

Agronomic characteristics of 12 genotypes of plantain

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Traore SIAKA, CNRA, Abidjan, Côte d'Ivoire

Yapi Eric YAPI, CNRA, Bingerville, Côte d'Ivoire

Antonin KOUASSI, UNA, Abidjan, Côte d'Ivoire

Anne-Marie Tatiana BEUGRE, UNA, Abidjan, Côte d'Ivoire

Judicael ADIKO, CNRA, Bingerville, Côte d'Ivoire

Patricia N'GORAN-HADDAD, CNRA, Bingerville, Côte d'Ivoire

Prudence DEFFAN, CNRA, Bingerville, Côte d'Ivoire

Sylvie N'nan DIBY, UPGC, Korhogo, Côte d'Ivoire

Didier MBEGUIE-A-MBEGUIE, Cirad, Montpellier, France



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ABSTRACT

Choosing plantain varieties adapted to local conditions in these times of climate change requires knowledge of their agronomic performance and disease resistance. The aim of this study was to obtain agronomic data from plantain genotypes grown under local conditions for the production of *aloco* (fried plantain). A total of 12 plantain genotypes were grown in June 2023. During their growth, measurements were taken on the number of leaves at flowering and harvest, plant size, cercosporiosis infection index, etc. At harvest, bunches mass, number of hands and number of fingers were determined. The results showed significant variations between genotypes, both in terms of disease susceptibility and physical development. Some genotypes, such as *Corne bout rond*, showed superior performance in terms of growth and pseudo-trunk circumference, while others, such as *Fhia 21*, showed less favorable results. The infection index revealed that varieties such as *SACI*, *Orishele*, and *Big Ebanga* were the most susceptible to cercosporiosis disease, while *Corne bout rond* and *Zakoi* proved more resistant. In terms of agromorphology, notable differences were observed in the number of leaves, with *Fiha 21* recording the highest number at flowering and harvest, while varieties such as *Orishele* showed the lowest number of leaves. In addition, the height of the banana plants varied significantly, with *Corne bout rond* being the tallest variety and *Fhia 21* the shortest.

Key Words (10 maximum): plantain genotypes, agronomic parameters, bunches, circumference, index of infection, leave, height of plant

INTRODUCTION

As part of RTB's plantain breeding activities, the characterization of a local plantain-based product, namely *aloco*, was studied. This popular dish can be made from various plantain varieties, resulting in differences in quality depending on the type used. While new plantain varieties have been developed to enhance food security, their suitability for *aloco* production remains to be fully explored. This report examines the agronomic characteristics of the plantain varieties used in *aloco* preparation

1 MATERIAL AND METHODOLOGY

1.1 Material

The planting material used in this study comprises twelve plantain varieties from the CNRA collection at the Bimbresso research station. The varieties are Corne Bout Rond (CBR), BITA 3, Corne 1, SH 3640, French clair, Fhia 21, Zakoi, SACI, PITA 3, Big ebanga, Orishele and French sombre

1.2 Methodology: Setting up and running the trial

1.2.1 Experimental device

The trial was set up in a completely randomized 3-block design, with 2 x 2 m spacing between plants. On each row of each block, 9 plants were lined up, i.e. 27 plants per variety. This layout was designed to guarantee optimum growth and development conditions for each specimen studied.

1.2.2 Maintenance

Plot maintenance involved manual weeding with a machete as soon as weed growth became heavy, in order to limit competition for nutrients between weeds and banana plants. Staking consisted of installing bamboo stalks vertically close to the plants, then tying them with string to ensure their stability and prevent them from falling in bad weather, particularly strong winds.

1.2.3 Harvest

Harvesting began nine months after planting, preferably when the bunches were ripe

1.2.4 Data collected

The data collected concerned the health status of the plantains and the agro-morphological parameters of the banana plants.

1.2.5 Plant health

Plant health was assessed using the infection index, which represents the proportion of necrotic leaf surface on the whole plant (Stover, 1971; Gauhl et al., 1993). This assessment began at flowering and continued weekly until harvest. At each observation, the number of leaves per plant was counted, and the rate of necrotic leaf area was estimated for each leaf. The assessment was based on a scale of 0 to 6, where a score of 0 corresponded to a healthy leaf, while affected leaves were scored from 1 to 6 according to the severity of symptoms, ranging from mildly to severely affected (Fig 1 & Table 1). The infection index was calculated using the following formula:

$$IF = \sum n \times 100 / NF \times 6$$

IF: Infection index ;

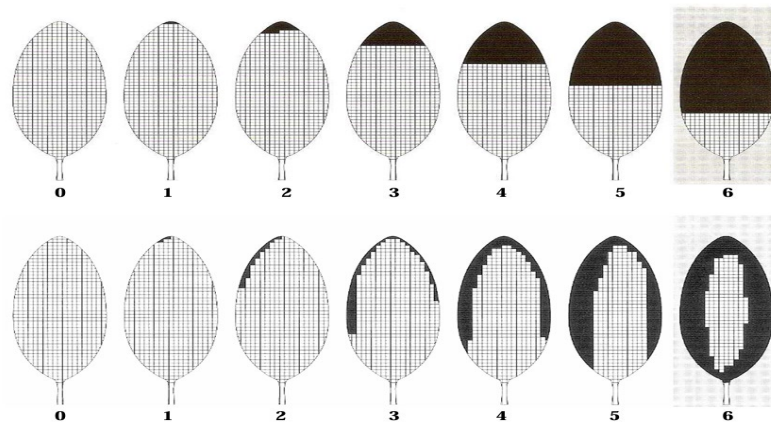


Figure 1 : Two examples of cercosporiosis severity rating scales (Stover 1971; Gauhl et al., 1993)

Table 1 : Cercosporiosis severity rating scales

Rating scales	Proportion of leaf area showing disease symptoms
0	No illness
1	Symptoms on less than 1% of leaf blades (only dashes and/or up to 10 spots)
2	Symptoms on 1 to 5% of the leaf blade
3	Symptoms on 6 to 15% of the leaf blade
4	Symptoms on 16 to 33% of the leaf blade
5	Symptoms on 33 to 50 % of the leaf blade
6	Symptoms on 51 to 100 % of the leaf blade

1.2.6 Agronomic parameters of plantain genotypes

Monthly measurements were taken from January onwards on the following parameters:

- The height of the pseudo-trunk measured from the collar to the base of the “V” formed by the last two fully unrolled leaves
- Circumference at 10 cm
- Number of living leaves

1.3 Statistical analysis

The data collected were subjected to an analysis of variance using R software. In case of significant differences, means were separated using the DUNCAN test to distinguish homogeneous groups at the significance level $\alpha = 0.05$

2 RESULTS

2.1 Vegetative and pathological parameters of plantain genotypes

2.1.1 Index of infection of plantain plants by cercosporiosis disease

The infection index measures the rate of leaf area destroyed by disease on a banana plant at a given time. Statistical analysis showed a significant difference between the varieties observed, with four homogeneous groups. The infection index was high in banana plants of varieties such as SACI, ORISHELE and BIG EBANGA with respective percentages of (56.62%, 55.90% and 55.81%), while the varieties CORNE BOUT ROND and ZAKOI presented the least severe infection indices with respective percentages of (36.23% and 36.48%), as shown in figure 2.

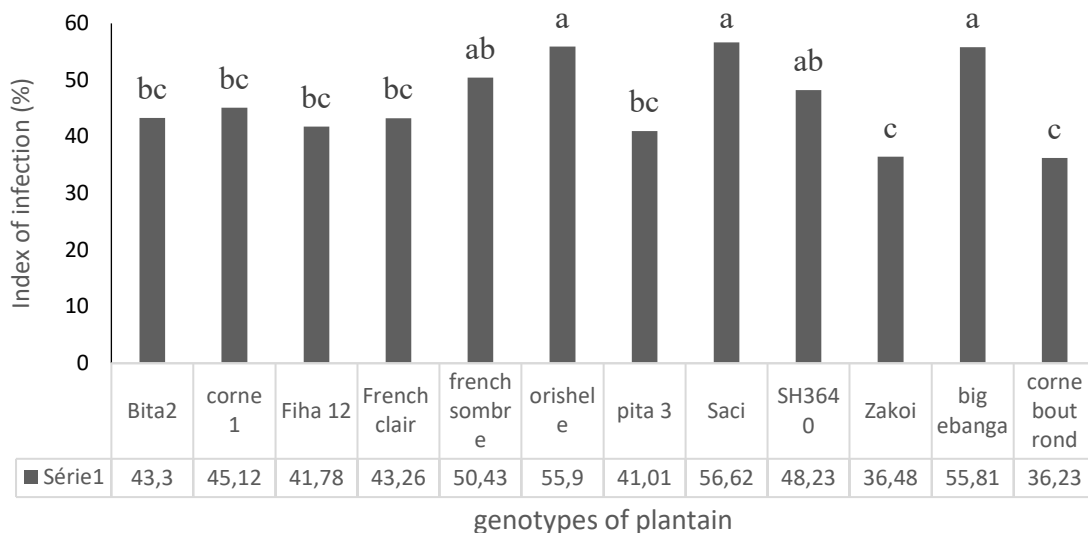


Figure 2: Index of infection of plantain plants

2.1.2 Number of leaves at flowering

Statistical analysis of leaves at flowering revealed a significant difference between the different varieties, highlighting four homogeneous groups. Fiha 21 had the highest number of leaves at flowering. On the other hand, Corne bout rond, BITA 3, SH 3640 and Zakoi recorded the lowest averages, with 8.80, 8.75, 8.60 and 8.60 leaves respectively (Table 2).

2.1.3 Number of leaves at harvest

Statistical analysis revealed a significant difference between varieties, distinguishing seven homogeneous groups. Corne bout rond had the highest number of leaves at harvest, with an average of 6.4, while Orishele had the lowest, with an average of 4.2. Varieties SH 3640 and Zakoi averaged 6.2 leaves, followed by Corne 1 with an average of 6 leaves. The BITA 3 and SACI varieties each averaged 5 leaves at harvest, while the

French clair variety averaged 4.8 leaves. Finally, the Big Ebanga, French sombre and PITA 3 varieties averaged 4.6 leaves at harvest (Table 2).

Table 2 : Number of leaves at flowering and at harvest to plantain genotypes

Plantain genotypes	NFF	NFH
BITA3	8,75±1,89 d	5±1,15 bcd
Corne bout rond	8,80±0,44 d	6,4±0,54 b
Big ebanga	10,40±0,54 bc	4,6±1,81 cd
French clair	9,40±0,54 cd	4,8±0,44 bcd
Corne 1	9,40±1,14 cd	6±1 bc
French sombre	9,40±0,54 cd	4,6±0,89 cd
Fiha 21	12,60±1,14 a	9,20±2,04 a
Saci	11,20±0,44 b	5±1 bcd
Orishele	9,20±0,83 cd	4,2±1,30 d
Zakoi	8,60±1,34 d	6,2±0,44 bc
SH 3640	8,60±0,54 d	6,2±0,83 bc
Pita3	9,80±0,44 cd	4,6±1,34 cd
P < 0,005	0,001	0,001

Note: Mean values with different letters within the same column are significantly different at 0.05

NFF: number of leaves at flowering; **NFH** : number of leaves at harvest

2.1.4 Height at flowering

The results showed a significant difference between the varieties, regardless of the parameters considered (Table 1). Concerning the plant height, Corne bout rond variety was the tallest, with an average of 215 cm, while the Fhia 21 variety was the shortest with an average of 122 cm (Table 3).

2.1.5 Pseudo stem circumference

The pseudo-trunk circumference at 100 cm from the ground of SH 3640 variety was the highest (56.8 cm) compared to the other varieties. The Fhia 21 variety showed the lowest circumference value (Table 3).

Table 3 : Height and stem circumference of plantain genotypes

Plantain genotypes	Height of plant	Stem circumference
Big Ebanga	154.89 ±28.74 ef	43.50 ±7.87 gh
Bita 3	175.93 ±47.45 bcde	49.06 ±11.02 bcdef
Corne bout rond	215.00 ±59.27 a	52.54 ±10.60 bcd
Corne 1	149.22 ±41.76 f	42.37 ±11.90 gh
Fiha 21	122.87 ±38.50 g	37.89 ±12.94 h
French clair	174.47 ±59.27 cdef	45.77 ±12.86 defg
French sombre	194.06 ±61.16 abcd	46.43 ±11.79 cdefg
Orishelle	172.55 ±51.33 cdef	45.21 ±11.15 efg
Pita 3	194.97 ±47.22 abcd	51.70 ±9.08 bcde
Saci	202.40 ±54.71 abc	54.92 ±11.53 abc
SH 3640	170.85 ±34.50 def	56.82 ±9.88 ab
Zakoi	172.16 ±73.16 cdef	44.45 ±13.06 fg
Probabilité< 0,05	0,01	0,001

Note: Mean values with different letters within the same column are significantly different at **0.05**

2.2 Production parameters of plantain genotypes

2.2.1 Planting to Flowering interval

The Bitá 3 and Zakoi genotypes flowered early around 209 days after planting. unlike Big Ebanga, Fhia 21 and Saci which flowered late. Zakoi and Saci have a short ripening time. while French Clair has the longest (Table 4).

2.2.2 Bunch weight

Fhia 21 had the highest bunch weight while the French sombre, Zakoi, Corne 1 and Big Ebanga genotypes showed the lowest ones (Table 4).

2.2.3 Number of hands

The Orishele genotype stands out, displaying a significantly higher value than the other varieties. The Pita 3 genotype has the lowest value (Table 4).

2.2.4 Number of fruits

Bitá 3 and SH 3640 varieties stood out, showing higher values than the other varieties. The variety Big Ebanga had the lowest value. However, there is no significant difference in the numbers of fruits between Corne bout rond (CBR), Big Ebanga and Corne 1 (Table 4).

Table 4 : Production parameters of plantain genotypes used

Plantain genotypes	Planting to Flowering interval (D)	Bunch weight (Kg)	Number of hands	Number of fruits
Corne bout rond	240 d	5.7 cd	6.7 a	30.5 c
Saci	303 a	8.3 b	7.0 a	44.4 b
Pita 3	240 d	7.3 bc	4.6 c	48.8 b
French sombre	274 c	5.2 cd	5.1 bc	49.0 b
Bitá 3	208 e	8.2 b	6.0 b	69.5 a
French clair	255 bc	5.8 d	5.4 bc	52.9 b
Orishele	278 b	5.6 cd	7.3 a	36.0 bc
Zakoi	210 e	5.0 d	5.4 b	49.8 b
SH 3640	243 d	7.8 b	6.5 ab	69.3 a
Big ebanga	306 a	4.5 d	6.5 ab	23.0 c
Corne 1	273 c	4.7 d	6.5 ab	28.2 c
Fhia 21	305 a	10.9 a	5.8 b	63.2 a

Note: Mean values with different letters within the same column are significantly different at 0.05

CONCLUSION

This study highlighted the agrophysiological and phytopathological performance of twelve plantain varieties under field-grown conditions. The results showed significant variations between varieties, both in terms of disease susceptibility and physical development. Some varieties, such as Corne bout rond, showed superior performance in terms of growth and pseudo-trunk circumference, while others, such as FIHA 21, showed less favorable results. The infection index revealed that varieties such as SACI, Orishele, and Big Ebanga were the most susceptible to cercosporiosis disease, while Corne bout rond and Zakoi proved more resistant. In terms of agromorphology, notable differences were observed in the number of leaves, with Fiha 21 recording the highest number at flowering and harvest, while varieties such as Orishele showed the lowest number of leaves. In addition, the height of the banana plants varied significantly, with Corne bout rond being the tallest variety and Fhia 21 the shortest.