Comparative studies on the development of Black Sigatoka on Banana (*Musa AAA*) and Plantain (*Musa AAB*)

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ABSTRACT

In several countries, banana and plantain are part of the staple food and sources of income and employment. Black sigatoka, caused by Mycosphaerella fijiensis, is the most important foliar disease of both Musaceae, inducing losses up to 100% production. The progress of Black Sigatoka was studied in commercial crops of banana cv. 'Williams' and plantain cv. 'Barraganete', during dry and rainy seasons, in Ecuador. Values of the Area Under Diseases Progress Curve were higher (AUDPC) for Banana. Was found a significant correlation between severity and number of hours with temperature (24-28 ºC) and relative humidity (>90%), measured at four or three weeks before severity assessment,.

Introduction

Banana (*AAA*) and Plantain (*AAB*) are two different species of ***Musa*** ,and have morphological and genetic characteristics of their own. However it has been considered that both crops have similar response to the pathogen M***ycosphaerella fijiensis*** (Black Sigatoka disease) and therefore control measures may be similar. A better understanding about the crops biodynamic, the organism involved and the interaction host-pathogen-environment, will lead to a more rational management strategy for each crop. The pathosystem Musa-Black Sigatoka en general lack of epidemiological studies, this work present some results of a simple comparative study between them under Ecuadorian conditions. Results were used to define an IPM control strategy for plantain farmers whose socioeconomic conditions as well as the ecosystem in use are quite different than those of the banana plantations.

Methodology

Banana, var. Williams and Plantain, var Barraganete were planted in an area of the PichilingueTropical Experimental Station, Quevedo, Los Ríos, Ecuador. The experimental plots were formed with two rows of six plants each, three rows of plants as borders and six replicates of each plot; the whole area was surrounded by two rows of corresponding plants. Two months old plantlets were initially planted three meters apart at the beginning of the rainy season and observed throughout till bunch harvest. Management was similar in both crops: weeding and choupon removal as needed; fertilization with NPK, follows soil analysis recommendations, and leaf pruning was the only measure taken against Black Sigatoka infection: every two or three weeks during the rainy and dry seasons respectively. The youngest spotted leaf (**YSL**), & a disease incidence (**DI**) was measure following Gould (1989), then the area under the disease progress curve was calculated. Mean differences between variables were analyzed with Tukey for p=0.01

Results

Banana plants reached the flowering stage one month before plantain, up to this stage the three variables used to qualified disease progress showed more severity on banana than on plantain (Table 1). The number of functional leaves (**NFL**) present at the flowering stage determine further evolution of bunches. That number has been established: for bananas 10 to 12 NFL, and 8 to10 for plantain. Banana reached the flowering stage with three leaves less than the minimum required (7 out of 10) while plantain had an acceptable NFL (9 out of 8), due to a faster disease evolution on banana leaves

Table 1 *Differences between plantain and banana with relation to incidence of Black Sigatoka as shown for the Area under the disease progress curve (AUDPC), the youngest spotted leaf (YSL) and number of functional leaves (NFL) at the flowering stage.*

Crop	AUDPC[1]	YSL	NFL
Banana (BW)	6370.41 a	4.67 b	6.93 b
Plantain (PBC)	5380.41 b	5.07 a	8.94 a

[1]/*Means with different letters are statistically different Tuckey Test, P=0.01*

Attempts were made to relate the disease incidence with weather parameters, and only minimum daily temperature gave differences for the two crops (Figure 1). However in plantain and banana the disease index followed the temperature pattern. With lower temperatures giving the lower disease incidence.

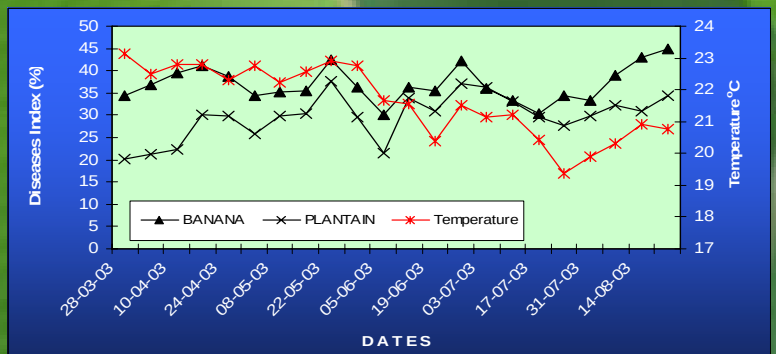

Figure 1 Weekly evolution of Black Sigatoka (Infection index in percent) on Plantain cv. Barraganete and Banana cv. Williams in relation to average daily minmum temperature. 2003.

A further step was to better define the relationship of the infection in plantain with weather parameters, using a Pearson correlation coefficient comparing the disease index in an specific day with the amount of hours with relative humidity >90% (RH> 90%), and a temperature range of 24-28oC during the former four weeks (Table 2). High correlation was found with weeks number four and three for the dry and rainy season respectively. Again no correlation was found with rain

Table 2 Pearson correlation Coefficient between severity of black sigatoka in plantain vs the week with the number of hours with relative humidity >90% (HR), Temperature (24-28 oC)

	Dry season				Rainy season			
Climatic	Week Nº				Week Nº			
Variable	1	2	3	4	1	2	3	4
HR	0,08	0,32	0,15	**0,67***	0,84*	0,65	**0,80***	0,68
Temp	0,68*	0,48	0,48	**0,68***	0,18	0,02	**0,92***	0,68
Precip	0,57	0,19	0,13	0,10	0,59	0,22	0,36	0,35

Conclusions

Plantain seems to have more natural resistance against the disease which can be used with advantage to design the strategy of management of Black Sigatoka disease, allowing management without or with a minimum fungicide use.

Temperature and relative humidity determine the dynamic of black Sigatoka.

A forecasting system should be a good mechanism for a rational management of the diseases.

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