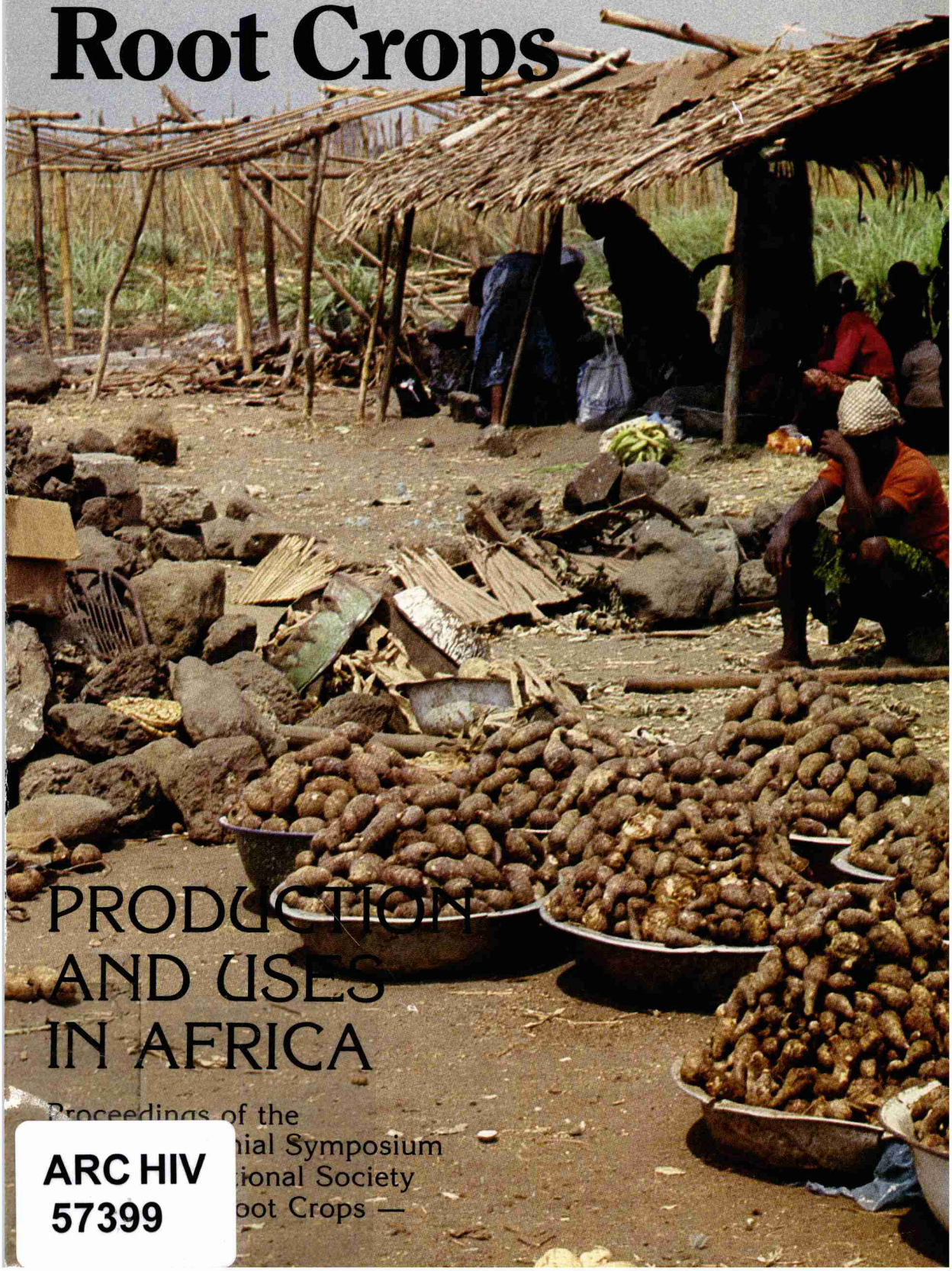
Tropical Root Crops



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.

Postal Address: Box 8500, Ottawa, Canada K1G 3H9
Head Office: 60 Queen Street, Ottawa, Canada

Terry, E.R.
Doku, E.V.
Arene, O.B.
Mahungu, N.M.

International Society for Tropical Root Crops. Africa Branch, Ibadan NG

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

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

CONTENTS

FUNCTIONAL RESPONSE OF *AMBLYSEIUS FUSTIS* TO INCREASING DENSITY OF ITS PREY *MONONYCHELLUS TANAJOA*

T.O. EZULIKE AND J.K.U. EMEHUTE[1]

We studied the functional response of *Amblyseius fustis* to increasing density of its prey *Mononychellus tanajoa*. The experiment was conducted in the laboratory at a temperature of 24–29°C and relative humidity of 50–73%. In tests at eight densities of prey (10, 20, 30, 40, 50, 60, 70, and 80 nymphs and adults), the predator increased its consumption of prey up to a maximum at a density of 40. The number of eggs laid by the predator was not influenced by prey density. The functional-response curve is typical of invertebrate predators.

At the National Root Crops Research Institute (NRCRI), Umudike, Nigeria, we have been studying the effectiveness of phytoseiid mites as predators of *Mononychellus tanajoa*, which, since its introduction into the country in 1973, has become a major threat to cassava. According to Huffaker et al. (1971), the first step in assessing the performance of a predator is to learn how it acts as an individual, i.e., the way in which it searches for prey and discriminates between individuals for attack. These responses are the basis for models of predator–prey interactions, an understanding of which is essential for development of realistic strategies and tactics of control.

Amblyseius fustis, an indigenous phytoseiid mite in Nigeria, preys on green spider mite (Ezulike and Odebiyi 1982), as well as red spider mite. We evaluated its response to increasing densities of *M. tanajoa*.

MATERIALS AND METHODS

In the laboratory of the NRCRI, at a temperature fluctuating between 24° and 29°C and relative humidity between 50% and 73%, the response of *A. fustis* to prey densities of 10, 20, 30, 40, 50, 60, 70, and 80 (nymphs and adults) was studied. A pair of male and female *A. fustis* were used for each of the prey densities. Each feeding regimen was replicated five times. The dead spider mites were removed daily and replaced with live ones to maintain the density.

Any eggs produced by female prey were removed to ensure that the predators were feeding only on the adult prey. Daily records of prey consumption and fecundity were kept. The number of prey consumed by the mated male or female was computed as the average consumption of the two individuals because the females were removed from the rearing units during oviposition.

RESULTS AND DISCUSSION

Consumption of prey by mated males and females increased gradually up to a maximum at a prey density of 40 (Fig. 1) and diminished at densities higher than 40.

Generally, more nymphs were consumed than adults probably because of size differences. The adult *A. fustis* attacked and consumed adult spider mites, which are actually slightly larger than the predators, but the nymphs were easier to handle. Our procedure did not control for the possibility that *A. fustis* fed on eggs laid during the night, but, according to findings by McMurtry and Scriven (1964), egg feeding probably had an insignificant effect on the number of prey consumed.

The functional-response curve of *A. fustis* was typical of invertebrate predators. Consumption increased with prey density up to predator satiation when further increases in prey density tended to decrease consumption. In a similar experiment, Mori (1969) observed that the number of *Tetranychus urticae* consumed by *Amblyseius longispinosus* diminished significantly

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

at high prey densities. Holling (1965) identified four components of functional response: the rate of successful search, the time available for searching, the time spent in handling prey, and the hunger level of the predator. Our findings are in line with those of others (McMurtry and Scriven 1966; Mansour et al. 1980).

The number of eggs laid at the eight densities of prey varied (Fig. 2) and was independent of the prey density and prey consumed.

The response under laboratory conditions does not necessarily indicate inability of a predator to control and regulate its prey under field conditions. Although the predator reduced its consumption of prey at densities higher than 40 : 1, such high concentrations are unlikely to occur outside a controlled environment.

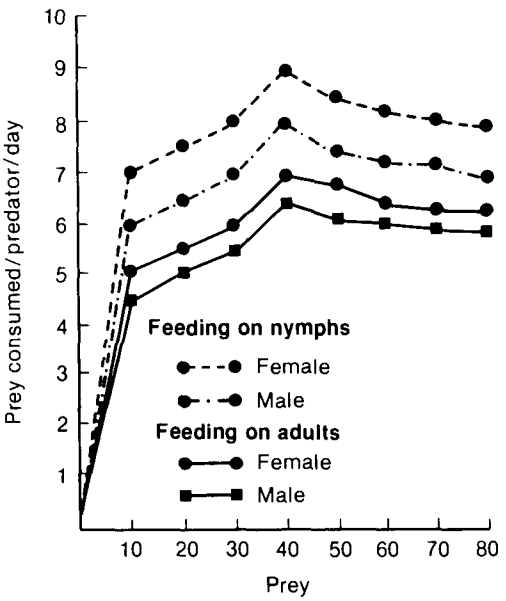

Fig. 1. *Average number of* M. tanajoa *consumed by mated* A. fustis.

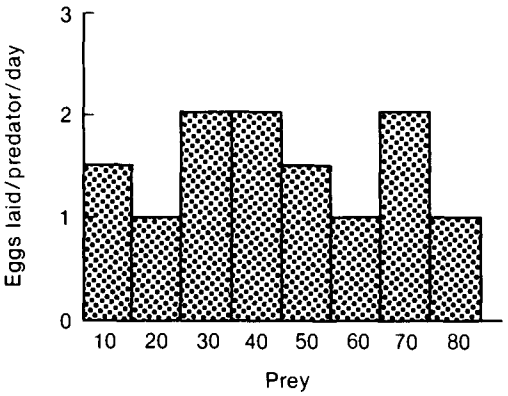

Fig. 2. *Average number of eggs laid by female* A. fustis.

Several authors have shown that when the ratio of prey to predator is low initially, phytoseiid mites are effective agents for biological control. Collyer (1958) reported that when 5, 25, or 50 *Panonychus ulmi* were placed on a plant with 5 *Typhlodromus pyri*, the prey population remained at a low density for the next 3 months. Bravenboer and Dosse (1962) reported that *Phytoseiulus persimilis* was able to control *Tetranychus cinnabarinus* best when liberated at rather low populations of prey.

Conclusion

Amblyseius fustis is a fast-running predatory mite with a good ability to locate prey. These are essential characteristics of an effective natural enemy (Huffaker et al. 1971). The predator spent only a short time in killing its prey and appears to have great potential for high rates of consumption.

We are grateful to the Director of the National Root Crops Research Institute, Umudike, Dr L.S.O. Ene, for the facilities for this study and permission to publish it.