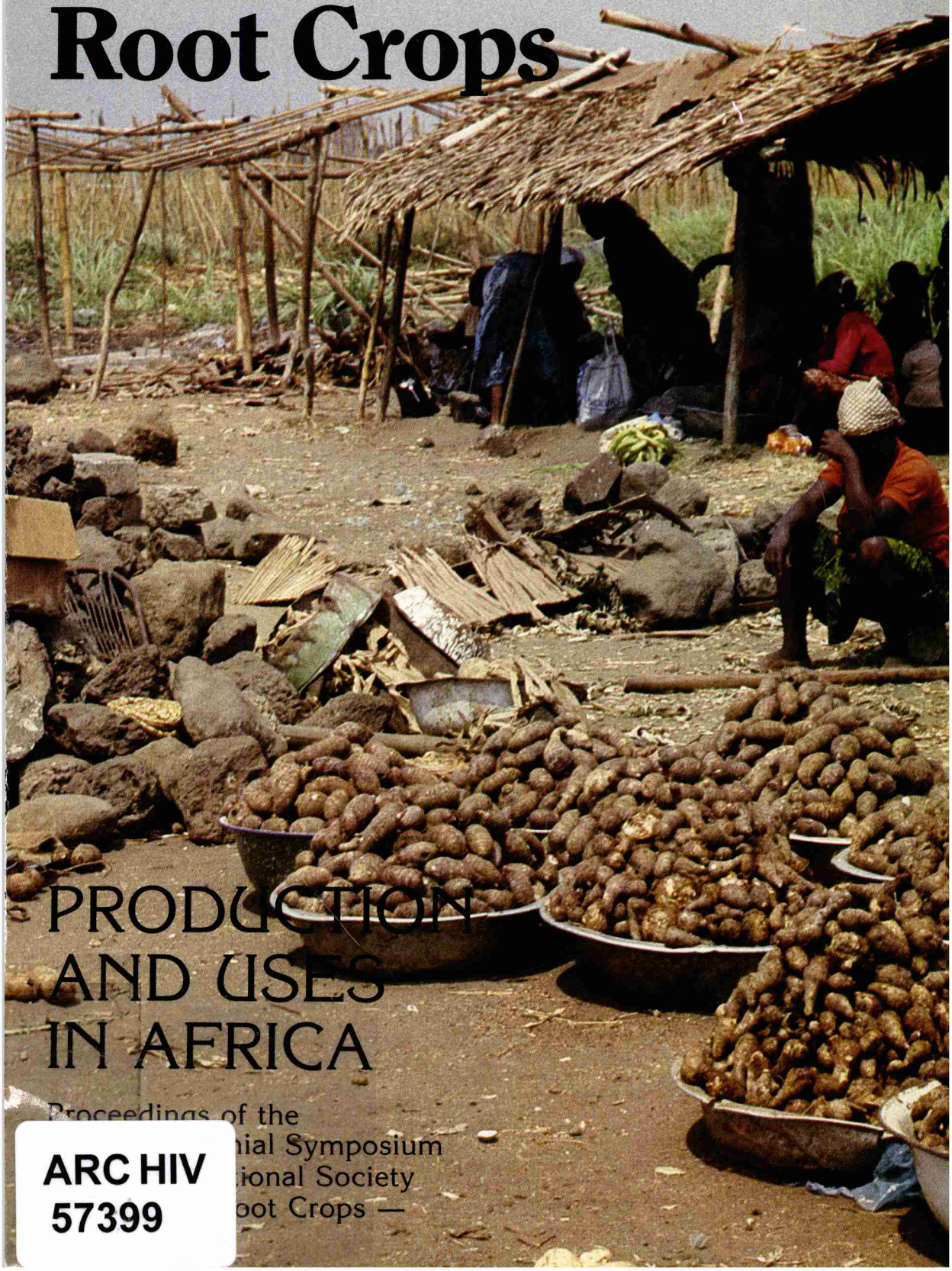
Tropical Root Crops



PRODUCTION AND USES IN AFRICA

Proceedings of the
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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

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.

IDRC-221e

TROPICAL ROOT CROPS:
PRODUCTION AND USES IN AFRICA

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

CONTENTS

EFFECTS OF FERTILIZER APPLICATION ON POSTEMBRYONIC DEVELOPMENT AND REPRODUCTION OF THE CASSAVA MEALYBUG

K.M. LEMA AND N.M. MAHUNGU[1]

Experiments were conducted with two cassava varieties in the greenhouse to ascertain the effect of NPK, N, and K fertilizer application on the postembryonic development and reproduction of the cassava mealybug, *Phenacoccus manihoti*. Nitrogen and NPK were applied at the rates of 60, 120, and 190 kg/ha and potassium (K_2O) at the rates of 15, 30, and 45 kg/ha. The results showed that none of the applications significantly ($P < 0.05$) affected either the development or the fertility of the mealybug on the two cassava varieties.

Fertilizer applications are known to affect mealybug populations and infestations. Fennah (1959, in Miller and Kosztarab 1979) reported that nitrogen application increased populations of *Planococcus citri* on cocoa in Trinidad. Potassium decreased, whereas phosphorus did not significantly affect, *P. citri*. Smirnoff and Valero (1975, cited by Miller and Kosztarab 1979) found that fertilization of jack pine with urea drastically increased infestations by the coccoid *Toumeyella parvicornis*, whereas fertilization with potassium reduced coccoid populations. The experiments reported here were carried out to ascertain the effects of NPK, N, and K fertilizers on the postembryonic development and fertility of *Phenacoccus manihoti*, as these two parameters influence insect populations and abundance.

MATERIALS AND METHODS

The two separate experiments were carried out in a greenhouse. Plastic pots (25 cm diameter) were filled with forest soil (total N 0.16%; P 47.4 μg/g; K 75.0 μg/g), and one cassava cutting was planted in each pot. Two cassava varieties, TMS 30001 and TMS 30572, were used. In the first experiment, N, P_2O_5, K_2O (15 : 15 : 15) fertilizer was applied 4 weeks after planting (WAP) at the rates of 60, 120, and 180 kg/ha. Three pots were used for each fertilizer level and for each cassava variety. Three other pots of each variety were not fertilized and were used as controls. The experiment was replicated twice. The pots were watered every day. A hygrothermograph placed in the middle of the greenhouse recorded the temperature and relative humidity. The average daily temperature ($\bar{X} \pm SD$) was 29.4 ± 2.01°C, and the relative humidity was 66.79 ± 6.38%.

One week after fertilizer application, the plants were artificially infested with freshly hatched, unfed mealybug nymphs (crawlers). We placed one crawler onto each leaf, using a camel-hair brush. About 24 h after the infestation, the crawlers were checked, and those that were established were numbered. A maximum of five crawlers was kept per plant. The crawlers were observed daily for cast skin indicating ecdysis, and the development of each nymphal stage was recorded. When the mealybugs started ovipositing, the eggs were removed every 3 days by means of an insect pin and counted under a binocular microscope.

In the second experiment, the effects of nitrogen and potassium were tested separately on the same cassava varieties. Nitrogen (calcium ammonium nitrate) was applied at the rates of 60, 120, and 180 kg/ha and potassium (K_2O) at 15, 30, and 45 kg/ha. Half the fertilizer was applied at 4 weeks after planting, and the remainder at 2 weeks after the plants were infested with the crawlers, i.e., at 7 weeks. The eggs were removed and counted. The average daily temperature was 30.75 ± 1.19°C, and the relative humidity 64.71 ± 4.54%.

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Table 1. Influence of NPK fertilizer application on the postembryonic development of the cassava mealybug reared on TMS 30001.

NPK application (kg/ha)	Life cycle (days, $\bar{X} \pm$ SE)			
	I	II	III	IV
0	6.3 ± 0.5	4.7 ± 0.3	6.3 ± 0.2	5.3 ± 0.2
60	5.6 ± 0.3	5.1 ± 0.2	6.1 ± 0.2	4.7 ± 0.2
120	5.6 ± 0.4	4.8 ± 0.1	6.2 ± 0.2	4.9 ± 0.2
180	5.4 ± 0.2	4.7 ± 0.3	6.5 ± 0.2	4.7 ± 0.2

Table 2. Effect of N and K application on the fertility of the cassava mealybug reared on TMS 30001 and TMS 30572.[a]

Treatment	Eggs/female ($\bar{X} \pm$ SE)	
	TMS 30001	TMS 30572
Control	331.3 ± 23.5	334.3 ± 46.9
Nitrogen (kg/ha)		
60	390.3 ± 50.0	378.4 ± 32.4
120	362.1 ± 34.9	260.0 ± 31.4
180	362.4 ± 41.3	277.7 ± 32.3
Potassium (kg/ha)		
60	345.6 ± 25.6	317.5 ± 37.5
120	354.4 ± 34.0	306.5 ± 20.7
180	378.3 ± 17.1	304.7 ± 29.0

[a]No significant differences were found between the means.

Results and Discussion

The results on cassava variety TMS 30572 in the first experiment are not reported because most of the mealybugs and their eggsacks were consumed by an unidentified species of ground lizard. No statistical analysis was done on the results, but apparently NPK levels used in this experiment did not significantly affect the postembryonic development of *P. manihoti* (Table 1). To complete the postembryonic development, the mealybug required 21.6 ± 0.2, 21.4 ± 0.3, and 21.3 ± 0.2, respectively, on plants fertilized with 60, 120, and 180 kg/ha and 22.3 ± 0.3 days, on the unfertilized control. Although the average number of eggs per female seemed to be highest at 180 kg NPK/ha, no significant differences were found between treatments (Table 2). Application of NPK fertilizer did not influence *P. manihoti* reproduction. The fertility was 360.4 ± 36.5, 392.3 ± 38.8, 347.5 ± 28.6, and 491.0 ± 21.5 eggs per female, respectively, for 0, 60, 120, and 180 kg NPK/ha.

The differences observed between the treatments were not statistically significant. However, for both cassava varieties, the highest mealybug fertility was observed at 60 kg N/ha.

In general, nitrogen has been shown to increase (and potassium to decrease) populations and infestations of coccoids (Miller and Kosztarab 1979). Applications of NPK, N, and K fertilizers at the rates in these experiments would not influence cassava mealybug in the field. However, fertilizer applications, like any other good agronomic practice, will ensure that the plants grow vigorously and, hence, will offer some protection against mealybug attack. The large variations in numbers of eggs laid by individual females may have masked differences attributable to fertilizer applications.