

Citrus tristeza virus survey and the citrus nursery program in French Polynesia

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ABSTRACT

INTRODUCTION. The status of citrus tristeza virus (CTV) was assessed in French Polynesia (FP) in 1995 and 1996. Updated information is presented in this paper together with proposals for nursery operations adapted to local conditions. **MATERIALS AND METHODS.** More than 2 800 field diagnostics were carried out on citrus trees of the five archipelagos of FP. Concurrently DTBIA tests were obtained from 142 grapefruit, 279 lime and 269 orange trees to detect possible symptomless carriers of CTV. **CITRUS TRISTEZA VIRUS SURVEY RESULTS.** Tahiti, Moorea, Raiatea, Huahine, Tahaa, Bora Bora and Maupiti are infested by the CTV. The aphid *Toxoptera citricidus*, the most efficient vector of the virus, is spread all over these islands, except in Bora Bora which is aphid free. The six islands of the Marqueses archipelago are CTV-free, but were found to host *Aphis spiraeicola*. The five islands of the Australes archipelago, were found to be tristeza free, although *A gossypii* was observed in Rimatara and Tubuai. The Tuamotu archipelago is aphid and CTV-free. **THE REGIONAL CITRUS NURSERY PROGRAM.** The objectives of the nursery program in FP are (i) to produce citrus plants adapted to each regional conditions and (ii) to preserve the phytosanitary status of each island. Two CTV-free foundations have been established with virus-free budwoods, one in Ua Huka (Northern Marqueses islands) and a second in Rurutu (Australes archipelago). They allow agronomic evaluations in dry or more temperate tropical conditions and provide budwood for the island nurseries in the Marqueses. Production of elite plants will be certified.

KEYWORDS

French Polynesia, *Citrus*, citrus tristeza clostevirus, disease surveillance.

Enquête sur le virus de la tristeza des agrumes en Polynésie française et programme d'installation de pépinières d'agrumes.

RÉSUMÉ

INTRODUCTION. Une enquête menée en 1995 et 1996 a permis d'évaluer la situation sanitaire de la Polynésie française (Pf) vis-à-vis du virus de la tristeza des agrumes (CTV). Ce document en présente les résultats et propose un programme d'installation de pépinières adaptés aux conditions régionales. **MATÉRIEL ET MÉTHODES.** Plus de 2 800 observations ont été effectuées sur des agrumes dans les cinq archipels de la Pf et des tests DTBIA ont été effectués sur 142 pamplemoussiers, 279 limettiers et 269 orangers pour détecter des plants infectés par le CTV. **RÉSULTATS DE L'ENQUÊTE.** Les îles Tahiti, Moorea, Raiatea, Huahine, Tahaa, Bora Bora, Maupiti se sont révélées infectées ; elles hébergent toutes l'aphide *Toxoptera citricidus*, vecteur du virus, sauf Bora Bora, indemne d'aphides. Les six îles des Marqueses sont indemnes de CTV, mais hébergent *Aphis spiraeicola*. Les cinq îles des Australes ont été trouvées sans tristeza, bien qu' *A gossypii* ait été observé dans les îles de Rimatara et Tubuai. L'archipel de Tuamotu est indemne de CTV et d'aphides. **LE PROGRAMME RÉGIONAL D'INSTALLATION DE PÉPINIÈRES.** Les objectifs du programme d'installation de pépinières en Pf sont la production de plants adaptés aux conditions locales et le maintien de la situation sanitaire de chaque île. Deux parcs à bois indemnes de CTV ont été installés, à partir de greffons sains, à Ua Huka (au nord des Marqueses) et à Rurutu (archipel des Australes). Ils permettent des évaluations agronomiques du matériel en conditions tropicales diverses et fournissent des greffons aux pépinières des différentes îles. La production de plants d'élite devra être certifiée.

MOTS CLÉS

Polynésie française, *Citrus*, clostevirus tristeza du citrus, surveillance épidémiologique.

Received 11 February 1997

Accepted 15 October 1997

Fruits, 1997, vol 52, p 405-408

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RESUMEN ESPAÑOL, p 408

introduction

French Polynesia covers six archipelagos representing a territory of 4 000 km² with 107 inhabited islands spread in a vast oceanic area of 5 millions km². In 1995, citrus production amounted to 1 200 t of which half is represented by Key lime. The latter is commonly used for local fish recipes.

A citrus phytosanitary survey was first carried out in 1975, concluding that Tahiti was CTV-free (VOGEL, 1975). However, 2 years later, the citrus tristeza virus was fraudulently introduced from the Cook islands affecting Tahiti, Moorea, Raiatea and Huahine (VOGEL, 1978). Since then, quarantine measures were established to avoid the movement of citrus plants and budwood from these islands to other archipelagos. Recently, in August 1995, an investigation was carried out in various islands (AUBERT et al, 1995). In 1996, this survey was completed for all the inhabited islands of French Polynesia. This paper presents the results of this last survey and proposes a nursery program in French Polynesia.

materials and methods

The CTV survey concerned the five archipelagos: i) the Windward islands (Tahiti, Moorea); ii) the Leeward islands (Raiatea, Huahine, Tahaa, Bora Bora, Maupiti) in the *îles de la Société*; iii) the Marquises islands (Hiva Oa, Fatu Hiva, Tahuata, Nuku Hiva, Ua Pou, Ua Huka); iv) the Australes islands (Rurutu, Tubuai, Raivavae, Rimatara, Rapa); and v) the Tuamotu atolls (Tikehau, Rangiroa, Apataki, Niau, Toau, Aratika, Kauehi, Raraka, Fakarava) (figure 1). The survey in the Tuamotu was limited to nine atolls in the Western side, due to transportation problems in the Eastern atolls. The detection of CTV was assessed by: i) collecting lime or grapefruit trees for controlling the presence or absence of vein clearing and stem pitting; ii) sampling young shoots by direct tissue blot immunoassay DTBIA; iii) controlling aphids for taxonomic confirmation. The survey was completed with observations on other pests on citrus. Finally, more

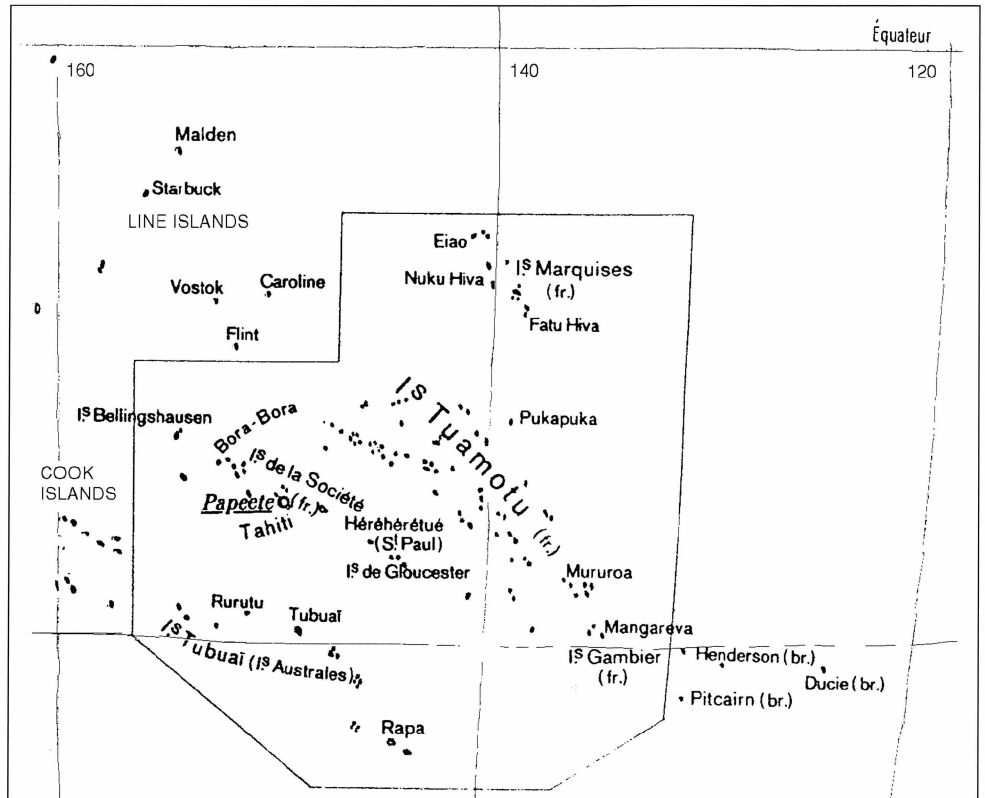


Figure 1
French Polynesia and most of the islands where the citrus tristeza virus survey was carried out.

than 2 800 observations were carried out on citrus trees of the five archipelagos and DTBIA tests were done on 142 grapefruit trees, 279 lime trees and 269 orange trees.

citrus tristeza virus survey results

Tahiti and Moorea in the Windward islands, and Raiatea and Huahine in the Leeward islands have been contaminated by CTV since 1977. Tahaa, Bora Bora and Maupiti are also now infected. In these territories all lime, pummelo and grapefruit trees were affected by stem pitting and inverse stem pitting. However, some Combava trees are still thriving in Raiatea, demonstrating the various number of tristeza strains in French Polynesia. *Toxoptera citricidus*, the most efficient vector of the citrus tristeza virus, was found in all these islands, except in Bora Bora which is aphid free.

All the Marqueses islands are CTV-free, although *Aphis spiraeicola* was noted in the six islands of this archipelago. In the Australes archipelago, CTV was not detected on any island, but *Aphis gossypii* was found in Rimatara and Tubuai. The nine atolls of the Western Tuamotu are not yet contaminated and no aphid was found there. These observations are encouraging as they show the efficiency of quarantine measures established between the Windward/Leeward islands and the other archipelagos. Nevertheless, some aphid vectors are already present in the latter islands.

the regional citrus nursery program

The objectives of the regional citrus nursery program carried out are to control the movement of citrus plants or budwood, and to preserve the CTV status in the archipelagos.

CTV-free budwood will be produced in two foundation blocks established with budwoods from the *station de recherche agronomique* (SRA), San Giuliano, France:

- The foundation block in Ua Huka island in the Northern Marqueses has 113 varieties of limes, pummelos, oranges and mandarins, enabling agronomic evaluations in dry tropical conditions. Only 600 residents live on this island. One flight per week and one boat per month make the island well protected and easy to control.
- The second foundation block in Rurutu, Australes island, comprises 28 varieties, mainly mandarins, for subtropical agronomic tests. More than 2 000 inhabitants live in Rurutu. Three flights per week and two boats per month arrive at Rurutu.

The two foundations are CTV indexed twice a year by DTBIA tests.

production of elite plants

In CTV-free islands of the Marqueses and Australes archipelagos, nurseries have to use budwood supplied by the foundation in Ua Huka and Rurutu, respectively.

In the Tuamotu archipelago, budwood will be provided by the Ua Huka foundation block. Nurseries established per group of atolls in relation to boat tour have to produce salt tolerant plants for corraline sandy soil.

The challenge supported with the Windward and Leeward islands includes cross protection of lime, grapefruit and pummelo trees. In Raiatea, the *Service du développement rural* has already collected selected strains of tristeza virus infected plants in insect-proof greenhouse. CTV-free budwood have to be provided by the Ua Huka or Rurutu foundations. In the future, the cross protection will be extended in all the Leeward islands.

quarantine measures

To avoid the entry of other CTV strains and, also, of other citrus virus diseases into French Polynesia, importation of citrus and ornamental *Rutacea* including *Citropsis*, *Microcitrus*, *Murraya*, *Pamburus* and *Kumquat*, in part of plants or budwood, is now forbidden, except from indexed virus-free foundations.

Circulation of plants or budwood from Windward and Leeward islands to all other islands is also forbidden, with the exception of controlled CTV-free budwood.

Double controls, at departure and on arrival in the airport and harbour, are enforced in all islands.

certification of elite plants

The control of elite plant production in the nurseries includes: i) the use of CTV-free budwood from controlled foundation blocks; ii) the grafting on adapted rootstocks; iii) the respect of propagation delays in nursery; iv) the use of tristeza virus strains for cross protection in Raiatea.

references

- Aubert B, Vernière C, Wong M, Baraer JJ (1995) Tristeza and other virus diseases in French Polynesia. In: *Proceeding 13 th Cong of Int Org of Citrus Virologists*, Nov 16-23 1995, Fuzhou, China
- Vogel R (1975) L'état sanitaire des agrumes en Polynésie française. San-Giuliano, France, Inra-Ifac, document interne, 41 p
- Vogel R (1978) Compte-rendu de mission en Polynésie française. San-Giuliano, France, Inra-Ifac, document interne, 16 p

Estudio acerca del virus de la tristeza de los agrios en la Polinesia francesa y programa de instalación de viveros de cítricos.

RESUMEN

INTRODUCCIÓN. Un estudio llevado a cabo en 1995 y 1996 ha permitido evaluar la situación sanitaria de la Polinesia francesa (Pf) con respecto al virus de la tristeza de los agrios (CTV). Este documento presenta los resultados y propone un programa de instalación de viveros adaptado a las condiciones regionales. **MATERIAL Y MÉTODOS.** Se efectuaron más de 2 800 observaciones en los cítricos de los cinco archipiélagos de la Pf y se realizaron tests DTBIA en 142 toronjos, 279 limeros y 269 naranjos para detectar las plantas infectadas por el CTV. **RESULTADOS DEL ESTUDIO.** Se descubrió que las islas Tahití, Moorea, Raiatea, Huahine, Tahaa, Bora Bora y Maupiti estaban infectadas; todas albergaban el áfido *Toxoptera citricidus*, vector del virus, excepto Bora Bora, exenta de áfidos. Las seis islas de las Marquesas están libres de CTV, pero albergan *Aphis spiraeicola*. En las cinco islas del archipiélago de las Australes no se encontró tristeza, aunque se halló *A gossypii* en las islas de Rimatara y Tubuai. El archipiélago de Tuamotu está exento de CTV y de áfidos. **EL PROGRAMA REGIONAL DE INSTALACIÓN DE VIVEROS.** Los objetivos del programa de instalación de viveros en Pf son: la producción de plantones adaptados a las condiciones locales y el mantenimiento de la situación sanitaria de cada isla. Se han instalado, a partir de injertos sanos, dos bases exentas de CTV en Ua Huka (en el norte de las Marquesas) y en Rurutu (archipiélago de las Australes). Estas bases permiten las evaluaciones agronómicas del material en condiciones tropicales diversas y proporcionan injertos a los viveros de las diferentes islas. La producción de plantones selectos tendrá que contar con un certificado.

PALABRAS CLAVES

Polinesia francesa, *Citrus*, closterovirus tristeza del citrus, vigilancia de enfermedades.