

In June 2004, Puerto Rico banana and plantain growers began noticing dark brown streaks on the underside of many of their plantain leaves. Within a couple of weeks, the brown color had darkened and spread to most of the leaves. When researchers from the University of Puerto Rico examined the leaves, they knew they were looking at a disease that had devastated banana farms in Africa and many of the countries surrounding them—black Sigatoka, or black leaf streak.

An airborne disease caused by the fungus *Mycosphaerella figiensis* Morelet, black Sigatoka quickly destroys the plant's leaves and causes premature ripening of the fruit—a bane to farmers exporting their bananas. Many banana-producing countries have been battling the disease since the 1960s through aerial spraying. Unfortunately, as the disease has evolved and become resistant to fungicides, growers have had to resort to increasing the frequency of applications, costing millions of dollars each year. The sale and export of bananas and plantains contribute about \$68,065 to Puerto Rico's annual income. Fungicide applications cost the country about \$1,000 per hectare each year.



Plantain farm affected by BS in Añasco, PR

At the University of Puerto Rico, researchers Wanda Almodovar, Ada Alvarado and Manuel Diaz began collecting affected leaves to examine them and positively identify the disease. For several years, Puerto Rico has struggled with the yellow Sigatoka, a disease whose symptoms are slightly different from those of black Sigatoka but difficult to distinguish when residing on the same plant. Because black Sigatoka affects plantains, dessert bananas and ABB cooking bananas not typically affected by yellow Sigatoka, specialty growers became increasingly concerned.

Almost immediately after discovering the disease, extension personnel and researchers participated in trainings and began working with other affected countries to establish a communication network to

discuss ways to control the disease, especially using IPM practices.

Samples of diseased plants were sent to Dr. Mourichon in Montpellier, France who identified the disease based on the morphological characteristics of the fungus. Later, a researcher from the Tropical Agriculture Research Station in Mayaguez, PR, Dr. Bryan Irish identified the disease using PCR.

While identification would allow a more targeted control approach for the disease, for the most part, growers used fungicides. However, with the increasing expense and the diminishing effect, fungicides were a less acceptable option. Trials with new cultivars yielded little success as well; more productive cultivars were typically less resistant to the disease, while more resistant cultivars did not produce as much fruit.

In response, Almodovar's team proposed to develop an IPM package for black Sigatoka, to be disseminated among extension personnel and the Puerto Rico Farmers Association. Assembly of the package would require collaboration with surrounding countries that had already developed IPM packages for their growers. The team included information about the disease symptoms, biology and ecology, the influence of climatic factors on disease development, how to evaluate the disease in the field, cultural management practices, calibration of pesticide equipment, possible fungicides and information about how black Sigatoka typically responded to fungicides.

In addition to giving the manual to extension personnel and growers organizations, the team planned several field days to educate extension specialists and growers on how to implement IPM techniques to prevent the disease and, once the disease was present, how to effectively control it.

The project, which is still ongoing, is projected to be completed August 2007, with a final assessment of the combination of training materials and workshops. In addition to evaluating growers' comfort with the package of control strategies for the black Sigatoka, Almodovar's team hopes that they will discover the growers' understanding of IPM techniques in general.



Severe damage in plantain of BS

Integrated Pest Management for Black Sigatoka, *Mycosphaerella figiensis*

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