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FIRST REPORT OF BLACK SIGATOKA DISEASE (CAUSAL AGENT *MYCOSPHAERELLA FIJIENSIS*) FROM TOBAGO

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ABSTRACT: Black Sigatoka Disease of Bananas/Plantains (causal agent *Mycosphaerella fijiensis*) has been reported in Trinidad since 2003. This is a leaf spot disease, and infected plants generally produce reduced yield of poor quality fruit. Heavily infected plants may produce no yield at all. It is the most serious disease of bananas/plantains, and control entails expensive application of chemical fungicides. Tobago was surveyed in May 2005 and the disease was not detected on the island. Quarantine measures were put in place to prevent its introduction in Tobago. However, after recent reports of disease symptoms in isolated areas on the island, another survey was conducted from December 13 to 16 2011. Results showed that Tobago is infected with the disease but levels of infection vary in different parts of the island, thus suggesting that introduction in Tobago occurred recently. This is the first report of the disease in Tobago. The impact of Black Sigatoka Disease on the banana/plantain industry in Tobago, the estimated time and pathways of introduction together with a proposal for the management of the disease on the island are discussed.

INTRODUCTION

Black Sigatoka Disease of Bananas/Plantains has been reported in Trinidad since 2003 (Fortune *et al.*, 2005). This is a leaf spot disease (Plate 1) and infected plants generally produce reduced yield of poor quality fruit. Heavily infected plants may produce no yield at all. It is the most serious disease of bananas/plantains and control entails expensive application of chemical fungicides.

Tobago was surveyed by the Scientists of the Research Division, Ministry of Food Production, Land and Marine Affairs (MFPLMA) in May 2005 and the disease was not detected on the island. However, in recent times, there have been reports of symptoms of Black Sigatoka Disease in isolated areas on the island. It was important for Tobago to be surveyed again for the following reasons:

- To determine whether the island has retained its disease-free status
- To eradicate, if possible, any early signs of the disease
- A regional study is underway among scientists in the Caribbean to determine the spread of the disease in the region. Knowledge of the status of Tobago is vital for an understanding of the dynamics of spread.
- Internal Plant Quarantine arrangements between Trinidad and Tobago may have to be revised depending on the status of Tobago. Restrictions on trade in Bananas and Plantains may have to be lifted.

MATERIALS AND METHODS

The survey was conducted on a district basis. There are eight districts in Tobago and Table 1 indicates the dates on which each district was covered together with the local officers who assisted with the survey. In each district, the main roads were sampled every 2 to 3 km. Known Plantain and Banana farmers in each district were also visited. Samples were taken at all sites where leaf symptoms appeared. In all, 35 sites were sampled.

Table 1. Districts in Tobago included in survey, dates surveyed and relevant Tobago officers.

District	Date Surveyed	Main Tobago Officers Involved
Bethel	Tuesday 13th December 2011	Mr. Terrence Pope, Mr. Kenta John, Ms.Casey-Marie Boucher
Plymouth	Tuesday 13th December 2011	Mr.TerrencePope, Mr.Kenta John, Ms.Casey-Marie Boucher
Mt. St. George	Tuesday 13th December 2011	Mr.TerrencePope, Mr. Kenta John, Ms.Casey-Marie Boucher
Runnemede	Wednesday 14th December 2011	Ms.Casey-Marie Boucher, Ms. Duke, Mr. Kenta John,
Goldsborough	Wednesday 14th December 2011	Ms. Casey-Marie Boucher, Ms. Duke, Mr. Kenta John,
Belle Garden	Wednesday 14th December 2011	Ms.Casey-Marie Boucher, Ms. Duke, Mr. Kenta John,
Roxborough	Thursday 15th December 2011	Ms.Casey-Marie Boucher, Ms.JemDuke, Mr. Kenta John, Mr.Terrence Pope, Ms. KadieRobinson
Charlotteville	Thursday 15th December 2011	Ms.Casey-Marie Boucher, Ms.JemDuke, Mr. Kenta John, Mr. Terrence Pope, Ms.KadieRobinson

The level of infection at sites was noted using the following criteria:

- Youngest leaf with visible symptoms. Black Sigatoka symptoms on leaves 1 to 3 indicate severe infection.
- The stage of infection present. The presence of stages 4 and 5 on young leaves indicate a high level of infection.
- The presence of Yellow Sigatoka symptoms. The presence of Yellow Sigatoka indicates that Black Sigatoka has only recently been introduced in the area (within the last two years). Black Sigatoka usually displaces Yellow Sigatoka in time.

During the diagnostic procedure, slides for microscope examination were prepared using (1) the quick method of lifting fungal structures with clear sticky tape (Scotch tape) and placing same on a glass slide with cotton blue in lactophenol stain, and (2) the scraping of epidermal tissue of lesions and staining with cotton blue in lactophenol stain and covering with a glass cover slip. The slides were then examined for diagnostic *Mycosphaerella Fijiensis* conidiophores and conidia.

RESULTS AND DISCUSSION

The results of the survey are presented in Table 2. Black Sigatoka Disease was found to be widespread in Tobago. Of the 35 sites visited, 28 were positive for the presence of the disease. Infection levels were noticeably lighter in the Crown Point/Bon Accord area where some sites showed no symptoms of the disease (Map 1). In the North Eastern regions of the island, also, infection levels were light. Heaviest infection levels occurred in the mid-western part of the island from Buccoo to Runnemede. This area includes the most populous part of Tobago and its main town of Scarborough.

Both Black and Yellow Sigatoka symptoms were observed at sites in Runnemede, Belle Garden and Roxborough, all areas generally northeast of the populous areas of the island. The presence of Yellow Sigatoka suggests relatively recent introductions of Black Sigatoka in the area as Black Sigatoka tends to replace Yellow Sigatoka in two to three years.

From the results, the following may be inferred:

- Disease introduced from Scarborough port. The light infection in and around the airport at Crown Point and the seaport at Charlotteville suggests minimum traffic of diseased material in these areas.
- Disease may have been introduced two to three years ago, based on the presence of Yellow Sigatoka and large areas of light infection.
- The slow spread to the northeast of the island may be due in part to the prevailing wind direction, which blows from North-East. Wind is a major method of spread of the disease.
- Man has been a major vector for rapid spread.
- Quarantine needs to be improved on the island. Since its introduction in Trinidad in 2003, Tobago has been notified about the Black Sigatoka threat, extensive training of agricultural officers, quarantine officers and farmers were done and internal plant quarantine measures between the two islands were devised.

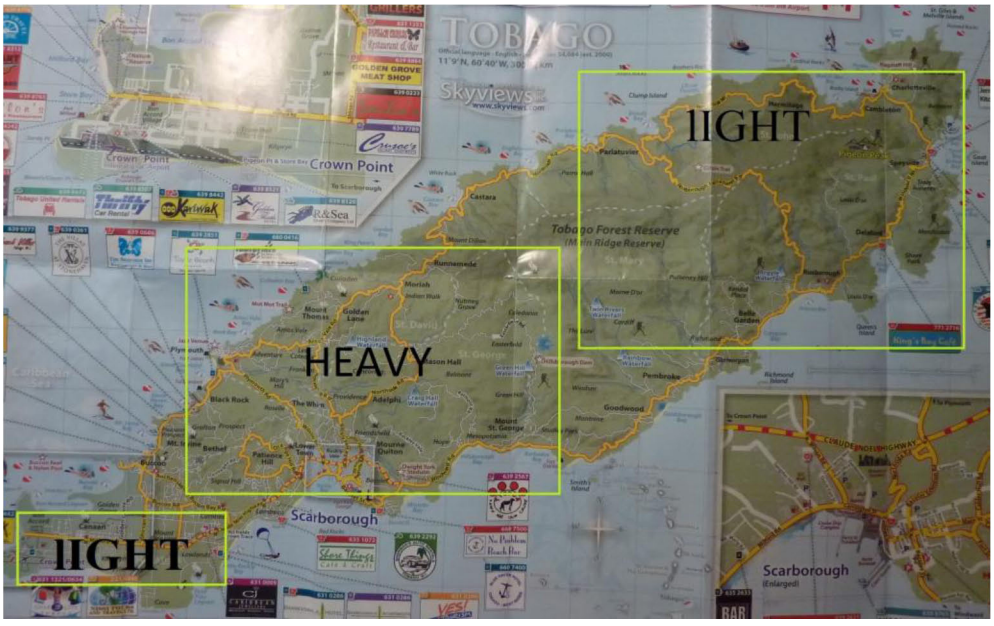
RECOMMENDATIONS

Black Sigatoka Disease is far too widespread at this time to attempt any eradication programme. Farmers traditionally do not apply any pesticides to control leaf diseases in *Musa* spp. in Tobago. To save the industry in the island, an aggressive management programme should be implemented. To this end, the following is recommended:

- A massive education and public awareness campaign needs to be implemented in the short term.
- Extension Officers to work closely with farmers for the coordinated development of management strategies. For control of this disease, it is important that large areas be controlled together as opposed to the individualism of farmers, bearing in mind the fact that the disease is transmitted by wind, water and human movement.
- A functioning diagnostic laboratory for pests and diseases needs to be developed on the island.
- Protocols for internal plant quarantine between the islands need to be developed to prevent subsequent waves of introductions of this and other exotic pests.
- Serious borer problems in Charlotteville were discovered (Plate 2) and assessed to be the major limiting factor to production in that area. This and other pests and diseases in *Musa* also need to be addressed for the development of the industry.

Table 2. Results of Tobago Survey for Black Sigatoka Disease (BS), 13-16 December 2011. YS=Yellow Sigatoka

DATE	LOCATION	TOWN	VARIETY	SIGATOKA STATUS
13/12/11	Store Bay Local Road	Crown Point	Plantain	Negative
13/12/11	Milford Road	Bon Accord	Plantain	Negative
13/12/11	Hope Farm Vet. Lab	Mt. St. George	French Plantain	Positive BS
13/12/11	Lp # 519 Village St. no. 2	Mt. St. George	Plantain	Positive BS
13/12/11	#29 Bacolet Point	Bacolet	French Plantain	Positive BS
13/12/11	Lp # 441 Windward Rd	Mt. St. George	Moko fig	Negative
13/12/11	Lp # 519 Mt. St. George Main Rd	Mt. St. George	Plantain	Positive BS
13/12/11	Studley Park Dump Rd	Mt. St. George	French Plantain	Positive BS
13/12/11	Belmont Branch Rd	Mason Hall	Plantain &Lacatan	Positive BS
13/12/11	Adelphi Rd	Mason Hall	Plantain	Positive BS
13/12/11	LP # 131 Tablepiece Rd	Los Coteaux	Lacatan	Positive BS
13/12/11	Dent Land Trace	Los Coteaux	Plantain	Positive BS
13/12/11	Fort Bennett Junction	Black Rock	Banana	Positive BS
13/12/11	#3 Cocrico Avenue	Buccoo	Horse Plantain	Positive BS
13/12/11	Lp # 4 A Evelina Tr. Audrey Gardens	Bon Accord	Lacatan	Positive BS
14/12/11	Richmond Main Rd	Richmond	Plantain	Positive BS
14/12/11	Lure Station	Goldsborough	Plantain &Lacatan	Positive BS
14/12/11	Goldsborough	Goldsborough	Plantain (Chico)	Positive BS
14/12/11	Runnemede Main Rd	Runnemede	Gros Michel	Positive BS
14/12/11	Runnemede Local Rd	Runnemede	Plantain &Lacatan	Positive BS Positive YS
15/12/11	Lp # 760 Belle Garden Main Rd	Belle Garden	Lacatan	Positive BS Positive YS
15/12/11	Lammy Rd	Lammy Rd	Plantain &Lacatan	Positive BS
15/12/11	Lp # 265 Roxborough Main Rd	Roxborough	Lacatan	Negative Positive YS
15/12/11	Lp # 902 Delaford Main Rd	Delaford	Lacatan	Negative
15/12/11	King's Bay Main Rd	King's Bay Main Rd	Plantain &Lacatan	Negative
15/12/11	Lp # 04286 Speyside Main Rd	Speyside	Lacatan	Positive BS
15/12/11	Charlotteville	Charlotteville	Plantain	Positive BS
15/12/11	Hermitage Main Rd	Hermitage	Plantain &Lacatan	Positive BS
15/12/11	L'anseFourmi Main Rd	L'anseFourmi	Lacatan, Silk, Gros Michel	Positive BS Positive YS
15/12/11	Bloody bay Main Rd	Bloody Bay	Plantain	Positive BS
15/12/11	Bloody bay Main Rd	Bloody Bay		Positive BS
15/12/11	Bloody Bay Main Rd	Bloody Bay	Plantain	Negative
15/12/11	Lp # 418 Castara Main Rd	Castara	Plantain &Lacatan	Positive BS
15/12/11	Louis D'or	Louis D'or		Positive BS
15/12/11	Lamby Rd		Banana	Positive BS



Map 1. Heavy and light infection areas of Black Sigatoka Disease in Tobago. Heavy infection areas are designated when sites sampled were consistently infected, disease symptoms were frequently visible on leaf number 3 and no symptoms of Yellow Sigatoka Disease were observed.

Plate 1. Field with heavy infection of Black Sigatoka Disease in Central Tobago.

Plate 2. Severe Borer infestation of Banana stool in Charlotteville, Tobago. Stool toppled and broke at base from infestation. Brown/black necrotic areas are tunnels made by the borer. Borer larva in centre indicated by pointed finger.

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