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Historical review of *Citrus tristeza virus* in Italy

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Abstract. A brief introduction on the Italian citrus industry is provided. Tristeza findings are reported from 1955 to date and emphasis is laid on the outbreaks which occurred in Sicily and in Apulia in 2002. Special attention is paid to the Apulian legislation which reinforces the current national regulation for the mandatory control of CTV in Italy.

Keywords. Aphids – Citrus – Citrus tristeza virus – Italy – Monitoring.

Rétrospective historique du CTV en Italie

Résumé. *Une brève rétrospective de l'agrumiculture italienne est présentée dans ce travail. Les données relatives à la Tristeza sont passées en revue de 1955 à nos jours, en rappelant, en particulier, les foyers qui se sont développés en Sicile et dans les Pouilles en 2002. Une attention particulière est donnée sur la législation régionale des Pouilles qui renforce la règlementation nationale pour la lutte obligatoire contre le CTV en Italie.*

Mots-clés. *Pucerons – Agrumes – Virus de la tristeza des agrumes – Italie – Suivi.*

I – The citrus industry in Italy

In Italy the citrus industry covers a surface area of 182 000 ha averaging a production of about 3 million tons. The most common species is the sweet orange (61%) followed by clementine (18%) and lemon (20%) whereas minor citrus trees (e.g. grapefruit, bergamot and citron) account for 1%. Citrus trees are mainly grown in southern Italy (Sicily, Calabria, Apulia, Basilicata, Sardinia and Campania) where the CTV-sensitive sour orange is the most common rootstock (about 98%) (ISTAT,2006).

Over the last years, due to the crisis of the Italian citriculture, the cultivation of citrus trees for ornamental purposes has been playing a primary role with a mean annual production of about 2 500 000 plants (mainly lemon, kumquat, calamondin, myrtle-leaf orange) for the northern European market. National nurserymen guarantee a qualitatively-high production and contribute to consolidating the Italian leadership in the northern European market (ISTAT,2006).

The crisis of the citrus sector, resulting from the higher economic competitiveness of the Spanish and non-EU produce, has spurred the commercial production of valuable typical citrus trees which characterize peculiar areas to meet the needs of a niche market. At present, in our country, ancient citrus collections are still grown in the gardens of historical palaces and in protected areas where ancient-old citrus varieties may be found. In these sites, citrus trees are also protected by the Department for Cultural Heritage since they are considered as integral part of the Italian landscape.

II – Historical review of Tristeza

1955. The disease was first reported at Acireale (CT) when it was identified on Meyer lemon and Owari satsuma trees introduced from foreign countries and on two Meyer lemon trees kept in the Botanical Garden in Palermo. As known, these species are healthy carriers of tristeza, a disease which originated in China (Russo,1956).

1967 - 1974. Both in Catania and in Reggio Calabria, some isolated foci of the virus were reported on the above-mentioned species (Servazzi *et al.* 1967; Catara, 1968; Davino *et al.,* 1998)..

1982 - 1986. In Calabria, the first major focus was identified of infected Marsh seedless grapefruit, Golden Buckeye sweet orange, Wase satsuma and Ceylon lemon trees, varieties introduced from countries where the infection is endemic (e.g. Spain) (Davino *et al.,* 1983).

1986 - 1995. With the start of tristeza monitoring activities, carried out by scientific institutions, some 200 cases of infection were discovered (plants and scions) (Davino *et al.,* 1998).

1995 - 1996. In the ornamental nurseries of Pescia (Pistoia) a focus was discovered of about 4000 *Citrus othaitense* plants and of 10 000 calamondin plants. These plants originated from infected sources with scions imported from an English botanical garden (Davino *et al.,* 1998).

1996. Due to the incidence of CTV infected plants, the Decree on Mandatory Control (D.M. n. 285 of 22 November 1996) transposing the EC directive n. 77/93/EEC, was issued. This Decree allows regulating the mandatory control to CTV through systematic monitoring in commercial citrus groves, nurseries, supply sources, mother plants, varietal collections, public and private gardens.

1997 - 2002. Monitoring activities were carried out by the Mediterranean Agronomic Institute of Bari under the umbrella of the regional phytosanitary services, enabled to identify some ornamental citrus plants (all of Sicilian origin) in a nursery located in Apulia, these plants were promptly eradicated.

In Sicily, Apulia and Sardinia, open-field foci, identified in areas kilometres apart, with thousand plants of different species and age. In Sicily, two foci were detected one of which in the district of Siracusa, with “Fortune” and “Nova” hybrids, satsuma and grapefruit plants showing symptoms of dieback, stunted growth and death. In the other focus, in the district of Catania, local Tarocco orange plants, showed symptoms of chlorosis, small-sized fruits and poor pigmentation. Diseased plants did not exhibit symptoms of inverse pitting at bud line on sour orange. Since the virus attacks Tarocco as well, which is a local Sicilian selection, the natural transmission of the virus was also envisaged.

Two foci were identified in Apulia in the district of Taranto, one with a few infected Navelina orange plants, showing reduced size; in the second focus, Navelina orchard had an infection rate exceeding 30% while Common clementine planting recorded a 20% infection. In this case infected plants did not display inverse pitting symptoms at bud line on sour orange. Diseased plants in the first focus and the whole orchard in the second focus were immediately uprooted (Davino *et al.* 2003; Babarossa *et al.* 2005).

In the same period, also in Sardinia, a few CTV-infected plants were identified and immediately destroyed. (Davino *et al.* 2003; Babarossa *et al.* 2005).

2003 - 2005. After the first outbreaks in Sicily and Apulia, and thanks to monitoring activities, other foci were identified.

In Sicily, new outbreaks were reported from the districts of Palermo and Messina. The Regional Phytosanitary Service proposed a strategy other than the one envisaged by the decree of mandatory control given the severity of the disease (Davino *et al.* 2002).

The Regional Government of Apulia adopted very stringent control measures with two provisions issued by the Regional Council (n° 780 of 5/6/2003 and n° 554 of 20/4/204) envisaging different procedures according to the destination of orchards and areas (free or contaminated). New working tools were introduced such as ortophotographs with cadastral map for the fast identification of sites to be monitored and of their owners and the application of more through hierarchical sampling methods (Gottwald and Hughes, 2000), 25% of plants both in the field and

in the nursery) and faster diagnosis (DTBIA instead of DAS-ELISA). An information campaign was also launched by promoting periodical meetings and handing out leaflets reporting salient clues on the disease and its vectors, on the control methods and on the institutions to get in touch with in case of need.

With Directive 2005/18/EC of 2 March 2005, the European Commission repelled the status of protected area. Citrus produced in Italy can not be sold with the leaves and will be considered on a par with the Spanish citrus fruit.

2006. With the first monitoring in Calabria, CTV foci were identified on Fortune and Satsuma mandarin in Reggio Calabria district. On mandarin, the disease was manifest and numerous plants had already been killed (Caruso *et al.* 2006; Schimio *et al.* 2007).

The National Phytosanitary Service set up an inter-regional working group including experts from scientific institutions and regional phytosanitary inspectors with a view to studying all the needed amendments to the decree on the mandatory control.

After the first detection of *Toxoptera citricidus* (main CTV vector) in Northern Portugal and in Spain, a working group was set up by the National Phytosanitary Service, also to issue a national decree for the mandatory control of *T. citricidus* to amend the M.D. on CTV.

In Apulia, Sicily and Calabria, systemic monitoring of aphids was promoted to exclude the presence of *T. citricidus* from citrus-growing areas. The results excluded the presence of *T. citricidus* but highlighted other vectors such as *A. gossypii*, *A. spiraecola*, *T. aurantii*.

Interestingly, the continuous monitoring activities, the biological and molecular characterization of the CTV isolates in different areas of the country, indicates apparently the presence and diffusion of the mild CTV strain (Barbarossa *et al.,* 2004; Davino *et al,* 2005)

III – Conclusions

The serious aphid-vectored disease outbreaks in the major Italian citrus-growing regions (Sicily, Apulia and Calabria), and the presence of sour orange which is highly susceptible to tristeza, corroborate the hypothesis that drastic measures must be taken to face tristeza which is likely to destroy the Italian citrus industry (fresh fruit, processed products and ornamental citrus plants) and the landscape.

Several factors can impact the success of this battle among which are: (i) an updated regulation on the mandatory control of CTV with procedures which respond to the effective contamination levels; (ii) a new regulation on *T. citricidus* to gain the recognition of area protected from this aphid; (iii) strengthening quarantine measures; (iv) eradication of CTV foci in the Regions where the virus is not endemic yet (Apulia, Calabria); (v) the characterization of CTV isolates to assess their severity and eventually their eradication; (vi) reinforcing faster monitoring methods, strain characterization for a rapid field identification of virulent strains and for the selection of those which match cross protection; (vii) training human resources and empowering the Regional Phytosanitary Services; (viii) setting up a team of national coordination for the application in the Italian citrus-growing regions, of common measures relating to information, interaction, fund raising for those growers obliged to uproot their orchards and other initiatives.

These steps may be undertaken with the joint commitment of the political authorities, inspection boards, research institutions, nurseries' and producers' associations. The citrus industry has a strong impact on the Italian economy; the fate of the citrus industry and the future of our country depend on the timely solution of this crisis.

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