoted to citrus growing is about 7.000 ha (Anonymous, 2001). with an average size of 1-2 ha of citrus plantation.

Citrus growing is concentrated mainly around the coastal areas of the Mediterranean sea where the climate is mild and rainfall abundant.There are also some plantations in the South of the country near Sebha region (Abu-Daba and Abu-Ziada, 1978).

All citrus produced is consumed locally as fresh fruit. On the other hand, no citrus is imported; the main rootstock is the sour orange, however, other rootstocks were introduced in the country during the seventies as experimental trials and some of them were recommended as alternatives to the sour orange for their disease resistance and soil tolerance.

Since most citrus cultivars, currently cultivated in Libya, were imported from Italy, Spain, Egypt, Palestine and from neighbouring countries, it must be expected that many other pathogens were inadvertently also introduced.

Based on visual observations, several diseases induced by virus and virus-like agents were observed such as various forms of psorosis, cachexia, gummy bark of sweet orange, woody gall, impietratura and exocortis (Chapot, 1975; Fudl-allah, 1978; Nour-Eldin, 1975; Nour-Eldin and Fudl-Allah, 1976; Salibe, 1985; Khalil *et al.*, 1994; Bové, 1995).

II – CTV situation

The CTV was first detected by Nour-Eldin and Fudl-Allah (1976). Two cases of CTV were found at the research station of El-Ftah University in Tripoli. These cases were confirmed through biological indexing onto Mexican lime indicator, the trees were eradicated and after those findings no further investigations have been carried out.

In 2007, in the framework of a mobility MSc Thesis under the supervision of the CIHEAM-IAMB, a CTV monitoring was carried out in the main citrus cultivated areas in Libya.

Survey was carried out in nurseries, varietal collections, mother trees blocks and commercial orchards in the main citrus growing areas.

During the survey, a total of 515 samples were collected in four regions from various farms and different areas; meanwhile, the main citrus species belonging to four nurseries producing 30,000 to 90,000 seedlings were selected to be surveyed, the total samples belonging to the mother block of two nurseries were collected, while, in the two other nurseries, in the absence of mother block, the samples were collected randomly.

Moreover, two varietal collections were surveyed, one belonging to Zahra region, the second to Sabha region, both maintained by the Agriculture Research Center (ARC). CTV monitoring was carried out on the total of the existing trees (569).

Surveys carried out in nurseries registered 5.6 % as overall CTV incidence, whereas, all the infected trees were present in just one mother block located in Tripoli with a 25% incidence.

The CTV infected plants were detected in four varieties: sukkari orange, Navel orange, blood orange and Jaffa; no CTV infected plants were detected in nurseries located in Tajora region.

In commercial orchards, an incidence of 3.5% was registered. The infected trees were found in just three areas represented by Zawia region (having the highest infection rate (8%), followed by Zahra region (2.5%), and Grabolli region (1%). The infected trees in this field were showing a general decline which could be associated to CTV. Blood orange was a highly infected variety (3%), followed by navel orange (0.58%).

Regarding the varietal collection, the CTV was detected only on 2 trees out of the 569 sampled trees, representing an infection rate of 0.35%

The overall CTV infection rate in all surveyed sites (nurseries, mother blocks, commercial orchard and varietal collections) reached 3% and the CTV-infected trees were all belonging to sweet oranges. Dammi orange (Sanguina) showed the highest number of infection (1.25%), followed by navel orange (0.75%) ,Sukari (0.45%) and Jaffa (0.2%).

A preliminary molecular characterization of the CTV isolates was carried out; several clones were selected and their partial coat protein was sequenced.

In order to have a genetic comparison with some retrieved sequences used as references in the GenBank, the sequences obtained were compared to other well known CTV isolates in the world. The partial coat protein gene nucleotide sequence, obtained from 4 clones, revealed a highly nucleotide homology with well studied isolate VT (Mawassi *et al.*, 1993) (accession E 937519), the Jordanian isolate (accession AY550 252) and the Syrian isolate STV 6 (Abu Kubaa *et al.*, 2008) (accession EU626 555). Interestingly, all these isolates belong to the Middle East countries and were in some cases responsible for epidemics in those areas.

III – Conclusion

The assessment of the sanitary situation of the main citrus growing areas in Libya, with particular reference to CTV, reported for the first time the presence of CTV, and its wide distribution.

The presence of CTV in several areas (Zawia, Zahra, Tripoli, Grapolli and Sabha) can contribute to the fast and long spreading of the virus into the country, since nurseries are producing and selling CTV-infected propagating material in different areas of Libya. Indeed, tristeza is the most important virus disease of citrus in the world and in the Mediterranean countries causing reduced fruit quality, rapid decline and death of trees.

Additionally, first investigations on the CTV characterization of local isolate, put in evidence interesting results. The sequence analysis of the partial CPg clustered the virus in a group including several Mediterranean CTV isolates, most of them are infecting the citrus trees in the Middle East, and were responsible for epidemics in those areas; based on these considerations, it's of utmost importance to investigate the vector capability and efficiency to transmit the virus.

Considering the presence and distribution of vectored CTV which can endanger the Libyan citriculture, the situation is alarming and urgent actions need to be taken to avoid a serious crisis and deterioration of the citrus industry in Libya.

Libyan administration should soon adopt urgent actions to continue such surveys, by establishing laws, regulating the control of CTV and their main vectors, since this is the only tool to control and to stop the introduction of new emerging diseases, as greening and witches' broom which are already in the neighboring area.

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