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CARIBBEAN FOOD CROPS SOCIETY

34th Annual Meeting 1998

Rural Agricultural Development Authority
Ministry of Agriculture, Jamaica

*“Enhancing Regional Food Security and Exports
by Integrating National Strategies”*

JAMAICA

VOL. XXXIV

APPROACHES TO MANAGING CITRUS TRISTEZA VIRUS (CTV) DISEASE IN JAMAICA.

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ABSTRACT

Although the citrus tristeza disease has been reported in Jamaica from 1959, severe strains of the virus was only confirmed in 1992 when a survey was conducted. Mild strains were widespread while severe ones were present in the two major citrus growing parishes, Manchester and St. Catherine. The discovery of the Brown Citrus Aphid (BrCA) in Jamaica and Cuba in 1993 resulted from a northward movement of the pest from Venezuela in 1976 into the Caribbean region in 1989. Over 90% of Jamaica's citrus orchards are established on sour orange rootstock, a cultivar which is highly susceptible to CTV. The presence of all three factors- severe strains of the virus; BrCA an efficient vector of the virus, and highly susceptible cultivars as rootstock, makes an effective disease management system urgent and critical. This paper discuss the programmes being considered.

INTRODUCTION

The failure to establish sweet orange and mandarin on sour orange rootstock in South Africa in the late 1890's was due to the presence of CTV, and not because of incompatibility between scions/rootstock. This was supported by the fact that these scions/rootstock combination grew successfully in California and elsewhere as reported by Webber (1925). The involvement of the virus in the failure of Satsuma grafted on sour orange in Florida was also proposed by Swingle (1909). The resultant plants grew slowly and were mere "dwarfed bush".

Zeman (1931) and Carrera (1933) described symptoms of a disease observed in Argentina in 1930, while Topopeus (1937) working in Java observed symptoms which he believed to be the same disease and advanced the theory that the sweet orange top developed some substance which was lethal to the sour orange rootstock.

Fawcett and Bitancourt were the first to suggest that the disease was caused by a virus following a visit to infected orchards in Argentina in 1937 (Bitancourt 1940). Subsequent to intensive research, Fawcett and Wallace (1946) confirmed that the disorder was caused by a virus. Meneghini (1946) working in Brazil simultaneously reported that tristeza was caused by a virus and the brown citrus aphid, *Toxoptera citricidus* Kirk., was a vector of the virus.

Moreira (1942), however was the first to use the name "tristeza" a Portuguese word meaning "sadness" or "melancholy". This has become the accepted name as the various disorders were determined to be identical or at least closely related.

The discovery by Hughes and Lister (1949) that an aphid transmissible disease of lime trees induced veinal flecks and stem pitting, followed by studies by McClean (1950) in South Africa, Costa, Grant and Moreira (1950) in Brazil and Wallace and Drake (1951) in California resulted in the "lime test" being use as a diagnostic tool for tristeza. It was also observed that seedlings of West Indian (Mexican) lime (*C. aurantifolia* Swing) developed a specific kind of vein clearing and other diagnostic symptoms after infection with tristeza virus which led to the conclusion that lime disease, stem pitting of grapefruit, tristeza and quick decline are caused by the same virus.

BrCA was first observed in Brazil and Argentina in the 1930's resulting in the loss of 30 million citrus trees on sour orange rootstock by the subsequent spread of CTV. It was next detected in Venezuela in 1976 where 6 million trees on sour orange rootstock was reported killed by CTV by 1987.

The movement of the BrCA continued, reaching Costa Rica in 1989, Dominican Republic, Puerto Rico the Southern Caribbean island and Nicaragua in 1992, Cuba and Jamaica in 1993, Florida 1995, the Bahamas and Belize in 1996.

The progressive spread of the BrCA in the region, the presence of CTV and over 200 million trees establish on the highly susceptible CTV, rootstock - sour orange put these orchards at tremendous risk. Moreover, this vector specie spreads CTV 25 times more efficiently than other and within five years after its introduction into an area epidemic losses can be expected.

Economic Importance

In Jamaica, Approximately 400 farmers produce citrus on 15,000 acres (6.073 hectares) of land. Some 10,000 persons are employed on farm and another 13,000 involved in marketing and processing. The industry is serviced by approximately 50 nurseries which produce over 90% of the plants grafted on sour orange rootstock. The production of citrus in 1996 was 180,200 tonnes with 10,023 tonnes being exported and realizing US\$5.69 million. About 90% of citrus produced is consumed locally at a value of J\$500 million.

The citrus industry of Jamaica though relatively small in absolute trade and production volume, plays an important role in the nation's socio economy. It generates labour and has a special niche in the international market.

Although CTV and psorosis were reported in the island since 1959 by Dr. L.C. Knorr a Pathologist from Florida, and confirmed by Dr. W.C. Price a Virologist from Lake Alfred Experiment Station (Tristeza on grapefruit at Wakefield and Bodles, St. Catherine, on sweet orange at Irwin, St. James, and Psorosis on grapefruit at Bodles, St. Catherine,) it did not pose a problem. However, with the presence of the BrCA in 1993 its colonization and rapid spread, the scenario has drastically changed.

Certification Programme

The presence of the virus, its efficient vector BrCA, and the susceptible rootstock makes citrus very vulnerable to CTV. This will necessitate the change to CTV tolerant rootstocks so as to combat the threat.

It poses another problem as these rootstocks are susceptible to other graft-transmissible viruses and viroids. For example, *Exocortis* and other viroid will limit growth and productivity on citrange citrumelo and sweet lime rootstock, *Cachexia* on mandarin and *Macrophylla* rootstock, Citrus tatterleaf on most citrange, citrumelo, trifoliolate and lemon rootstock as well as lemon and limes grown on other rootstocks. By using only certified citrus plants any CTV tolerant rootstock may be considered as the certified scion budwood will be free of other viruses.

The FAO at the request of the Government of Jamaica provided technical and legal experts in establishing the frame work for a Citrus Certification Programme. The Jamaica Government through the Ministry of Agriculture has delegated the implementation of the programme to the Jamaica Citrus Protection Agency (JCPA). The JCPA will be a registered liability company be financed through membership fees, acreage fees, and service fees. There will be a board of management supported by a technical advisory council.

Technical Aspect

The technical aspects of the programme will involve all the biological phases, i.e selection of parent material, rootstock, indexing, cultural practices etc. in the production of certified disease free planting material.

Parent trees will be established by importing pathogen free budwood from a clean stock programme that implement or complies with the FAO/IPGRI guidelines for the safe movement of Citrus Germplasm or local clones based on documented evidence of desirable traits, such as yield and/or fruit quality data. Local clone selections

will be sent to an institution where a recognised clean stock programme is practiced and undergo shoot tip graft transmissible diseases.

All prospective parental accessions will be indexed as follows:

- * **Short term indexes for CTV (conducted by ELISA), citrus viroids (except cachexia), and psorosis complex of viruses.**

Freedom from viroids will be done by biological indexing using citron scions maintained under warm temperature, followed by extraction and analysis on polyacrylamide gels if no symptoms are expressed citron.

Freedom from cachexia may be tested from the inoculated citron by use of polyacrylamide gels and/or reverse transcriptase polymerase chain reaction assays with the use of proper positive and negative controls.

Freedom from psorosis complex of viruses may be tested by graft inoculating a nursery plant, such as rough lemon or sweet orange, and top-working with a live bud of Rusk citrange.

- * **Long term indexes for freedom from citrus cachexia viroid and citrus tatterleaf virus.**

These three should be observed for two years for symptoms expressions. These long term indexes should be completed by the time the trueness of type of the fruit has been verified.

Cachexia viroid is long term indexed by planting two trees propagated from the prospective parent trees on either Orlando tangelo or Clemelin root stock.

Citrus tatterleaf virus is long term indexed by planting two trees propagated from the perspective parent trees on Poncirus trifoliata rootstock.

- * Budwood from the prospective parent trees may be conditionally released upon negative indexing results for the short term indexes, but the subsequent budwood propagations will be subject to recall if cachexia, citrus tatterleaf virus, or other virus is indicated by the long term indexes.

Administration

The Jamaica Citrus Protection Agency (JCPA) will be responsible for administering the programme. It comprise a Board of Directors which will oversee the legal and financial aspects, with a council which is responsible for the technical matters. Registration of nurseries, certification of scions, seed source trees, local clone accessions, variety trial, budwood cutting and service fees will be the responsibility of JCPA.

- Seed Source Trees

These will be trees established for the production of certified seeds which will be used for indicator plants (indexing) and rootstock for citrus propagation. These will undergo test for psorosis complex (the only virus known to be seed transmitted in citrus) and if found negative will be certified and registered. Certification will be for a period of four years and the trees and those immediately surrounding them will be inspected visually on an annual basis for freedom from bark and leaf symptoms of the psorosis complex, citrus blight citrus viroids, decline, gummosis or other recognisable disease symptoms as well as fruit or foliage mutation

Physical

The physical structures required for operating the programme are:

1. A large insect proof screenhouse with double door for the production of indicator plants for indexing.
2. Two glasshouses with controlled temperatures
 - (a) A cool room with temperatures of 24°C-30°C in the day and 18-20°C at night for viruses which require cool temperature for best symptom expressions.
 - (b) Warm room with temperature 30-35°C in the day and 20-24°C at night for viruses which require warm conditions for symptom expression.
 - (c) Hot room with temperature of 32-40°C in the day and 24-27°C at night for preconditioning of budwood prior to thermo-therapy.

REGIONAL ASPECT

Jamaica is in the process of establishing a citrus certification programme like its neighbours Belize, Cuba and others in the Caribbean basin.

The Inter-American Citrus Network has already undertaken a survey on the distribution of the BrCA in the region. Two projects are being developed.

- To challenge the advance of BrCA/CTV in the region and subsequent development of virulent strains of CTV.
- The production and distribution of certified planting material (disease-free with high productive potential and quality) in all countries of the region.
- A meeting to standardize the indexing procedure took place in June of this year.

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