

Cooking Banana Consumption Patterns in the Plantain-growing Area of Southeastern Nigeria

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Keywords: Cooking bananas- Plantains- Consumption patterns

Summary

Cooking bananas (Musa spp., ABB genome) were introduced into Southeastern Nigeria by the International Institute of Tropical Agriculture (IITA) in the mid-1980s as an interim measure to reduce the incidence of black sigatoka disease (caused by the fungus Mycosphaerella fijiensis Morelet) on plantain. However, the people of this region were not familiar with their utilisation methods. To address this lack of the knowledge and thereby sustain cooking banana cultivation, IITA, in collaboration with the Shell Petroleum Development Company (SPDC) and the Nigeria Agip Oil Company (NAOC) commenced a training campaign on cooking banana processing methods. This study examined the patterns of utilisation of cooking bananas ten years after the training took place and compared them with plantain. About 95% of the households interviewed are consuming cooking banana, indicating a broad acceptance of the crop in the region. Overall, two ripening stages termed green and ripe are the most popular ripening stages for the consumption of both plantain and cooking banana, followed by partially ripe maturity stage. The most common forms of consumption for green plantain are, in decreasing order of importance, pottage, boiled, roasted, and fried. Green cooking banana is also mostly eaten in pottage and boiled forms, and less frequently in fried and pounded forms. Ripe plantain is mostly eaten in fried and pottage forms, while ripe cooking banana is mostly eaten in fried and raw forms. Partially ripe plantain is mostly eaten in pottage, fried, boiled, and roasted forms, while partially ripe cooking banana is eaten in fried, pottage and boiled forms. These results indicate that the consumption patterns of plantain and cooking banana are very similar. This similarity has greatly contributed to the rapid integration of cooking banana within the existing plantain consumption and cropping systems.

Résumé

Modes de consommation de la banane à cuire dans le sud-est du Nigeria

Les bananes à cuire (Musa spp., génome ABB) ont été introduites au Nigeria par l'Institut International d'Agriculture Tropicale (IITA) au milieu des années 1980 comme mesure transitoire pour réduire l'incidence de la cercosporiose noire (causée par le champignon Mycosphaerella fijiensis Morelet) sur le bananier plantain; mais il s'avéra que les paysans ne savaient pas comment la consommer. Pour remédier à ce problème et promouvoir l'adoption de la banane à cuire dans la région, l'IITA, en collaboration avec Shell Petroleum Development Company (SPDC) et Nigeria Agip Oil Company (NAOC), entreprit une campagne de formation des paysans sur les différentes façons de consommer les bananes à cuire. Environ dix ans après la formation, cette étude a examiné les différentes formes de consommation de cette culture parmi la population locale du sud-est du Nigeria. Près de 95% de ménages interrogés consomment actuellement la banane à cuire; ceci est une indication de l'adoption de cette culture dans la région. Dans l'ensemble, le plantain et la banane à cuire sont surtout consommés lorsque leur fruit est vert ou mûr, et dans une moindre mesure lorsqu'il est à moitié mûr. Les formes de consommation les plus courantes du fruit vert de la banane plantain sont dans l'ordre de grandeur décroissante: potage, bouilli, grillades et fritures. Quant à la banane à cuire, son fruit vert est également mangé comme potage ou simplement bouilli et dans une moindre mesure comme fritures ou pilé. Lorsque son fruit est mûr, le plantain est surtout consommé sous forme de fritures ou de potage alors que la banane à cuire est consommée surtout comme fritures ou comme bananes de table. A moitié mûr le plantain se mange surtout sous forme de potage, comme fritures, bouilli ou comme grillades alors que la banane à cuire à moitié mûre se consomme d'abord comme fritures puis sous forme de potage ou tout simplement bouillie. Ces résultats indiquent qu'il y a une grande similarité entre les formes de consommation de la banane plantain et celles de la banane à cuire dans la région enquêtée. Cette similarité aurait grandement contribué à l'intégration de la banane à cuire dans le système de consommation locale.

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Received on 14. 12. 00 and accepted for publication on 05. 07. 01

Introduction

The International Institute of Tropical Agriculture (IITA) introduced cooking bananas (*Musa* spp., ABB genome) from Asia into Southeast Nigeria in the mid-1980s through the International Network for the Improvement of Banana and Plantain Transit Centre (16, 17, 18). They were supposed to serve as an interim measure in checking the incidence of black sigatoka disease on plantain (7). Black sigatoka is a leaf spot disease (caused by the fungus *Mycosphaerella fijiensis* Morelet), which has become a major threat to plantain production in sub-Saharan Africa (SSA) (15, 19) reducing yield by up to 50% (6, 11, 15), and in some instances, leading to total crop failure. The long-term strategy consisted of the establishment of a plantain-breeding programme aimed at conferring black sigatoka resistance characteristics to plantains.

Plantain is among the major food crops in SSA where it serves as one of the major staples to about 70 million people in the region (5, 6). In addition to being an important staple for rural and urban consumers, plantain serves as an important source of income for smallholder farmers (2). In Nigeria alone, plantain is produced by about 49% of farming households as a main crop (12), while in eastern Nigeria, it ranks very high as a carbohydrate source (13).

The major cooking banana cultivars introduced were Cardaba, Bluggoe, Fougamou, Nzizi and Pelipita (7, 14). On introduction, plantlets were multiplied by means of *in-vitro* techniques and distributed directly to farmers, or indirectly through such institutions as State Ministries of Agriculture and Agricultural Development Programs; the Shell Petroleum Development Corporation (SPDC), the Nigerian Agip Oil Company (NAOC) and other non-governmental organisations (NGOs). Preliminary investigations (1, 4) revealed that farmers rejected the cultivars. Their reason was lack of knowledge on how to utilise the cooking banana fruit. They expected cooking bananas to have the same characteristics as plantains. Cooking bananas fruits are quite different from plantains in their morphology, physical characteristics (fingers size/form, pulp-to-peel ratio, dry matter, etc.), pulp carbohydrate composition (starch and sugar) and pulp texture or firmness of the pulp (3). As a result, cooking bananas have different post-harvest quality characteristics (durability and palatability) compared with plantains (3).

To address this development, IITA, in collaboration with SPDC and NAOC organised a project of generation and transfer of cooking banana post-harvest technologies to farmers and consumers. A number of cooking banana processing methods, which were mostly based on traditional plantain dishes (7), were developed and taken to the farmers and other end-users through training workshops/seminars, agricultural shows, food exhibitions, farmers' days and demonstrations. Since the introduction (about ten years ago) of the cooking banana processing methods, no effort has been made to establish whether or not cooking banana fruit is now consumed in the region and, if it is, to define the consumption patterns. This study investigates the level of cooking banana consumption in Southeast Nigeria and examines its consumption patterns vis-à-vis those of plantain. More specifically, this study investigates the major maturation stages and forms of cooking banana consump-

tion. This is vital for the adoption of the crop and its integration in the local cropping and consumption systems.

Methodology

The study was carried out in Southeast Nigeria where cooking bananas were initially introduced and where IITA, in collaboration with SPDC and NAOC, trained farmers and other end-users on cooking banana processing methods. The training was carried out among eleven farmer groups/co-operatives. These spanned through four states namely, Abia, Delta, Imo and Rivers. In each group, a list of members who took part in the training was compiled and a total of 232 respondents were randomly selected.

A structured questionnaire was designed and used in the collection of data from the respondents. Information collected included plantain and cooking banana consumption habits, maturation stages and forms of consuming plantain and cooking banana. Each respondent was asked to rank in decreasing order of importance the different ripening stages and forms in which he/she usually eats plantain and cooking banana. Data collection lasted from May 1998 to February 1999. Data analysis was based on descriptive statistics such as percentages and frequencies, while tables were used in presenting results.

Results and discussion

Plantain and cooking banana consumption habits

All the respondents consume plantain, while about 95% of them declared eating cooking banana. In the last month up to the time this information was gathered, about 4% of the respondents had not eaten plantain against 31% for cooking banana (Table 1).

Table 1
Distribution (%) of respondents by intensity of consumption of plantain and cooking banana in the last month (n= 232)

Intensity of consumption	Respondents (%)	
	Plantain	Cooking banana
0	4.0	30.6
1 - 5	34.8	45.7
6 - 10	28.2	8.6
11 - 15	5.2	1.9
16 - 20	7.4	1.4
21 - 25	0.4	0.0
> 25	14.1	3.7
When available	5.7	8.2

n = number of observations

The percentage of respondents corresponding to the different levels of consumption is higher for plantain than for cooking banana, except for the first range (1-5). About 7% of respondents had consumed plantain up to 20 times in the last month but this was only 1% for cooking banana; while 14% reported always consuming plantain against 4% for cooking banana. Although to some respondents, frequency of consumption of plantain or cooking banana is dictated by availability, the above results indicate that plantain consumption is far higher than that of cooking banana. This is most likely due to the fact that plantain is more cultivated than

cooking banana. However, the consumption of cooking banana by almost all respondents is an indication of its acceptance in the surveyed area. By implication, it fits into the people's consumption habits, and thus, has the potential of compensating for the yield loss due to black sigatoka in plantain. Increased production of cooking banana as well as a better awareness campaign on its utilisation methods will increase its consumption in the area.

Ripening stages of consumption of plantain and cooking banana

Farmers were asked to rank, in decreasing order of importance, the different ripening stages and forms in which they usually (prefer to) eat plantain and cooking banana. Results show that both plantain and cooking banana are eaten in the green, ripe, partially ripe (half-ripe), and sometimes over-ripe maturity stages (Table 2).

Table 2
Distribution of respondents (%) by crop (plantain and cooking banana) and by rank of maturity stages

Stage of maturity	Crop	P	Rank				
			1	2	3	4	5
Green	PL	96	54.3	22.4	22.9	0.0	0.4
	CB	88	49.5	24.2	25.8	0.0	0.5
Half-ripe	PL	71	7.9	56.1	36.0	0.0	0.0
	CB	68	14.7	55.3	30.0	0.0	0.0
Ripe	PL	98	41.9	37.4	20.7	0.0	0.0
	CB	85	50.3	29.9	19.8	0.0	0.0
Over-ripe	PL	2	0.0	0.0	50.0	50.0	0.0
	CB	2	20.0	20.0	0.0	60.0	0.0

Note: P = percentage of respondents (n = 232); PL = plantain; CB = cooking banana; Rank = 1 the most preferred maturity stage, R = 2 is the next most preferred maturity stage, etc.

About 96% of respondents reported eating plantain in green form, while 98% consumed it when it is ripe, and 71% in half-ripe form; the figures are respectively 88% (green), 85% (ripe), and 68% (half-ripe) for cooking banana. These results are consistent with Marriot and Lancaster (10) who found that in Africa, plantains are usually eaten in the green and ripe forms. The majority of respondents ranked green and ripe as their first preferred ripening stage for plantain consumption, while they ranked half-ripe ripening stage in the second or third preferred position. Over-ripe is the last ripening stage in plantain and cooking banana consumption: only 2% of respondents declared consuming plantain and cooking banana in the over-ripe form. The majority of them ranked over-ripe in the last position among the ripening stages at which both plantain and cooking banana are consumed. These results indicate that the profiles of ripening stages of consuming plantain and cooking banana are similar. Their relative rankings further reinforce the similarities of ripening stages (at which they are consumed) between plantain and cooking banana. However, it is germane to point out that decisions regarding the consumption of plantain / cooking banana in the partially ripe and over-ripe stages are

not consciously made, as the respondents in most instances could not differentiate partially ripe and over-ripe from ripe. Again, it is not a common practice for consumers to deliberately allow cooking banana or plantain become over-ripe before consumption. The respondents attributed several reasons for ranking the above ripening stages as 1 (i.e., as the most preferred maturity stage for consumption) (Table 3).

Table 3
Distribution (%) of reasons of consuming plantain and cooking banana at the most preferred stage of ripening (Rank = 1)

Reasons	Ripening stages							
	Green		Partially ripe		Ripe		Over-ripe	
	PL	CB	PL	CB	PL	CB	PL	CB
Nutritional	44	29	5	5	8	40	0	0
Medical	4	8	0	5	1	0	0	0
Food habit	5	5	9	0	3	1	0	0
Taste	44	55	45	90	87	57	0	100
Others	3	3	41	0	1	2	0	0
Total	100	100	100	100	100	100	0	100
n	124	101	22	21	93	139	0	1

Note: CB = Cooking banana; PL = Plantain; n = number of observations.

A look at the responses shows that "taste" is the major factor influencing the consumer's decision to choose the best ripening stage for consuming plantain and cooking banana. Most respondents think that cooking banana taste better than plantain when eaten green or half-ripe; the reverse is observed for the ripe maturity stage. Nutritional value is the second most important reason given by the respondents as the first reason for choosing the ripening stage at which they prefer to eat plantain and cooking banana. Most respondents think that plantain is more nutritious than cooking banana when eaten green; the reverse is observed for the ripe stage. Very few respondents indicated "medical value" as another reason to explain their first choice. The low percentage observed for "medical value" would mean that a large number of people are not aware of the "medical value" of plantain and cooking banana. As well as being a good source of energy, bananas are rich in vitamins A, C and B6 and contain high levels of several minerals, such as calcium, potassium and phosphorus (8). They are easy to digest and have a soothing effect in the treatment of gastric ulcers and diarrhoea and help to relieve stress and anxiety (9).

Consumption forms of plantain and cooking banana

The major forms of consuming plantain and cooking banana in the surveyed area are indicated in tables 4a, 4b, and 4c. The most common ways of consuming green plantain are, in decreasing order of importance (considering only the most preferred form, i.e. Rank = 1), pottage, boiled and roasted forms, and less frequently in pounded, soup and fried forms. For green cooking banana, the most common consumption forms are, in decreasing order of importance (also considering only the most preferred form, i.e. Rank = 1), pottage, boiled, fried, pounded, and less frequently in roasted

and soup forms.

In spite of slight ranking differences, the major forms of consuming green plantain and green cooking banana fruits are similar.

The major forms of consuming half-ripe plantain are pottage, fried, boiled, and less frequently in roasted form; while half-ripe cooking banana is mostly eaten in fried, pottage, and boiled forms. Except for the roasted plantain, consumption forms of both crops in half-ripe maturity stage are similar.

Fried, pottage, raw, and boiled forms are the major ways of eating ripe plantains. When ripe, cooking bananas are mostly consumed in fried, raw, pottage, and boiled forms. The consumption of cooking banana in raw form is due to the fact that some respondents still confuse cooking banana fruit with dessert bananas. Contrary to cooking bananas, very few respondents eat ripe plantains as dessert bananas. In addition, the duration of the ripe stage of cooking banana is very short compared to plantain.

Although the number of observations does not permit to draw statistically valid conclusions, the results on forms of consumption of both ripe and over-ripe plantains and cooking bananas suggest that their major ways of consumption are moin-moin (steamed cooking banana paste mixed with corn flour and spices), pottage, raw, and akara (fried cooking banana paste mixed with cassava granules and spices).

Summary and recommendations

The introduction of cooking bananas into Southeast Nigeria by IITA was aimed at securing an interim solution to the problem of black sigatoka disease on plantain; the long-term strategy being the breeding of black sigatoka resistant plantains. Though it fitted into the local plantain cropping system, farmers and consumers were not familiar with its processing methods. In order to address this problem and sustain cooking banana cultivation by the farmers, IITA, in collaboration with SPDC and NAOC, commenced a training campaign on

cooking banana processing methods. The aim of this study was to establish cooking banana consumption patterns about ten years after the training exercise.

Results show that about 95% of the interviewees are now consuming cooking banana. However, plantain consumption is far higher than that of cooking banana, most likely because plantain is more cultivated than cooking banana. This would also mean that either consumers prefer plantain to cooking banana and/or that there is still room for expanding cooking banana cultivation. The consumption of cooking banana by almost all the respondents is an indication of its acceptability in the study area and underlines its potential for expansion.

Overall, green and ripe are the major ripening stages of consuming both plantain and cooking banana. About 96% of the respondents reported eating plantain in green form, while 98% consumed it ripe; the figures are respectively 88% (green) and 85% (ripe) for cooking banana. Green and ripe forms are ranked first ripening stage of consuming plantain by about 55% and 42% of the respondents, respectively; the figures are 50% for the green form and 50% for ripe form in the case of cooking banana consumption.

Pottage, boiled, and roasted forms are the most common ways of consuming green plantain by the respondents. For green cooking bananas, pottage, boiled, pounded, fried, and roasted forms are the most common ways of consumption. When ripe, plantains are mostly eaten in fried, pottage, and boiled forms, while cooking bananas are mostly consumed in fried, pottage, and raw forms.

One striking observation is that the major forms of consuming cooking bananas in its various ripening stages are approximately close to those of plantains. In other words, there is high similarity of consumption forms between plantains and cooking bananas. The meaning of those results is that cooking banana consumption forms fit into the people's food system, and, therefore, has the potential to adequately supplement plantain.

Table 4a
Distribution (%) of respondents by ripening stage and by rank of consumption form of plantain (PL) and cooking banana (CB)

A	B	C	D	RANK						Total
				1	2	3	4	5	6	
Green	Boiled	PL	142	36	41	14	8	2	0	100
		CB	108	46	30	16	7	1	1	100
	Fried	PL	76	11	22	40	24	3	1	100
		CB	103	33	29	25	10	2	1	100
	Pottage	PL	194	57	28	11	3	1	1	100
		CB	126	54	29	10	6	1	0	100
	Pounded	PL	35	14	17	43	14	9	3	100
		CB	63	37	33	19	8	3	0	100
	Roasted	PL	153	28	36	22	12	2	0	100
		CB	30	23	27	40	7	3	0	100
	Soup	PL	37	14	22	30	22	14	0	100
		CB	16	13	25	6	31	25	0	100

Note: A = ripening stage; B = form of consumption; C = Crop; CB = cooking banana; D = number of respondents; PL = plantain; Rank = 1 is the most preferred form of consumption, Rank = 2 is the next preferred consumption form, etc.

Table 4b
Distribution (%) of respondents by ripening stage and by rank of consumption form of plantain (PL) and cooking banana (CB)

A	B	C	D	RANK						Total
				1	2	3	4	5	6	
Half-ripe	Boiled	PL	37	51	24	19	5	0	0	100
		CB	28	64	25	11	0	0	0	100
	Fried	PL	64	50	38	12	0	0	0	100
		CB	63	67	24	9	0	0	0	100
	Pottage	PL	66	62	30	6	2	0	0	100
		CB	44	57	36	5	2	0	0	100
Roasted	PL	31	29	32	32	7	0	0	100	
	CB	5	60	40	0	0	0	0	100	
Ripe	Akara	PL	2	50	0	0	50	0	0	100
		CB	19	53	16	16	16	0	0	100
	Boiled	PL	33	24	42	27	6	0	0	100
		CB	13	39	39	22	0	0	0	100
	Cake	PL	0	-	-	-	-	-	-	-
		CB	12	17	42	33	8	0	0	100
	Fried	PL	196	69	29	2	0	0	0	100
		CB	128	74	21	5	0	0	0	100
	Moin-moin	PL	13	39	31	23	8	0	0	100
		CB	25	32	32	16	20	0	0	100
	Raw	PL	43	5	58	28	9	0	0	100
		CB	95	33	42	21	2	2	0	100
	Roasted	PL	22	23	23	41	14	0	0	100
		CB	5	20	60	20	0	0	0	100
	Pottage	PL	126	52	46	7	2	2	0	100
		CB	58	40	47	12	2	0	0	100

Note: A = ripening stage; B = form of consumption; C = Crop; CB = cooking banana; D = number of respondents; PL = plantain; R = 1 is the most preferred form of consumption, Rank = 2 is the next preferred consumption form, etc.

Table 4c
Distribution (%) of respondents by ripening stage and by rank of consumption form of plantain (PL) and cooking banana (CB)

A	B	C	D	RANK						Total
				1	2	3	4	5	6	
Over-ripe	Akara	PL	2	100	0	0	0	0	0	100
		CB	4	75	25	0	0	0	0	100
	Boiled	PL	2	100	0	0	0	0	0	100
		CB	0	0	0	0	0	0	0	100
	Fried	PL	11	100	0	0	0	0	0	100
		CB	2	50	50	0	0	0	0	100
	Moin-moin	PL	21	95	5	0	0	0	0	100
		CB	18	94	6	0	0	0	0	100
	Pottage	PL	21	95	5	0	0	0	0	100
		CB	0	0	0	0	0	0	0	100
	Raw	PL	19	90	10	0	0	0	0	100
		CB	12	92	8	0	0	0	0	100
	Roasted	PL	1	100	0	0	0	0	0	100
		CB	0	0	0	0	0	0	0	0

Note: A = ripening stage; B = form of consumption; C = Crop; CB = cooking banana; D = number of respondents; PL = plantain; Rank = 1 is the most preferred form of consumption, Rank = 2 is the next preferred consumption form, etc.

However, a significant proportion of people still utilise cooking banana like sweet banana, while others do not know that cooking banana could be used in many other ways. This may be connected with a lack of adequate awareness on the utilisation methods of cooking banana. Therefore, to ensure full realisation of the potential of the crop in supplementing plantain in the food system, more effort should be channelled in creat-

ing awareness concerning its utilisation potentials. It is believed that, everything being equal, increased consumption of cooking banana will indirectly increase farmers' income from plantain. Likewise, increased utilisation of cooking banana, instead of plantain, in plantain-based food products is expected to positively affect farmers' income.

Literature

1. Akele S.A., 1996. Green River Project (GRP) of Nigerian Agip Oil Company. pp 65 - 66. In: R. Ortiz and M.O. Akoroda (Editors), Plantain and Banana: Production and Research in West and Central Africa, IITA, Ibadan, Nigeria.
2. Dorosh P., 1988. Economics of production and utilisation of plantains in Africa. IITA, Ibadan, Nigeria. 15p.
3. Eggleston G., Swennen R. & Akoni S., 1992. Differences in composition and texture among plantains, plantain hybrids and a cooking banana. Traditional African Foods – Quality and Nutrition, 179- 185.
4. Ferris R.S.B., Adeniji T., Chukwu U., Akalumhe Y.O., Vuylsteke D. & Ortiz R., 1996. Postharvest Quality of Plantains and Cooking Bananas. pp 15 - 21. In: R. Ortiz, and M.O. Akoroda (Editors), Plantain and Banana: Production and Research in West and Central Africa, IITA, Ibadan, Nigeria.
5. Frison E., 1997. Towards a *Musa* Improvement Programme. MusAfrica, 11, 5-6.
6. Gauhl F., Ferris S., Pasberg-Gauh, C. & Lawrence A., 1998. On-farm yield loss assessment of black sigatoka on plantain and banana. IITA Research Guide 67. IITA, Ibadan, Nigeria. 48p.
7. Hahn S., Vuylsteke D. & Swennen R., 1990. First reactions to ABB cooking bananas distributed in Southeastern Nigeria. pp 306 - 315. In: R.A Fullerton and R.H. Stover (Editors), Sigatoka leaf spot disease of bananas: proceedings of an international workshop held at San José, Costa Rica, March 28-April 1, 1989.
8. INIBAP, 2000. Banana, food for the poor. International Network for the Improvement of Banana and Plantain. Montpellier, France.
9. INIBAP, 2000. The many uses of *Musa*. International Network for the Improvement of Banana and Plantain. Montpellier, France.
10. Marriot J. & Lancaster P.A., 1983. Bananas and plantains. In: H.T. Chan Jr. (Editor), Handbook of Tropical Food, New York and Basel: Dekker.
11. Mobambo K. N., Gauhl F., Vuylsteke D., Ortiz R., Pasberg, C. & Swennen R. 1993. Yield loss in plantain from black sigatoka leaf spot and field performance of resistant hybrids. Field Crops Research. 35(1), 35- 42.
12. Nweke F.I., 1996. Cassava: A Cash Crop in Africa. COSCA Working Paper (14), International Institute of Tropical Agriculture, Ibadan, Nigeria. 79p.
13. Nweke F.I., Njoku J.E. & Wilson G.F., 1988. Productivity and Limitations of Plantain (*Musa* spp. cv AAB) Production in Compound Gardens in Southeastern Nigeria. Fruits, 43(3), 161-166.
14. Ortiz R., de Cauwer I. & Vuylsteke D., 1995. Adaptations of plantain hybrids and cooking bananas in Africa. In: Abstracts of XIV EUCARPIA (European Association for Research in Plant Breeding): Adaptations and Plant Breeding. Jyväskylä, Finland. July 31 - August 4, 1995.
15. Stover R., 1983. Effet du *Cercospora* noir sur les plantains en Amérique Centrale. Fruits, 38, 326- 329.
16. Van den Houwe I. & Swennen R., 1998. La collection mondiale du bananier (*Musa* spp.) au Centre de Transit de l'INIBAP à la K.U.Leuven: Stratégies de conservation et mode d'opération. Biotechnologie, Agronomie, Société et Environnement 2, 36- 45.
17. Van den Houwe I., Panis B. & Swennen R., 2000. The *in vitro* germplasm collection at the *Musa* INIBAP Transit Centre and the importance of cryopreservation. pp 255 – 260. In: F. Engelmann and H. Takagi (Editors), Cryopreservation of tropical plant germplasm, Current research progress and applications. JIRCAS/IPGRI Joint International Workshop: Tsukuba, Japan, 20-23 October 1998.
18. Vuylsteke D., Schoofs J., Swennen R., Adejare G., Ayodele M. & De Langhe E., 1990. Shoot tip culture and third-country quarantine to facilitate the introduction of new *Musa* germplasm into West Africa. IBPGR/FAO Plant Genetic Resources Newsletter 81/82, 5-11.
19. Wilson G.F. & Buddenhagen I., 1986. The black sigatoka threat to plantain and banana in West Africa production. IITA Research Briefs, 7(3), 3.

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