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Research Paper

Assessment of pest attacks on the banana variety (Libanga Blanc) during the last cropping cycle under Yangambi conditions

KelekeleKwengene John[1,3]*, AluaLitwanga Léon[1], AssumaniAngbonda Dieu Merci[1], Babila Abraham Peter[1], Bakumi Bafelo Jean Paul[1], Ebandabua Alingo Prosper[1], Lisungila Litwanga Rodeo[1], Mambokolo Molongo Charles[2], Litucha Bakokola Joseph[2]

[1]*National Institute for Agronomic Study and Research of Yangambi, P.O. Box 2037 Kinshasa, Democratic Republic of the Congo*
[2]*Faculty Institute of Agronomic Sciences of Yangambi, P.O. Box 1232 Kisangani, Democratic Republic of the Congo*
[3]*University of Kisangani, Faculty of Agronomic Sciences, P.O. Box 2012 Kisangani, Democratic Republic of the Congo*

ABSTRACT
The present study aimed to evaluate the pest attack rate on the banana variety Libanga Blanc during the last cropping cycle.
Regarding the results obtained, it should be noted that a total of 25 plants were observed, and all were mature, as indicated by the average pseudostem height and diameter values of 4.64 m and 37.9 cm, respectively.
Concerning nematode infestation, it was observed that several roots of this variety were attacked. Consequently, the infestation rate reached 100%. However, the variety has the ability to produce a high number of roots, which may be considered a replacement mechanism for infested roots. In this way, the damage potentially caused by nematodes is not directly visible on Libanga Blanc plants.
Attack by the banana weevil (Cosmopolites sordidus) was also significant, as indicated by the galleries observed. From the beginning to the end of the observations, 18 out of 25 plants showed weevil galleries, corresponding to an attack rate of 72%.

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I. INTRODUCTION

The Democratic Republic of the Congo ranks second in banana production (Swennen & Rosales, 1994). According to Ibap (1993), plantain production in the DRC accounts for 23% of the West African population's consumption. Plantains and bananas are produced throughout the country, with 80% coming from the provinces of Tshopo, North Kivu, Equateur, Bas-Congo, Bandundu, and Maniema.

In these provinces, production is more concentrated in forest zones than in savanna areas. Tshopo Province, with Kisangani as its capital, ranks first in national production with more than 600,000 tons, mainly plantains, representing one-third of total production.Banana diseases are abnormalities resulting from alterations in the plant's physiological or biochemical processes. These alterations are expressed through symptoms that may be external or internal in affected plant tissues (Valimunzigha, 2008 in Bokana, 2011). This ultimately leads to reduced production and yield losses ranging from 40% to 100% of crop potential. The situation is particularly concerning in rural areas where phytosanitary products are not easilyaccessible.Among the various banana diseases observed in our study area, plantain varieties are highly affected under Yangambi conditions, including the Libanga Blanc variety. This is why we evaluated whether this variety could be considered among the most vulnerable plantain varieties under Yangambi conditions.

Indeed, transferring a plant to another ecological region often leads to adaptation difficulties, making it more susceptible to pests and diseases, which results in yieldlosses.The local Libanga Blanc variety is believed to be susceptible to pest attacks due to the odor released by a liquid that oozes from the corm when it is cut with a machete. This odor attracts pests, especially weevils, which feed on the corm once they reach it.

OBJECTIVES

- ✓ To identify certain pests and study their morphology
- ✓ To evaluate the pest attack rate on the local variety "Libanga Blanc" during the last cropping cycle at Yangambi.

1.5. IMPORTANCE OF THE STUDY

From a scientific perspective, this study helps to determine the level of pest attack in the collection field and to assess the susceptibility of the variety to infestations.

1.6. STUDY AREA

Investigations were conducted at the INERA-Yangambi experimental site in Tshopo Province, Isangi Territory, Democratic Republic of the Congo. The exact location is Km 17 to the right of the National Rice Research Program office. GPS coordinates are: latitude 00°52'N, longitude 24°31'E, altitude 481 m.

1.7. MATERIALS USED

Technical materials used included machetes, hoes, and a graduated ruler. The biological material consisted of the Libanga Blanc banana variety, with 25 plants under full cultivation in the collection field, observed monthly during 2023 at the Yangambi site.

1.8. METHODS

Data collection consisted of identifying symptoms of major banana pest attacks on Libanga Blanc samples selected in the collection field. Observations were carried out on all plants due to the limited number of individuals identified during the survey.

1.10. BANANA WEEVIL (*Cosmopolites sordidus*)

1.10.1. BIOLOGY AND LIFE CYCLE

Cosmopolites sordidus (Germar, 1824) (Coleoptera: Curculionidae) is one of the main pests of plantains and bananas. The adult is black and measures 10–15 mm. It moves freely but is most often found between leaf sheaths, in the soil at the base of banana plants, or in plant debris. The weevil is nocturnal and highly sensitive to desiccation.

Adults may remain on the same plant for long periods, with only a small proportion moving more than 25 meters over six months. Flight is rare, and dispersion mainly occurs through infested planting material.

The banana weevil follows a K-selection strategy characterized by long lifespan and low fecundity. Adult lifespan is typically one year but may reach up to four years. Under humid conditions, adults can survive for several months without feeding. The sex ratio is 1:1. Females lay approximately one egg per week, depositing eggs individually in holes made with their rostrum, mainly in leaf sheaths and the upper part of the corm, especially in flowering plants and plant debris.

After hatching, larvae feed mainly inside the corm but may also attack the pseudostem. They pass through 5 to 8 larval stages. Pupation occurs in chambers near the plant surface. Development depends on temperature, requiring about 5 to 7 weeks in tropical conditions. Eggs do not develop below 12°C, which explains why the pest is rarely found above 1600 m altitude.

1.10.2. NEMATODES

Nematode infestation is characterized by early and often total loss of the root system. Affected plants are easily uprooted during windy periods. Discoloration from brown to reddish-brown is observed when roots are cut, indicating infection.

Common species include *Helicotylenchusmulticinctus*, *Meloidogynejavanica*, *Radopholus similis*, amongothers.

II. RESULTS AND DISCUSSION

Frequency and dimensions of observed plants

The table below presents the pseudostem dimensions used for observation in this study.

Individuals	Plant height (m)	Plant diameter (cm)
1	4,6	42,2
2	3,6	36,3
3	4,0	41,6
4	4,3	41,3
5	4,8	36,4
6	5,1	33,5
7	4,9	39,2
8	5,2	39,1

9	5,2	33,2
10	4,6	40,2
11	5,2	39,2
12	4,3	41,6
13	4,8	39,1
14	4,8	35,5
15	4,3	35,5
16	3,9	33,8
17	4,7	40,6
18	4,5	38,2
19	5,4	37,3
20	4,8	35,3
21	4,3	37,1
22	4,2	40,2
23	4,5	41,1
24	5,2	35,2
25	4,8	36,4
Total	116	949,1
X —	4,64	37,96

It appears from Table 1 that the field at Km 17 contains 25 individual plants, which could be used for further propagation of Libanga Blanc in other collections. This represents an effective means of conserving this local speciesunderYangambi conditions.The dimensions of recorded plants show relative homogeneity in pseudostemheight and diameter.It appearsfrom Table 1 that the field established at the Km 17 site contains a total of 25 individual plants that can be used to further propagate Libanga Blanc in other collections. This potential represents an effective means of conserving this local species under the environmental conditions of Yangambi and itssurroundings.Regarding the measuredcharacteristics of the recorded individuals, Table 1 indicates a homogeneity in pseudostem height values as well as in their average diameters.

Figure 1. Presents the level of nematode and banana weevil infestation observed on Libanga Blanc plants.

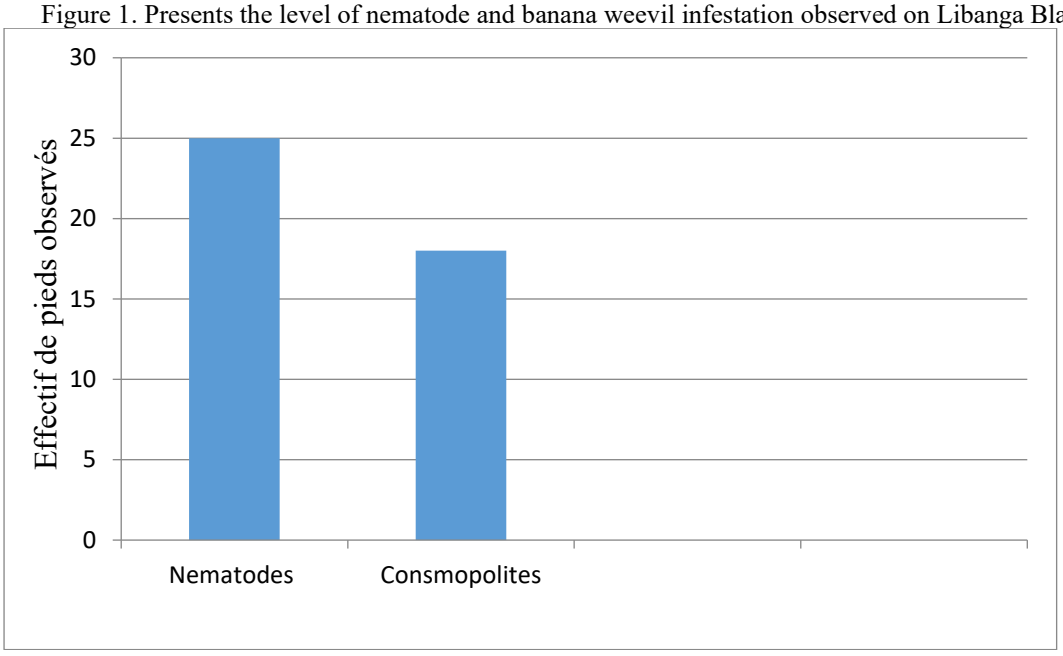

Fig. 1. Soil-borne pest attacks on Libanga Blanc plants

It appears from Figure 1 that all 25 Libanga Blanc plants were attacked by nematodes, as traces of this infestation were observed in all roots collected and split open.

Regarding banana weevil (*Cosmopolites sordidus*) attacks, 18 out of the 25 observed plants showed galleries around the corms of the sampled plants. This damage was estimated at 72%, indicating a permanent presence of weevils on Libanga Blanc plants during the last cycle.

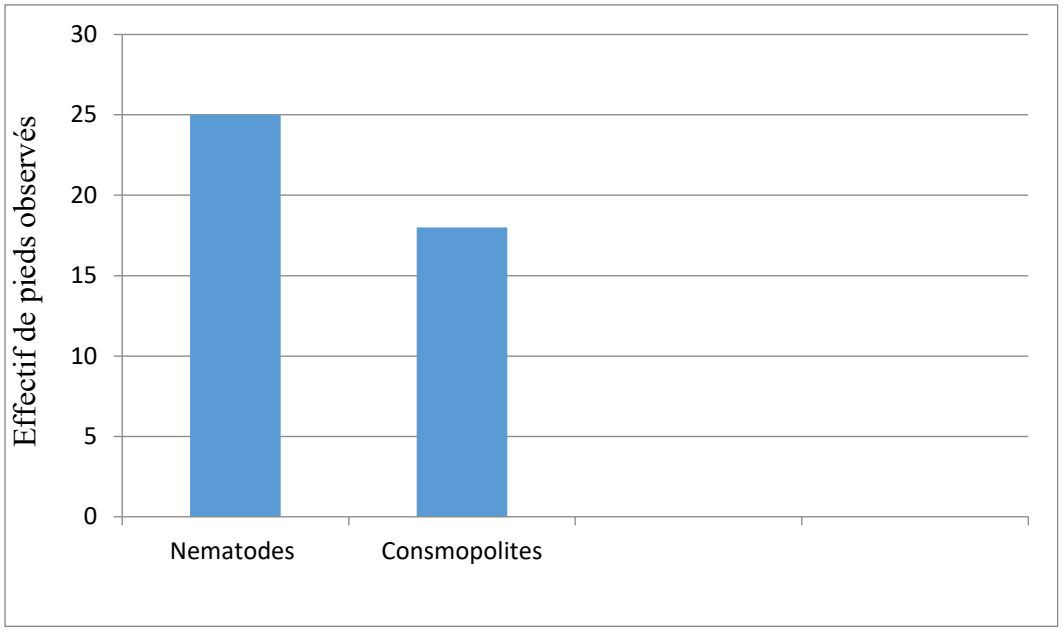

Fig 2. Soil-borne pest attacks on Libanga Blanc plants

It appears from Figure 2 that all 25 Libanga Blanc plants observed for the second time maintained the same nematode infestation rate recorded during the first observation conducted at the plant growth stage. This rate, as in the second observation, was 100%, indicating the presence of nematodes in the roots of all 25 plants.
Regarding banana weevils (*Cosmopolites sordidus*), the attack rate during the second observation remained the same as in the first observation, at 72%.

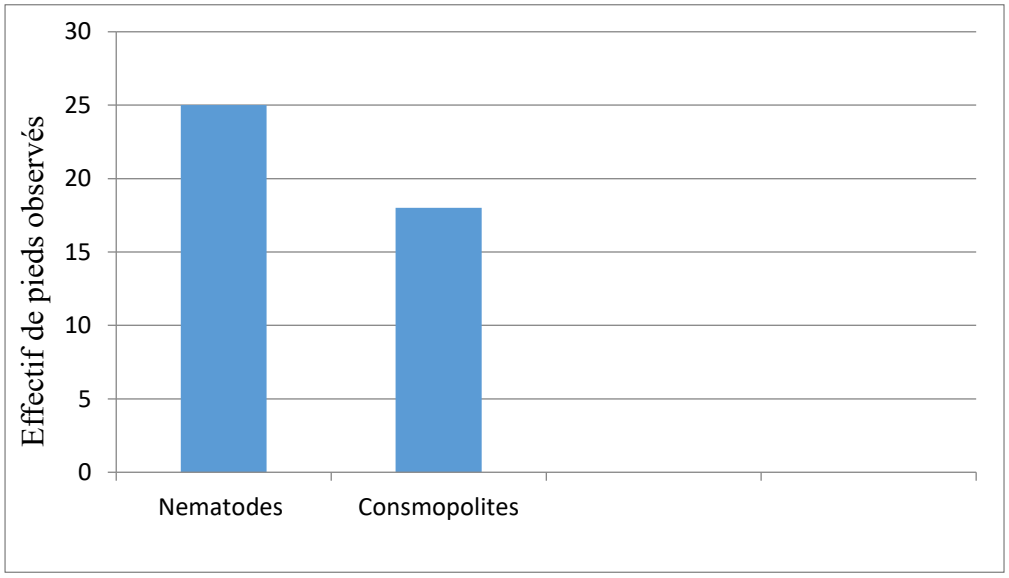

Fig 3. Soil-borne pest attacks on Libanga Blanc plants

Figure 3 shows that all 25 Libanga Blanc plants were attacked by nematodes, as was the case in previous observations, corresponding to a 100% infestation rate.
Regarding banana weevils (*Cosmopolites sordidus*), the same infestation rate of 72% was again recorded during the third observation.

III. CONCLUSION

The present study aimed to evaluate the pest attack rate on the Libanga Blanc variety during the last cropping cycle.Based on the results obtained, it should be noted that a total of 25 plants were observed, and all were mature, as indicated by the average pseudostem height and diameter values of 4.64 m and 37.9 cm, respectively.

Regarding nematode infestation, it was observed that many roots of this variety were affected. Consequently, the infestation rate reached 100%. However, the variety has the ability to produce a high number of roots, which can be considered a compensatory mechanism replacing infested roots. In this way, the damage potentially caused by nematodes is not directly visible on Libanga Blanc plants.

Banana weevil attacks were also clearly observed through the galleries they created. From the beginning to the end of the observations, 18 out of 25 plants showed weevil galleries, corresponding to a 72% attack rate.

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