

CHAPTER 3.8

Panama

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Introduction

Geographical context

Most of the Panamanian territory receives tropical rains in excess of 2500 mm/yr, a climatic factor known to drastically reduce whitefly populations. Nevertheless, during the first (1992) workshop on whiteflies in Central America and the Caribbean, held in Costa Rica, Panama was already present (Zachrisson and Poveda, 1992). According to the report presented by the Panamanian delegate at that meeting, the emergence of whiteflies as agricultural pests in Panama was associated with the expansion of non-traditional crops, mainly melon (*Cucumis melo* L.), for export to the United States. Three horticultural areas were developed in the late 1980s: the Pacific Coast of the province of Panama; the central provinces of Coclé, Herrera and Los Santos (the largest); and the western province of Chiriquí, near the Costa Rican border (Zachrisson and Poveda, 1992; Delgado, 1994). These regions have in common the presence of a well-defined dry period and below-average precipitation during the year. Figure 1

shows the main agricultural regions affected by whitefly-transmitted begomoviruses.

The emergence of *Bemisia tabaci* as a pest and virus vector

The presence of *Bemisia tabaci* (Gennadius) on tomato (*Lycopersicon esculentum* Mill.) was first observed in the Azuero Peninsula in 1983. However, it was not until 1991, when unusually dry climatic conditions favoured the reproduction of *B. tabaci*, that this whitefly species became a pest in the central provinces of Panama. *B. tabaci* has been observed to reproduce in eggplant (*Solanum melongena* L.), sweet pepper (*Capsicum annum* L. var. *annuum*) and chilli pepper (*Capsicum* spp. L.). In 1992, the silver leaf symptom was observed on squash (*Cucurbita* spp. L.) attacked by *B. tabaci*, which suggested the presence of biotype B in Panama. The western horticultural zone, located in Chiriquí Province, is at a higher elevation and receives more rainfall than the other two horticultural zones of Panama. The problem pest in this area is not so much *B. tabaci* as *Trialeurodes vaporariorum* (Westwood), a whitefly species that attacks horticultural crops at altitudes above 1000 m (Zachrisson and Poveda, 1992).

In Panama, common bean (*Phaseolus vulgaris* L.) is cultivated in

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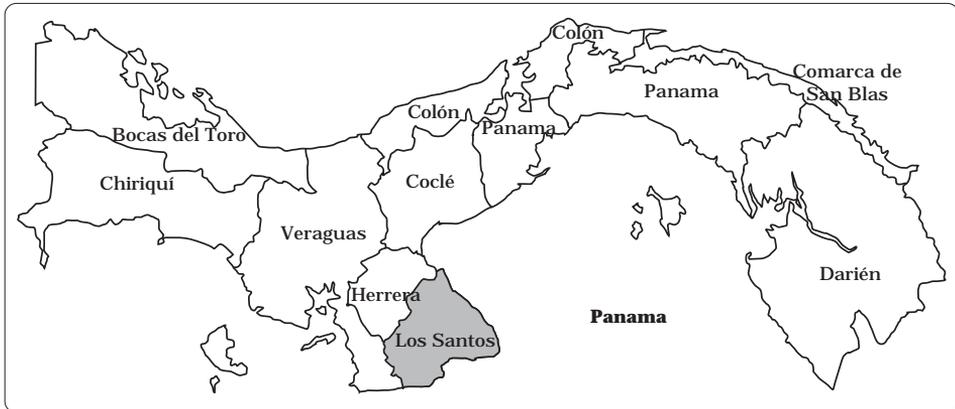


Figure 1. The main agricultural regions affected by whitefly-transmitted begomoviruses, Panama.

Chiriquí Province, at altitudes between 550 and 1000 m. *Bean golden yellow mosaic virus* (BGYMV) was observed affecting common bean in Panama prior to 1970 (Gámez, 1970) but this disease never has been a major production problem of common bean in Panama.

Advances in Biological Research

A whitefly-borne geminivirus affecting tomato was described in Panama in 1998 (Engel et al., 1998). The virus, named *Tomato leaf curl virus*, was shown in this project to have a high degree of nucleotide sequence similarity when compared to *Tomato yellow mosaic virus* (ToYMV) from Venezuela. The virus had been described in Panama as a strain of *Potato yellow mosaic virus*, a misnomer for ToYMV. Although this virus may be a new species, the name "*Tomato leaf curl virus*" is not appropriate because it is already given to a distinct begomovirus species that only exists in the Old World (Asia). Therefore, the Panamanian virus should be renamed.

A molecular characterization of *B. tabaci* biotypes from the central

horticultural zone of Azuero was conducted at the Centro Internacional de Agricultura Tropical (CIAT), with samples provided by Ing. Agr. José Angel Guerra of the Instituto de Investigación Agropecuaria de Panamá (IDIAP) (Table 1). Results demonstrate the coexistence of biotypes A and B of *B. tabaci* in the central provinces of the Azuero Peninsula. This is an interesting situation that needs to be monitored in order to study the outcome of the interaction between these two biotypes in a horticultural zone characterized by mixed cropping systems.

Socio-economic Analysis

Because Panama was not originally included in this project, no socio-economic information was collected for this country. However, it is known that whitefly-transmitted geminiviruses do not affect common bean severely in Chiriquí Province.

Between 1991 and 1994, about 6000 tons of tomato were lost to whitefly problems in Panama. During the 1997-98 tomato planting season, 2800 tons were lost because of the effect of *B. tabaci*, both as a pest and

Table 1. Molecular characterization of *Bemisia tabaci* biotypes from Azuero, Panama.

Sample	Crop	Biotype
1	Tomato	A/B
2	Melon	A
3	Melon	B
4	Melon	A/B
5	Melon	A
6	Tomato	B
7	Tomato	B
8	Tomato	B
9	Tomato	B
10	Tomato	A/B
11	Melon	A/B
12	Melon	B
13	Melon	B
14	Melon	B
15	Melon	B
16	Melon	B
17	Melon	B
18	Melon	A/B

vector of plant viruses. Whereas large-scale tomato growers absorbed most of the losses, these pests affected a number of small-scale producers in the province of Los Santos.

Strengthened Research Capacity

Considering that Panama was not included officially in the project, an agreement was made with the Red Colaborativa de Investigación y Desarrollo de Hortalizas para América Central, Panamá y República Dominicana (REDCAHOR), a horticultural research network operating in the region, to train Panamanian researchers. The network financed the training at CIAT of two national scientists: an entomologist (Ing. José Guerra) and a virologist (Dr. Orencio Fernández) from IDIAP.

These scientists were trained in the molecular characterization of *B. tabaci* biotypes and the use of monoclonal antibodies for the identification of begomoviruses.

Current Status of Whitefly/Begomovirus Problems

Although Panama is one of the rainiest countries in the world, with an average annual rainfall above 2000 mm, there are less humid (1000-2000 mm) coastal regions around the Gulf of Panama, where horticultural production has increased significantly in the last decades. The main horticultural area is located in the Azuero Peninsula, where most of the whitefly/begomovirus problems have emerged in past years. Whitefly populations increase in the drier months of the year: January-March. Panama is in the process of expanding the production of non-traditional export crops and consequently this country should take measures to control the whitefly problem before it becomes unmanageable.

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