

**Biological studies on *Hyperaspis marmottani* Fairm.
(Col., Coccinellidae), a predator of the cassava mealybug
Phenacoccus manihoti Mat-Ferr. (Hom., Pseudococcidae)**

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Abstract

Hyperaspis marmottani Fairm., occurring widely in the south eastern Nigeria is a potentially effective predator of the cassava mealybug, *Phenacoccus manihoti* Mat-Ferr. It took about 28 days for *H. marmottani* to complete development at 28 °C, passing through the egg, four larval, a prepupal and pupal instars. The duration of the larva, prepupa, and pupa was 11.9, 2.0 and 9.1 days, respectively. All the larval instars as well as the adult fed actively on the different stages of the mealybug. *H. marmottani* controls cassava mealybug by 2 methods: by mechanically injuring and killing them and by predation. The larvae and adults are secretive, hiding under the egg masses, cracks and curled up leaves.

1 Introduction

The most important single pest species in Nigeria today is the cassava mealybug, *Phenacoccus manihoti* Mat-Ferr. Introduced into Nigeria in 1979 (AKINLOSOTU and LEUSCHNER 1979), the cassava mealybug has quickly swept across the southern states of Nigeria which are the cassava growing areas. Cassava either as Fufu, Garri or Tapioka (Abacha) is important in the dietary needs of over 50 % of the population in Nigeria, supplying more than 70 % of their daily calorie requirement. With the spread of cassava mealybug, the cost of Garri, for example, has gone up by over 500 % (UGO 1981).

Control measures against the mealybug so far are a combination of chemical and cultural methods. Chemical control involves dipping cassava cuttings in any of the recommended chemicals (NWANZE 1978) such as Unden, Ultracide, Rogor, before planting and cultural method essentially involves planting cassava early in the season so that they are well established before the onset of dry season when cassava mealybug activity is at its peak (UMEH in press).

A combination of both methods is unsatisfactory as the mealybug population eventually builds up, destroying the whole plants before the end of dry season. Attention has therefore shifted to biological control which, wherever successful gives a permanent solution to pest problems.

Of the natural enemies of cassava mealybug in the south eastern states of Nigeria, *Hyperaspis marmottani*¹ Fairm. is the most abundant and from preliminary tests is considered to have great potential in controlling cassava mealybug.

¹ *H. marmottani* was identified by T. G. VAZIRANI of the Commonwealth Institute of Entomology, London.

To the knowledge of the author, no work has been done on this coccinellid predator. This paper therefore deals with the preliminary laboratory investigation and field observations on some aspects of the biology of *H. marmottani*.

2 Materials and method

The life cycle of *H. marmottani* was studied on detached cassava leaves infested with cassava mealybug and placed in Petri dishes under laboratory temperature of 28 °C.

Newly laid eggs were each placed on infested cassava leaf in the Petri dish until they hatched. Each larva was observed daily while fresh Petri dish and mealybugs were supplied to the larva every other day until the prepupal stage was reached. The prepupa was left undisturbed although daily observations continued until it emerged as adult. There was no larval mortality during the course of this investigation.

For studying predation, adults or larvae of *H. marmottani* were each supplied with cassava mealybugs in a Petri dish and observations of *H. marmottani* activity was made through the transparent Petri dish top.

3 Results

3.1 Development of *H. marmottani*

It was found an average of 5.1 days for the development of the eggs of *H. marmottani*. The first instar larva is pale yellow in colour and measures about 1.0 mm in length. It fed actively on the eggs and younger instar of cassava mealybug for 2.5 days before moulting. The second instar larva which is also pale yellow in colour measures about 2.5 mm in length and fed on larger mealybugs. It moulted after 3.0 days. The third instar larva is ash grey in colour and measures 4.0 mm in length. It fed mainly on ovipositing females for 3.1 days. The fourth instar larva which is also ash grey in colour became the prepupa after 3.3 days. The prepupa did not feed but remained quiescent for 2 days before it changed to pupa. Just before pupation starts the prepupa attaches the tip of its abdomen to either the leaf, woolly mass or even in the Petri dish. As the prepupa changes into pupa, the prepupal skin splits dorsally so that the pupa is partially enclosed. The duration of the pupa was 9.1 days.

3.2 Control of mealybug

H. marmottani controls the mealybug in two ways: by mechanically injuring and killing them and by preying on them.

Sometimes the predator gives the mealybug a jab on the dorsal surface using its well developed mandibles. The reason for this jabbing is not clear at the moment but the attacked mealybug continues to live for another 1–3 days during which it goes black and dies.

All the larval instars and adult *H. marmottani* feed on the different stages of the mealybug. The first instar larva fed on 8–10 young mealybugs a day. The second instar larva preferred larger ones and consumed about 6–10 mealybugs daily. The third instar consumed about 6–8 ovipositing females per day while the fourth instar fed on up to 10 mealybugs per day. The adults lived for up to 5 weeks, and each consumed about 10 mealybugs of mixed age daily. Thus one *H. marmottani* can consume about 477 mealybugs during its developmental and reproductive life. This number is, however, conservative when only the younger mealybugs are available.

Both the larvae and adults prey on the mealybug in a characteristic fashion.

The predator swallows only the abdomen of the mealybug, while the head and thorax are cut off and discarded. The larvae hide under egg masses after preying on the ovipositing females, and feed on the eggs as well as the first instars as they hatch.

3.3 Field observations

The different stages of *H. marmottani* are secretive in habit. The larvae were found in large numbers under the woolly mass where they also pupate. This appears to be of survival value since the larvae are well protected from parasitoids and are also not easily dislodged from the woolly mass. Adults hide in cracks, curled up leaves and under the woolly masses.

H. marmottani is biparental, and from scattered observations, it is apparent that mating in this species takes place on emergence of the females. Mating is short, lasting from 45–90 seconds, and it may occur more than once during the reproductive period of a single female.

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Zusammenfassung

Untersuchungen über die Biologie von Hyperaspis marmottani Fairm. (Col., Coccinellidae) als Prädator der Maniok-Schildlaus Phenacoccus manihoti Mat-Ferr. (Hom., Pseudococcidae)

Der im südöstlichen Nigeria weitverbreitete Marienkäfer *H. marmottani* ist ein wirksamer räuberischer Feind der Maniok-Schildlaus *P. manihoti*. Seine Gesamtentwicklung dauerte bei 28 °C rund 28 Tage. Seine 7 Entwicklungsstadien sind: Ei, 4 Larvenstadien, Präpuppe und Puppe. Davon entwickelten sich im Mittel die Larven in 11,9, die Präpuppe in 2,0 und die Puppe in 9,1 Tagen. Alle Larvenstadien sowie die Käfer fressen die verschiedenen Entwicklungsstadien der Schildlaus. Außer durch Fraß vernichten die Käfer die Schildläuse auch durch Totbeissen, ohne sie zu fressen. Die Larven und Imagines des Marienkäfers leben versteckt unter den Eigelegen der Schildlaus, in Ritzen sowie in eingerollten Blättern.

References

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