



Research Paper

Disease incidence on FHIA 01 during the last cycle under standard conditions at Yangambi

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Abstract

With the aim of determining the incidence of fungal diseases on FHIA-01, a new tetraploid banana variety, some observations were carried out on FHIA-01 plants in the INERA-Yangambi (Km 17) research station. This incidence was assessed in relation to two diseases (*Fusarium* wilt and *Sigatoka* leaf spot). Infections observed on the 25 FHIA-01 plants recorded were 40% for *Fusarium* wilt and 8% for *Sigatoka* leaf spot, representing 2 plants out of a total of 25.

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I. INTRODUCTION

The banana plant is one of the most widely used crops in the Democratic Republic of the Congo, and its fruits are undoubtedly among the most important tropical fruits. In terms of production value, bananas and plantains rank fourth among globally important food crops (La Soudière, 2007 ; Alistair, 2010).

In producing countries, plantains represent an important food resource for more than 400 million people in tropical regions of the world. Globally, bananas and plantains are the fourth most important staple food, more important than maize. Two other major advantages make banana a vital food in many poor rural areas : its high nutritional value (rich in vitamins A, C, and B6, for example) and its year-round production. However, the crop is subject to a number of pest and disease constraints that sometimes discourage producers (CIRAD, 2007). To address this situation, several research works on pests have been conducted not only to control their geographical spread but also their impact on banana cultivation (Lassoudière, 2007). In the same context, the Honduran Foundation for Agricultural Research (FHIA) implemented a breeding program aimed at developing banana varieties capable of resisting various diseases (Anonymous, 1993). New tetraploid banana varieties are subject to several attacks under the conditions of Yangambi, including the FHIA-01 variety, although it is known to be resistant to fungal diseases and pests. Indeed, it is recognized that any crop grown outside its area of origin is always more susceptible to diseases compared to native flora. Furthermore, the direct and indirect effects of pests resulting from this susceptibility reduce banana yield or fruit quality (Lassoudière, 2007).

The most severe and destructive diseases affecting banana cultivation remain *Fusarium* wilt (Lassoudière, 2007; Yenga, 2009). New tetraploid banana varieties (FHIA) are generally resistant to fungal diseases such as black *Sigatoka* and *Fusarium* wilt. The susceptibility of FHIA varieties to diseases varies depending on the different stages of their vegetative cycle. These tetraploid varieties may also be susceptible to pest attacks due to the large size of their corms, which serve as a food source for pests.

I.3. OBJECTIVES

This study was conducted with the aim of:

- ✓ Determining the incidence of diseases on tetraploid banana varieties established in the collection field at Yangambi Km 17.

I.4. IMPORTANCE OF THE STUDY

This study is of particular scientific and agronomic importance, as it highlights the level of susceptibility of tetraploid varieties under cultivation. This first contribution indirectly supports the protection of genetic resources and, consequently, biodiversity management.

Study area

Our investigations were carried out at the INERA Yangambi experimental site, in Tshopo Province, Isangi Territory, Democratic Republic of the Congo. Its exact location is Km 17 to the right of the office of the National Rice Research Program. Geographic coordinates recorded by GPS were: latitude 00°52' N, longitude 24°31' E, altitude 481 m.

Climate

Yangambi and its surroundings experience an Af-type climate according to the Köppen classification, characterized by a hot and humid climate with average annual temperatures around 25°C. Rainfall is abundant, with an average annual precipitation of 1800 mm. Relative humidity ranges between 80% and 90% (Borex, 2005; Likoko, 2015).

Vegetation

The vegetation of Yangambi is generally an evergreen equatorial rainforest. It is rich in species, forming a dense evergreen forest. However, this richness of the central basin forests does not exceed that of the Amazon and Asian forests (Colyn, 1991). This vegetation is currently undergoing changes in its composition.

I.5. MATERIALS USED

A number of technical tools were used, including machetes, hoes, notebooks, and a portable ruler. The biological material consisted of the tetraploid banana variety (FHIA-01), with 25 plants in full cultivation in the collection field analyzed every two weeks during the 2014 period at the Yangambi (Km 17) site.

I.6. METHODS

Data collection consisted of identifying symptoms of the main banana diseases on FHIA-01 samples selected in the collection field. Symptom observations were carried out on all plants, given the limited number of plants identified during the survey. Fusarium wilt was identified based on external symptoms on the plant. For Sigatoka leaf spot, which appears as foliar lesions, the first step consisted of observing the third and fourth leaves from the unexpanded leaf, and the second step involved measuring the diameter of the lesions. All observations were conducted three times: first during the vegetative phase; second during male bud emergence; and the final observation was carried out on plants bearing bunches.

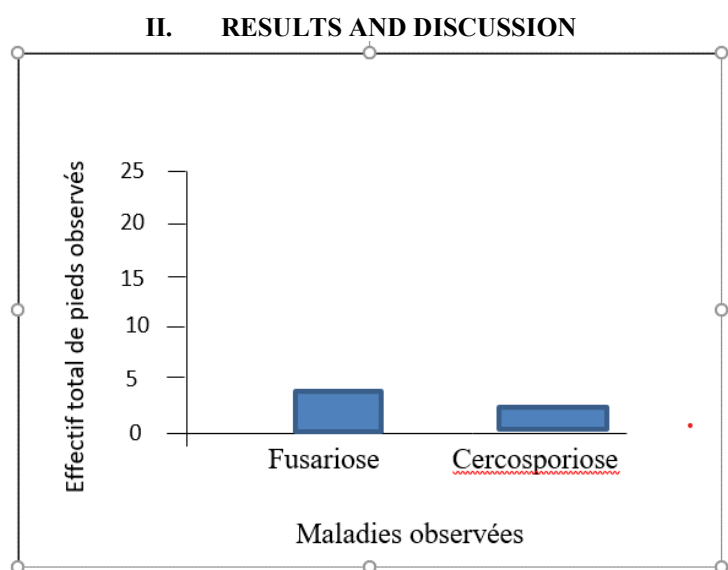


Figure. Incidence of Fusarium wilt and Sigatoka leaf spot

It appears from Figure 1 that 4 out of the 25 observed plants showed Fusarium wilt infection, representing 16%. Regarding Sigatoka leaf spot, 2 out of 25 plants, or 8%, showed symptoms during the first observation.

Likaya (2009), who observed FHIA 03 plants during the first cycle, reported that in percentage terms, the incidence of Sigatoka leaf spot was 10%, whereas Fusarium wilt reached 33.3%.

The difference between these two observations is attributed to the fact that the varieties were not the same from one study to another. The present study assessed disease incidence on the FHIA 01 variety, which differs from FHIA 03. Table 1 presents the severity of Sigatoka leaf spot on the 25 FHIA 01 plants observed in the INERA Yangambi (Km 17) collection field.

Table 1. Severity of Sigatoka Leaf Spot

Observations	Severity level	Number of plants per severity level	Total number of plants	Percentage
Level 1	12	25	48%	
Level 2	6	25	24%	
Level 3	0	25	–	
Level 4	0	25	–	
Level 5	0	25	–	
Level 6	0	25	–	

The reading of Table 1 shows that the severity of Sigatoka leaf spot is negligible, since out of 18 affected plants, 16 exhibited minor symptoms corresponding to level 1, while 6 plants showed level 2 lesions according to the scoring scale of *Mycosphaerella fijiensis* infection.

These low-level spots indicate the presence of infection; however, at this stage, the disease can be controlled through simple pruning of leaves bearing these minor lesions.

No level 3 lesions were observed on FHIA 01 plants during the last cycle under the INERA-Yangambi collection conditions. The absence of large lesions associated with Sigatoka generally indicates that FHIA 01 maintains its resistance to the disease.

Fusarium wilt and Sigatoka leaf spot (2nd observation)

It appears from Figure 2 that 6 out of the 25 observed plants showed Fusarium wilt infection, representing 24%. Regarding Sigatoka leaf spot, 2 out of 25 plants (8%) showed symptoms. Considering the results obtained during the vegetative phase, the incidence of Sigatoka decreased, while that of Fusarium wilt increased.

For Sigatoka, this decrease may be interpreted as a plant response masking disease symptoms that had already appeared during the vegetative phase. It may also reflect an overestimation during the first observation.

Fusarium wilt and Sigatoka leaf spot (3rd observation)

Figure 3 shows that 10 out of the 25 observed plants were affected by Fusarium wilt, representing 40%, while Sigatoka-infected plants remained at 8% (2 plants out of 25). Compared to the second observation, Sigatoka incidence remained stable, whereas Fusarium wilt increased from 16% to 40% during the third observation.

III. CONCLUSION

The present study aimed to determine the incidence of diseases on FHIA 01 during the third cycle. FHIA-01 is a new tetraploid banana variety established in the INERA-Yangambi collection.

Regarding the results obtained, it should be noted that a total of 25 plants were observed, and all were mature.

For fungal diseases, some plants of the FHIA 01 tetraploid banana variety showed symptoms (spots) corresponding to the first and second stages, and rarely the third stage of Sigatoka leaf spot.

Regarding the infection rates among the 25 FHIA 01 plants observed, Fusarium wilt infection reached 40%, while Sigatoka leaf spot was 8%, representing 2 plants out of a total of 25.

Considering the endemic nature of these diseases in the Yangambi environment, it can be concluded that the observed infection levels are tolerable, although the Fusarium wilt incidence should not be underestimated. This characteristic is also linked to the resistance profile of the FHIA 01 variety.

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