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The International Exchange and Testing
of

CASSAVA GERM PLASM in AFRICA



Proceedings of an interdisciplinary workshop
held at IITA, Ibadan, Nigeria
17-21 November 1975

Editors: Eugene Terry and Reginald MacIntyre

Cosponsored by the
International Development Research Centre
and the
International Institute of Tropical Agriculture

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Part D

Guidelines for the Establishment of a Cassava Improvement Project: the Zaïre Model

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The main objectives of the Programme National Manioc (PNM), a cooperative cassava program between the International Institute of Tropical Agriculture and the Government of Zaïre, is the improvement of cassava productivity and quality in Zaïre through breeding, improved culture management practices, and identification, study, and control of major cassava pests and diseases. PNM intends to utilize the results of research efforts from appropriate agencies, particularly IITA, in an effort to help find solutions to problems of cassava production in Zaïre.

The following steps are planned: (1) to establish a broad-based germ plasm comprising improved populations from IITA and other organizations and agencies; (2) to screen the materials for desirable qualities (disease resistance (cassava mosaic disease, cassava bacterial blight, and anthracnose); pest resistance (mainly mealy bug); high leaf retention especially during dry seasons; high yield and high starch content and, later, low HCN content); (3) to locate areas of maximum impact and conduct multilocal trials (preliminary and advanced yield trials) with each location constituting a centre of distribution of locally acceptable materials; and (4) to get local officials involved in uniformity and demonstration trials and most important, to identify local personnel for training to ensure the long-term improvement of the crop in Zaïre.

Local materials

About 200 clones collected from Zaïrean cassava cultivars and exotic introductions have been established by the PNM at M'Vuazi, Bas-Zaïre (Table 1). Some of these give a higher yield than those presently grown by farmers, and some of them (e.g. 02864) are improved clones. This particular line has many good characteristics including high yields, early maturity (12 months), moderate resistance to anthracnose, good architecture similar to Isunikekiyan in Ibadan, and very high foliage production especially during rainy seasons. Yet it has not been multiplied and distributed to farmers although it has been grown in Zaïre since 1950. Therefore, in addition to disease and pest problems (cassava bacterial blight, cassava mosaic disease, stem anthracnose, mealy bug), other factors limiting cassava productivity (multiplication and distribution of available materials, logistics, and personnel development) should be considered in establishing a cassava improvement program. The 200 clonal materials are being evaluated for resistance to important diseases and pests, yield, leaf retention, root characteristics, and general architecture. Bulkled polycross seeds from this collection will be sent to the Root and Tuber Improvement Program of IITA at Ibadan for incorporation into its program.

Introductions and other seed stock

Since quarantine regulations prohibit transfer of clonal cassava materials, PNM introductions into Zaïre are in seed form. About 100,000 improved seeds from 165 families supplied by IITA were established in M'Vuazi in December 1974. Also, in March 1975 a further 2500 seeds from 138 families were established in the same location.

Over 50,000 seeds from inbred lines of about six cassava varieties collected by farmers in areas adjoining M'Vuazi have been established. Open pollinated bulked seeds collected from the 1973 planting of the 200 local collections have also been established as well as bulked seeds from IITA (Table 1).

Table 1. Manioc established at M'Vuazi, Bas-Zaïre, by the PNM.

Clones	Source		Date planted
200	Local and exotic		11 Nov. 74
<i>Seeds</i>	<i>Families</i>	<i>Source</i>	
100,000	165	IITA	12-13 Dec. 74
50,000	Bulked hybrids	IITA	17-18 Dec. 74
2,000	Bulked (OP)	INERA	22 Dec. 74
50,000	Local inbred (Bas-Zaïre)	Farmers	16 Jan. 75
2,500	138	IITA	14 Mar. 75

Utilization of the materials

All the plants established are being evaluated for resistance to CBB, CMD and anthracnose. PNM plans to screen for mealy bug, a very important pest in Bas-Zaïre. Anthracnose is more serious in Zaïre than in many other parts of Africa. Unlike CBB and mealy bug, and like CMD, its symptoms are fully expressed during both dry and rainy seasons. Many of the heterozygous stands from the improved populations from IITA exhibit resistance to CBB, CMD, and moderate resistance to anthracnose.

Multilocational trials

Selected plants from the nurseries will be established at several ecological locations in Zaïre (Table 2). The soil type in these locations ranges from very poor sandy soil to rich,

Table 2. PNM locations for 1975 trials.

Location	Elevation (m)	Annual rainfall (mm)
Bas-Zaïre		
M'Vuazi	490	1565
Mbanza-Ngungu	750	1412
Kimpese	450	1165
Kwilu-Ngongo	400	1360
Bandundu		
Kiyaka	700	1593
Feshi Tonu Vanga	893	1762
Equateur		
Eala	320	1720

forested areas. Rainfall distribution also varies from continuous rains throughout the year at Eala, Equateur, to various distribution patterns of dry and rainy seasons for the other locations (Table 3).

Table 3. Monthly distribution of rainfall (in millimetres) at offsite locations (6-year average, 1950–55).

	M'Vuazi	Mbanza-Ngungu	Kimpese	Kwilu-Ngongo	Kiyaka	Feshi	Eala
Jan.	99	69	171	100	148	201	96
Feb.	90	119	123	96	93	149	146
Mar.	267	234	180	210	227	249	158
Apr.	247	197	303	259	199	243	157
May	178	134	81	121	102	45	169
June	3	00	TR	TR	9	9	88
July	TR	00	00	TR	9	12	87
Aug.	0	TR	00	7	–	34	85
Sept.	17	26	TR	14	137	141	183
Oct.	109	126	73	79	213	239	231
Nov.	284	300	201	297	243	226	203
Dec.	250	206	231	176	179	213	115

September planting is possible in Bandundu, with mid to late October planting in Bas-Zaïre. Rains start and stop earlier in Bandundu than in Bas-Zaïre.

For each location, a total of 1000 heterozygous clones will be evaluated for yield, starch content, vigour, and earliness of maturity.

Nursery centres

Establishment of several nursery centres may be an easy means of transporting cassava materials. For a country as large as Zaïre, and in which transportation of cuttings (clones) is expensive, establishment of seedling nurseries at strategic locations instead of at one central location will minimize these costs. Five suitable locations suggested are M'Vuazi, Eala, Kiyaka, Lumumbashi, and Kisangani.

From 1976, improved seeds from IITA will be established and screened for important characteristics at these locations. Selected clones will be evaluated, and preliminary and advance yield trials conducted. Materials will be distributed to farmers in areas adjoining the nursery centres.

Exchange of seed materials

While improved seeds will continue to be received from IITA, local seeds from the germ plasm (open pollinated) will be bulked and sent to IITA for incorporation into its breeding program. Also stocks of selected locals will be planted in isolation at M'Vuazi with stocks of selected seedlings. Resulting seeds will be bulked, part of which will be established and screened at the main station in M'Vuazi, and the balance given to IITA and other interested organizations.

The 200 local cultivars as well as other exotics and new collections will be maintained at M'Vuazi. The genetic stock will, therefore, continue to be available for future breeding programs.

Effectiveness of the program

An important way to ensure an effective program is to get local personnel fully involved. Their familiarity with the language and understanding of local problems can ensure that the villagers and host officials cooperate with foreign personnel. Training should also be started as soon as a program gets established. The trained personnel should be scheduled to take up positions of responsibility at the various locations at an early stage.

New graduates from universities or those who have served in different capacities for some time would make excellent trainees. The plan is to eventually have 30 professionals working in the program including breeders, agronomists, pathologists, entomologists, and specialists in processing, storage, and production.

Locating areas for maximum impact

For a country as large as Zaïre (total land area is 234.5 million ha or 905,000 square miles), throughout which cassava is important, it is essential for the program to isolate and concentrate its efforts in areas of maximum impact. This choice has been made easy for the following reasons: (1) the problems of CBB, CMD, and anthracnose, and mealy bug are widespread in Bas-Zaïre and Bandundu regions; (2) cassava consumed as foofoo, chikwangue, and pondou or sakasaka is the major food item in these areas; (3) transportation infrastructure is much better developed in the Bas-Zaïre region than in any other region. A new road to Bandundu is being constructed, so communication with Kinshasa will be much better; (4) providing cassava to feed the large urban population of Kinshasa, which is still growing very rapidly, is largely the responsibility of these two regions, especially Bas-Zaïre, which at present supplies over 80% of the cassava needs to the city.

Conclusion

With the broad-based improved seed population available at IITA and perhaps at other agencies and organizations, a cassava improvement program, which relies on the results of these populations, should be able to provide a sustaining solution to the enormous problems in many cassava-growing areas. There are many problems of cassava production in Zaïre. These range from disease and insects to logistical difficulties.

We must therefore (1) establish a broad-based germ plasm; (2) identify areas of maximum impact and concentrate in these areas; (3) establish nursery centres at various locations to screen for desirable characters, conduct yield trials, and distribute to areas close to these centres. This will minimize transportation difficulties of heavy cuttings unique with cassava since seeds are less bulky and less costly to handle; (4) get local personnel involved in the program as early as possible; (5) clarify responsibilities of host and foreign staff.