

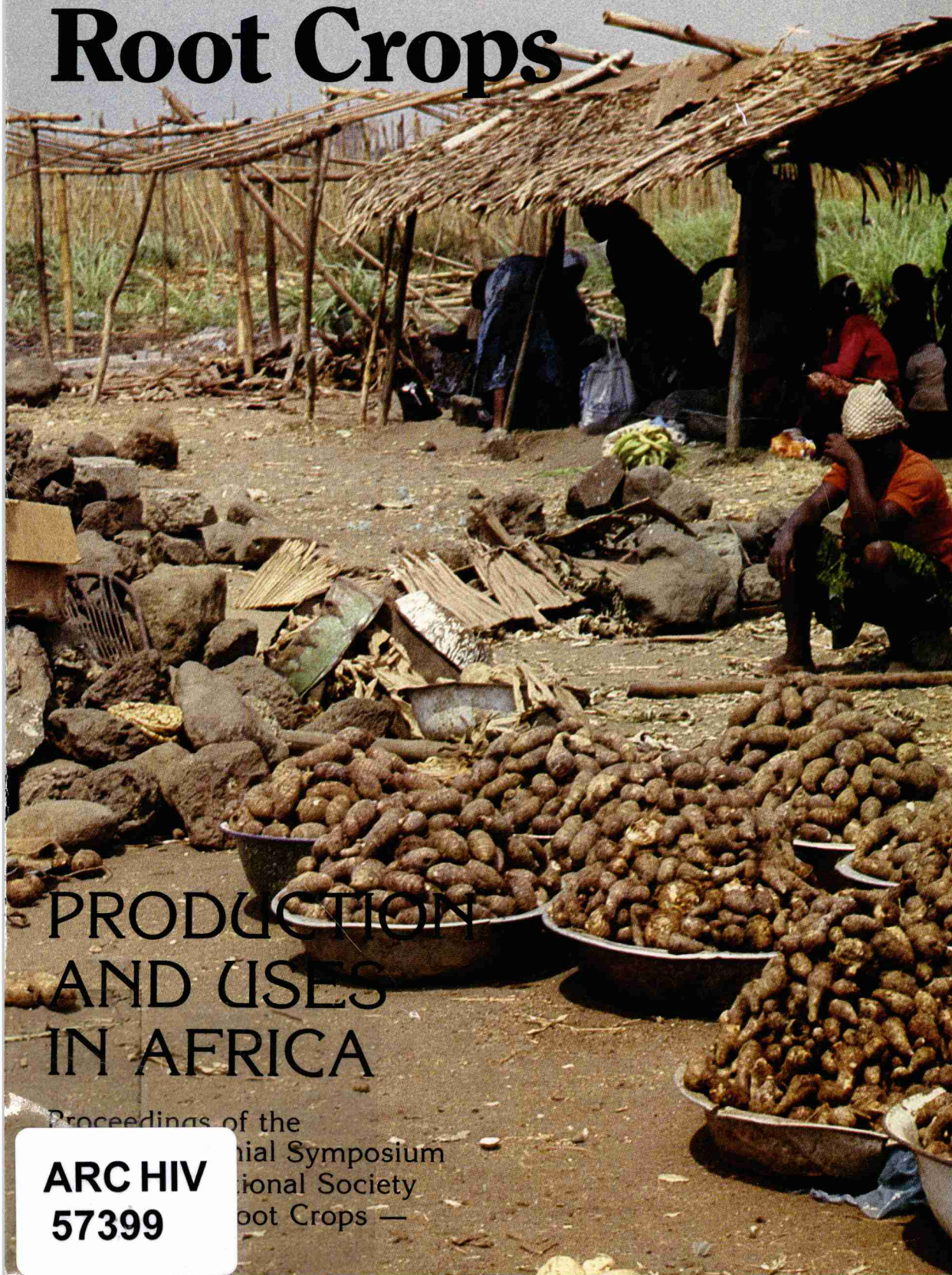
57399

Tropical Root Crops

PRODUCTION AND USES IN AFRICA

Proceedings of the
International Symposium
International Society
Root Crops —

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The International Society for Tropical Root Crops — Africa Branch was created in 1978 to stimulate research, production, and utilization of root and tuber crops in Africa and the adjacent islands. The activities include encouragement of training and extension, organization of workshops and symposia, exchange of genetic materials, and facilitation of contacts between personnel working with root and tuber crops. The Society's headquarters are at the International Institute of Tropical Agriculture in Ibadan, Nigeria, but its executive council comprises eminent root and tuber researchers from national programs throughout the continent.

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IDRC-221e

Tropical root crops: production and uses in Africa : Proceedings of the second Triennial Symposium of the International Society for Tropical Root Crops — Africa Branch held in Douala, Cameroon, 14–19 August 1983. Ottawa, Ont., IDRC, 1984. 231 p.: ill.

/Cassava/, /root crops/, /plant production/, /Africa/ — /genetic improvement/, /planting/, /plant diseases/, /pests of plants/, /intercropping/, /fertilizers/, /crop yield/, /sweet potatoes/, /plantains/, /agriproduct processing/, /nutritive value/, /food enrichment/, /feed/, /agricultural research/, /conference report/, /list of participants/.

UDC: 633.68

ISBN: 0-88936-409-5

Microfiche edition available.

Il existe également une édition française de cette publication.

TROPICAL ROOT CROPS: PRODUCTION AND USES IN AFRICA

Archiv
633.68
I 5
1983

ABSTRACT

A mixture of original research, updates on procedures, literature reviews, and survey reports, this document resulted from the second symposium of the International Society for Tropical Root Crops — Africa Branch, with 77 participants from 16 countries. The focus was cassava, yams, cocoyams, and sweet potatoes, from the perspectives of breeders, agronomists, soil specialists, plant pathologists, entomologists, nutritionists, food technologists, etc. Learning from past successes and failures, many of the researchers directed their efforts toward problems obstructing progress in reaching improved production and use of root crops and attempted to view, realistically, the context in which their results would be applied.

RÉSUMÉ

Résultats de recherches récentes, mises à jour sur les méthodes de recherche, revues de publications et rapports de sondages sont contenus dans ce document issu du Deuxième symposium de la Société internationale pour les plantes-racines tropicales — Direction Afrique, qui a réuni 77 participants de 16 pays. Des communications sur le manioc, le taro, le yam et la patate douce ont été présentées par des phytosélectionneurs, des agronomes, des pédologues, des phytopathologistes, des entomologistes et des spécialistes de la nutrition et des aliments, entre autres. Tirant leçon de leurs succès et de leurs échecs, beaucoup de ces chercheurs ont dirigé leurs efforts vers la solution des problèmes qui entravent l'augmentation de la production et de la consommation des plantes-racines et ont tenté de considérer d'un œil réaliste le contexte qui sera celui de l'application de leurs recherches.

RESUMEN

Una mezcla de investigaciones originales, actualizaciones de procedimientos, reseñas de literatura e informes de encuestas, este documento es el resultado del segundo simposio de la Sociedad Internacional de Raíces Tropicales, Filial Africana, que contó con 77 participantes de 16 países. El simposio se centró en la yuca, el ñame, el cocoñame y las batatas, desde la perspectiva de los fitomejoradores, los agrónomos, los especialistas en suelos, los patólogos vegetales, los entomólogos, los nutricionistas, los tecnólogos alimenticios, etc. A partir de los éxitos y fracasos anteriores, muchos de los investigadores encaminaron sus esfuerzos hacia los problemas que obstaculizan el avance para lograr una producción y un uso mejorados de las raíces y trataron de obtener una visión realista del contexto en que los resultados pueden ser aplicados.

TROPICAL ROOT CROPS: **PRODUCTION AND USES IN AFRICA**

EDITORS: E.R. TERRY, E.V. DOKU, O.B. ARENE, AND N.M. MAHUNGU

*PROCEEDINGS OF THE SECOND TRIENNIAL SYMPOSIUM OF THE INTERNATIONAL
SOCIETY FOR TROPICAL ROOT CROPS — AFRICA BRANCH HELD IN DOUALA,
CAMEROON, 14 – 19 AUGUST 1983*

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WEED INTERFERENCE IN CASSAVA-MAIZE INTERCROP IN THE RAIN FOREST OF NIGERIA

RAY P.A. UNAMMA AND L.S.O. ENE¹

In 1981–82, we conducted studies of cassava and maize intercropped on sandy loam in the rain-forest zone of Nigeria to determine when and how long the plants had to be kept weed-free. The major weeds present in the control (8 weeks after planting) were mainly annual broadleaves, grasses, and sedges. The broadleaves included *Boerhaavia diffusa*, *Calapogonium mucunoides*, *Cleome ciliata*, *Commelina benghalensis*, *Eupatorium odoratum*, *Euphorbia hirta*, *Talinum triangulare*, and *Trianthema protulacastrum*; the grasses comprised mainly *Andropogon gayanus*, *Brachiaria deflexa*, *Cynodon dactylon*, *Digitaria horizontalis*, *Panicum maximum*, *Paspalum orbiculare*, and *Setaria barbata*. Uncontrolled weed growth caused a 2-year average loss of \$5607/ha in yield value compared with the mixture kept weed-free from planting to maturity. Average value of yield for 2 years (\$9206/ha) from the cassava–maize intercrop was much higher than that for the sole crops, although yield in grain and roots was lower. The yield of the crop mixture was depressed by weed interference during the first 4–8 weeks; however weeds emerging after this period did not significantly impair the yield.

Nigeria and Zaire are the leading cassava producers in the humid and subhumid regions of Africa where about 67% of the continent's 4.4×10^7 t of cassava is produced (Jennings 1970; Tan and Bertrand 1972; FAO 1978). The farmers in Nigeria intercrop cassava with maize (Okigbo 1978) and control weeds by hoeing after they have finished planting (2–4 weeks). As it is neither economical nor feasible to keep a crop weed-free all season, knowledge of the time when weeds must be removed to minimize yield loss is crucial. Both maize and cassava have been shown to be sensitive to weed infestation — the former for the first 4 weeks and the latter for the first 10–12 weeks after establishment (Nieto et al. 1968; Onochie 1975). Information is lacking on the critical period of weed interference in a cassava–maize intercrop.

Our objectives in carrying out the present studies were:

- To determine the magnitude of weed interference in cassava intercropped with maize; and
- To define when and how long control is crucial, with a view to suggesting the most appropriate time to weed the crop mixture.

MATERIALS AND METHODS

The experiment was conducted in 1981 and in 1982, located on acid ferrallitic (sandy loam) soil at the research farm at the National Root Crops Research Institute (NRCRI), Umudike, in the rain-forest zone of Nigeria. The site was plowed, harrowed, and formed into ridges (100 cm apart). The two crops were planted the same day, cassava (TMS 30211) at 100 cm apart along the crests of the ridges and maize (FARZ7) at 3 stands/hole, also 100 cm apart but on both sides of the ridges and between cassava stands. The maize was thinned to 2 plants/stand 2 weeks later. The experiment was a randomized complete block design, with three replications/treatment.

Planting was done each year near the onset of rain. Maize was harvested at 4 months and cassava at 10 months. Two treatment schemes were employed. In one ("weed-free"), the cassava–maize mixtures were kept virtually weed-free (weeding every 2 weeks) for different lengths of time after planting. In the other ("weed-infested"), the mixtures were left unweeded after planting for different periods before being kept weed-free to maturity of the last crop in the plot. For comparison purposes, one cassava–maize mix was kept weed-free; another, weed-infested; and other mixtures weeded at

¹ National Root Crops Research Institute, Umudike, Umuahia, Nigeria.

Table 1. Effects of duration of weed interference on maize grain and fresh-root yields of cassava-maize intercrop, Umudike, 1981-82.

Interference (weeks after planting)	Yields (t/ha)			
	Maize ^a		Cassava	
	1981	1982	1981	1982
Weed free				
Intercrop				
0-4	3.0	2.3	13.7	11.5
0-8	3.0	2.4	14.3	12.6
0-12	3.1	2.9	15.9	11.5
0-16	3.1	2.2	23.9	12.9
0-20	3.1	2.4	18.1	12.8
0-24	3.1	2.6	21.2	12.5
0-28	3.1	2.2	18.7	11.8
0-40	3.0	2.8	20.0	17.6
Sole cassava				
0-40	0.0	0.0	21.2	18.4
Sole maize				
0-16	3.4	3.8	0.0	0.0
Weed infested				
Intercrop				
0-4	2.9	2.9	14.5	11.5
0-8	2.1	1.7	13.4	12.1
0-12	2.1	1.3	10.9	5.2
0-16	2.1	1.4	10.9	4.4
0-20	1.9	1.7	7.7	3.2
0-24	1.9	1.3	6.7	0.8
0-28	2.4	1.2	5.9	1.2
0-40	2.4	1.4	7.9	1.4
Sole cassava				
0-40	0.0	0.0	8.0	3.7
Sole maize				
0-40	2.4	0.0	0.0	0.0
Weeded				
at 3	2.6	2.7	10.7	8.5
at 3, 8, 12	2.9	2.3	18.9	12.9
Coefficient of variation (%)	24.0	52.0	43.56	66.0

^aDry grain at 14% moisture content.

3 weeks, as well as at 3, 8, and 12 weeks after planting (WAP). Weed-free and weed-infested monocultures were included for evaluations of the effects of intercropping on the yields of the two crops. NPK fertilizer (15 : 15 : 15) was applied to all plots at 400 kg/ha. In 1981, the plot sizes were 4 m × 6 m; in 1982, 6 m × 6 m.

At harvest, yields were measured for the crops in the middle two ridges excluding the peripheral stands and were converted to a per-hectare basis for meaningful comparisons. The value of

the yields was estimated from the prices of cassava and maize randomly sampled from the nearest local markets.

RESULTS AND DISCUSSION

Based on the 2-year average of the results obtained, uncontrolled weed growth in cassava intercropped with maize significantly reduced

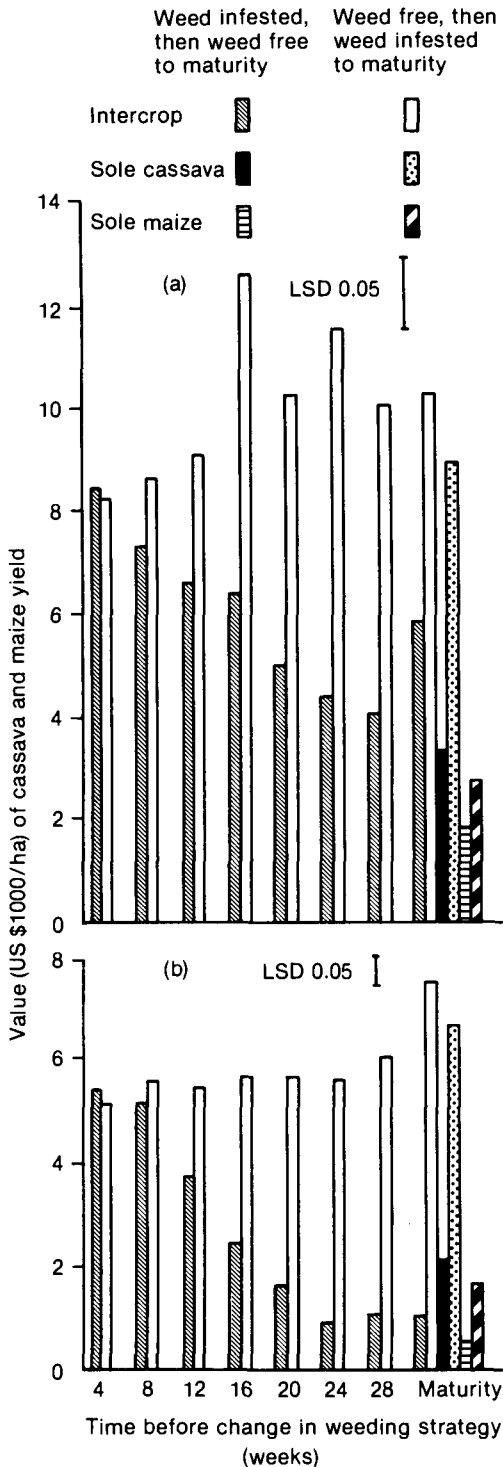


Fig. 1. Effects of weed interference on value of yields of cassava and maize.

the value of the intercrop by \$5607/ha (Fig. 1). The loss was 40% for maize grain and 75% for cassava root yields. The weed-free sole maize outyielded the maize in the weed-free intercrop by 19%, whereas the weed-free cassava in the mixture was outyielded by 5% by the weed-free sole cassava (Table 1). However, the combined yield of the two crops in monetary terms was significantly better than that derived by either of the two sole crops (Fig. 1).

Thus, the cassava was more sensitive to weed infestation than maize under intercrop conditions. On the other hand, the maize responded more negatively to the intercropping practice.

The dominant weeds at 8 WAP in the unweeded control were *Boerhaavia diffusa*, *Calapogonium mucunoides*, *Cleome ciliata*, *Comelina benghalensis*, *Eupatorium odoratum*, *Euphorbia hirta*, *Talinum triangulare*, and *Trianthema protulacastrum*, among the broad-leaved weeds. The grasses included *Andropogon gayanus*, *Brachiaria deflexa*, *Cynodon dactylon*, *Digitaria horizontalis*, *Panicum maximum*, *Paspalum orbiculare*, and *Setaria barbata*. The dominant sedges were *Cyperus difformis*, *C. distans*, *Fimbristylis barteri*, *Kyllinga nemoralis*, and *Mariscus alternifolius*.

The first 4–8 weeks are the most critical for weed control. After this period, weeds are controlled by shade from the maize and cassava canopy. Uncontrolled weed infestation in monocultures reduced the maize grain by an average 54% and the cassava-root yields by 70% for the 2 years. Intercropping maize with cassava and leaving the crop unweeded depressed the maize yield by 52% and the cassava yield by 69%. This suggested that the maize and cassava canopy contributed to control of some of the late-germinating weeds.

The intercrop formed a canopy earlier in the season than did either of the sole crops and, thus, shortened the critical period for weed control in the cassava component from 10–12 weeks to 8 weeks. The critical period of weed interference for maize was the same (4 WAP) as reported for monoculture (Nieto et al. 1968). Keeping the crop mixture weed-free for the first 8 weeks was sufficient to overcome the adverse effects of the weeds. The differences in yield between 1981 and 1982 were attributed to differences in rainfall and soil fertility. However, low cassava yields despite improved varieties and recommended fertilizer rates (Hahn et al. 1979) in farmers' fields in Nigeria are probably a reflection of the farmers' failure to weed early enough in the critical period.

Increasing the population of the crops and applying a preemergence herbicide that is tolerated by both crops would ensure that the crops were protected during the critical period for weed control and would minimize yield losses.

We are thankful to the Director and the Board of Governors, National Root Crops Research Institute, for sponsoring this project and for granting us permission to report the findings.