
IDENTIFICATION GUIDE

Major Pests of Callaloo

Dionne Clarke-Harris¹, Shelby Fleischer² and Andrea Fender¹

Contents

Introduction	1	Hawaiian Beet Armyworm (<i>Spolaba recurvalis</i>)	10
Lepidoptera		Coleoptera	
Fall Armyworm (<i>Spodoptera frugiperda</i>)	2	Banded Cucumber Beetle (<i>Diabrotica balteata</i>)	12
Southern Armyworm (<i>Spodoptera eridania</i>)	4	Flea Beetle (<i>Disoryca laevigata</i>)	12
Beet Armyworm (<i>Spodoptera exigua</i>) .	6	Homoptera	
Southern Beet Armyworm (<i>Herpetogramma bipunctalis</i>)	8	Leafhopper (<i>Empoasca</i> spp.)	13
		Acarina	
		Red Spider Mite (<i>Tetranychus</i> spp.) .	14
		References	15
		Acknowledgements	16

Introduction

Callaloo, *Amaranthus viridis* L. (Amaranthaceae) is an annual herb grown in Jamaica as a leaf vegetable. Other common names used in the Caribbean region are Bhaji, Calalu, Pigweed, Spinach and White Caterpillar. The plant grows from 10 centimeters to about one meter in height under natural conditions and will grow at middle or low elevations. Traditionally, callaloo has been cultivated in Jamaica on small holdings and backyard gardens for local markets as a main source of iron in the Jamaican diet.

Over the last 10 years callaloo has become an important export crop. Unfortunately, the leaves of this plant are plagued by numerous pest species which adversely affect yield and marketability of the crop and have required extensive chemical controls. Chemical control has



Callaloo leaves are severely damaged by foliage feeding insects. The photo above shows sieve holes and window-pane feeding patterns of some pest species.

been and still is heavily relied upon, but poses health hazards, insecticide resistance and environmental contamination. This guide was developed to identify the major insect pests of callaloo and to help create an Integrated Pest Management (IPM) approach that minimizes reliance on chemical controls.

1. CARDI, Jamaica

2. IPM CRSP, The Pennsylvania State University, USA

Fall Armyworm

Spodoptera frugiperda (J.E. Smith)

Order: *Lepidoptera* (Butterflies and Moths)

Family: *Noctuidae* (Owlet Moths and Underwings)

Wing span of this species is 31-34mm. The forewings are mottled greyish-yellow with black, white and reddish-brown markings, while the hindwings are white with dark veins and a fringe of dark hairs. Hindwings of adults are lightly iridescent purple in fresh specimens. Adults hide in plants during the day and are attracted to light at night. Fresh eggs are green and laid in masses (50-300 eggs) of more than one layer and covered in moth scales, while older eggs are dark brown close to time of hatching. Eggs may be laid on upper or lower leaf surfaces of plants, fences and buildings.

Young larvae are light coloured, sparsely covered with black setae and the head capsule is prominent and dark coloured with an inverted "Y". Later larval instars have blackish lateral stripes and a greyish or yellowish dorsal stripe which is twice as wide as lateral stripes with four black dots on each segment within the dorsal stripe. They feed on the upper leaf surface causing windowing, or leaf tearing. Larvae migrate to the soil where they pupate in a tunnel shaped pupal chamber near the soil surface. Pupae are 13mm long, dark and shiny with two minute spines.



Spodoptera frugiperda larva



Adult Spodoptera frugiperda



Typical Spodoptera frugiperda egg mass covered with moth scales.



Pupa of Spodoptera frugiperda with characteristic spines at the distal end.

Southern Armyworm

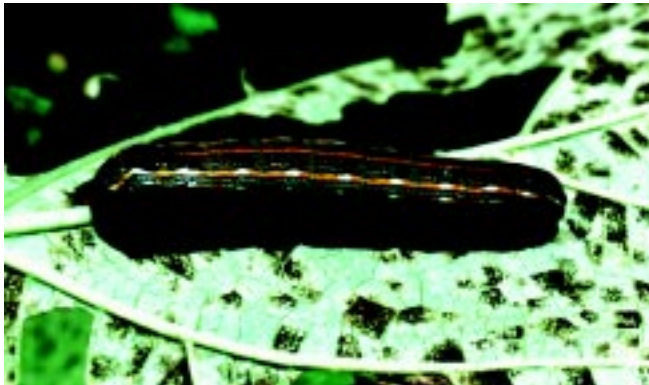
Spodoptera eridania (Cramer)

Order: *Lepidoptera* (Butterflies and Moths)

Family: *Noctuidae* (Owlet Moths and Underwings)

S. eridania moths have a wingspan of about 32mm. Forewings are greyish-brown and hindwings are white. Eggs are green and laid in masses of about 200, with each egg being 0.45mm long, 0.35mm wide and dome-shaped. The clusters are covered with moth scales from the adult female's abdomen. The head capsule of the larva is a uniform brown colour. There is a lateral spot in the first abdominal segment just above the subspiracular stripe

(common to most *S. eridania*). The intensity of the subspiracular stripe fades from the point adjacent to this spot up towards the head (characteristic of *S. eridania*). In some individuals this stripe may be pale or absent, however the dorsal triangle on the first abdominal segment is always relatively large compared to other dorsal triangles. The maximum length of the final instar larva is 34mm. Pupation occurs in a pupal chamber in the soil.



*Late instar of
Spodoptera
eridania. The
intensity of the
subspiracular line
fades from the first
abdominal segments
toward the head.*



*Adult Spodoptera
eridania*

Beet Armyworm

Spodoptera exigua (Hb.)

Order: *Lepidoptera* (Butterflies and Moths)

Family: *Noctuidae* (Owlet Moths and Underwings)

The body length of adult *S. exigua* ranges from 10-14mm with a wing span of 25-30mm. The forewings are greyish-brown with a small, round, rust coloured spot above a smaller kidney-shaped spot. The hindwings are white with dark brown veins and margins. Eggs are laid in masses on the lower leaf surface and covered with white scales from

the adult female's abdomen. Larvae are light green with conspicuous lateral stripes. They feed on lower leaf surfaces, leaving the upper surface intact, though sometimes the leaves are punctured. The full grown larva is 30mm with pupation occurring in the soil. Pupae are 10-14mm long, brown and shiny.



*Full grown larva of
Spodoptera exigua.*



*Adult Spodoptera
exigua.*

Southern Beet Armyworm

Herpetogramma bipunctalis (Fabr.)

Order: *Lepidoptera* (Butterflies and Moths)

Family: *Pyralidae* (Pyralid, Grass and Wax Moths)

The wings are metallic golden-brown with black spots, two on the forewing and one on the hindwing. Dark brown markings on both wings form three continuous wavy lines which are roughly parallel to the wing margins. The wing span is about 20mm. Eggs are translucent and nearly colourless, oval shaped sacs (0.6 x 0.5)mm, laid on the underside of leaves in clusters of about ten eggs. The side attached to the leaf is flattened. Empty egg sacs are iridescent and appear as shiny flecks to the naked eye. Irregular polygonal reticulations can be seen on the

surface when viewed under X20 magnification. Neonate larvae are yellow and gradually darken to a translucent dull green as the larvae grow. The head is either dark brown or black and mottled. The cervical shield has a kidney shaped spot on either side. The body appears spotted due to the pigmentation around the base of setae. Fully grown larvae are 20-23mm long. Larvae feed on leaves and web leaves together with a silken thread to form a protective covering where they pupate. Pupae are dark brown and about 10mm long.



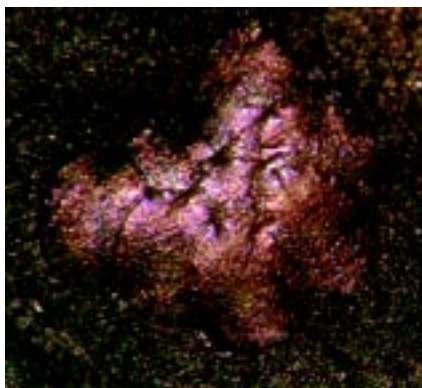
Larva of *Herpetogramma bipunctalis*. Prepupal stage turns yellowish cream, and spots are prominent.



*Late instar of
Herpetogramma
bipunctalis webs
leaf around itself.*



*Adult
Herpetogramma
bipunctalis*



*Left: Cluster of
translucent
Herpetogramma
bipunctalis eggs laid
on underside of leaf.*

Right: Empty egg sacs

Hawaiian Beet Armyworm

Spoladea recurvalis (F.)

Order: *Lepidoptera* (Butterflies and Moths)

Family: *Pyralidae* (Pyralid, Grass and Wax Moths)

The adult is a dark brown moth with two white translucent bands on the forewings and one on the hindwings; these bands form a continuous arch pattern when the wings are spread. The wing span is about 20mm. The eggs are scale-like, shiny translucent yellow sacs, 0.6 x 0.5mm. The larvae are a translucent green with the gut visible through the integument as a pulsating dark green band.

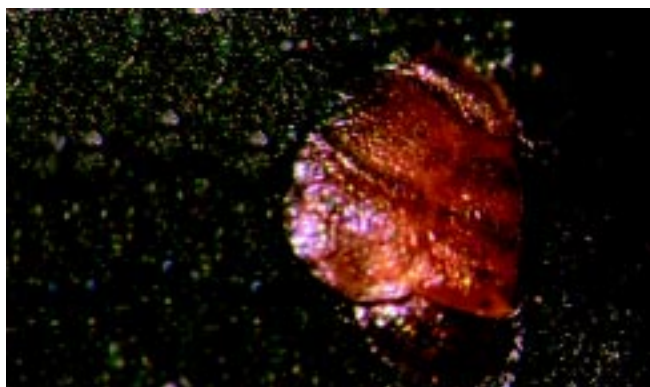
There are two longitudinal white wavy lines sandwiching the green band formed by the gut. The head capsule is light coloured. In the prepupal stage the larva changes colour from green to yellow to brown to bright pink. The larva webs the leaf around itself using silken threads and pupates there. Pupae are 8-10mm long and straw coloured.



Middle instar larva of *Spoladea recurvalis*



Adult *Spoladea recurvalis*



Egg cluster of *Spoladea recurvalis* attached to the underside of leaf.

Banded Cucumber Beetle

Diabrotica balteata Lec.

Order: Coleoptera (Beetles)

Family: Chrysomelidae (Leaf Beetle)

The adult beetle is 6mm long with a reddish-brown head, dark eyes and long antennae. The body is greenish with yellow bands. Eggs are laid in the top 10cm of soil near the base of the host plant. These beetles gnaw holes in the leaves. Larvae are whitish and wireworm-like and feed on roots. Pupation takes place in soil.



Adult *Diabrotica balteata*

Flea Beetle

Disomyca laevigata (Jacoby)

Order: Coleoptera (Beetles)

Family: Chrysomelidae (Leaf Beetle)

These beetles are 7-8mm long. Their elytra are striped with alternating dark brown and yellow bands. The head, thorax, abdomen and legs are red-orange in colour. The femur of the hind legs are enlarged because these beetles are strong jumpers. They

gnaw holes in the leaves. Eggs are ellipsoidal with one end more pointed than the other and are scattered in soil near the base of host plants. Larvae are wireworm-like with a whitish-brown head. They feed on roots and pupate in soil.



Left:
Adult *Disomyca laevigata*

Right:
Adult *Disomyca laevigata* (color variation) on damaged leaf

Leafhopper

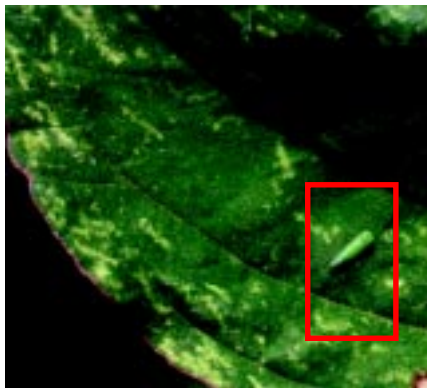
Empoasca spp.

Order: *Hemiptera* (*Aphids, Leafhoppers, Planthoppers, Scale insects and Allies*)

Family: *Cicadellidae* (*Leafhoppers*)

Adult leafhoppers are about 3mm long, slender bodied and shiny green in colour. Eggs are oviposited in stems or leaf ribs. Nymphs are bright green and feed on the underside of the leaf where they run about. Adults and nymphs feed by

piercing plant tissue with slender needle-like mouthparts and removing plant juices. Linear yellow etchings on the leaf surface result from feeding, and a very heavy infestation affects the health, vigor and aesthetics of the crop.



Left:
Adult Empoasca and damage symptoms caused by feeding.

Right:
Magnification



Left:
Nymphs of Empoasca on underside of leaf.

Right:
Magnification

Red Spider Mite

Tetranychus spp.

Order: *Acarina* (Arachnids)

Family: *Tetranychidae* (Spider Mites)

Adult mites are 0.3-0.4mm and globular. They are a dull red colour, eight-legged, with an oval body sparsely covered with spines. Two dark spots show through the transparent body wall. The mites feed on the lower surface of the leaves causing yellowing and speckling. A heavy infestation causes silvering of

the leaf, 'silver back' and ultimately leaf abscission. The nymphs are similar to adults but have only six legs. Eggs are spherical, translucent and laid on the underside of leaves attached to the leaf surface by a web spun by the mite. All stages of the mite can be found on a single leaf where they form a colony.



Tetranychus egg and adult stage



Tetranychus colony on underside of leaf.

References

- Fennah, R. G. 1947. The Insect Pests of Food Crops in the Lesser Antilles. Dept. of Agriculture for the Windward Islands, St. George's, Grenada, British West Indies: Department of Agriculture for the Leeward Islands, St. John's, Antigua, British West Indies. 207 pp.
- Gowdey, C.D. 1923. The Principal Agricultural Pests of Jamaica. Govt. Print. Office. Kingston, Jamaica. 86 pp.
- Kranz, J., K. Schmutterer and W. Koch (eds.) 1978. Diseases, Pests and Weeds in Tropical Crops. John Wiley, Inc. Chichester, New York. 666 pp.
- Krysan, J. L. and T.A. Miller (eds.) 1986. Methods for the Study of Pest Diabrotica. Springer-Verlag, Inc. New York. 260 pp.
- Metcalf, C.L. and W.P. Flint (eds.) 1939. Destructive and Useful Insects and Their Habits and Control. McGraw-Hill Book Company. New York. 981 pp.
- Passoa, S. 1991. Color identification of economically important *Spodoptera* larvae in Honduras (Lepidoptera: Noctuidae). *Insecta Mundi*. Vol. 5(3-4):185 - 192.
- Peterson, A. 1962. Larvae of Insects. Edwards Brothers, Inc. Ann Arbor, Michigan. 732 pp.
- Peterson, A. 1963. Egg types among moths of the Pyralidae and Phycitidae-Lepidoptera. *The Florida Entomologist*. Supplement No. 1 (September). 14 pp.
- Schmutterer, H. 1990. Crop Pests in the Caribbean with Particular Reference to the Dominican Republic. Eschborn, Germany. 640 pp.
- Sorensen, K.A. and J.R. Baker (eds.). 1994. Insect and Related Pests of Vegetables, AG-136, N.C. Ag. Ext. Serv. Dept. of Agricultural Communications, North Carolina State University. Raleigh, NC. 180 pp.
- Stoetzel, M. 1989. Common Names of Insects and Related Organisms. Entomological Society of America. Landam, MD. 199 pp.
-

Acknowledgements

The authors would like to acknowledge the assistance of Dr. Steven Passoa (US APHIS) and Dr. Bruce McPherson (The Pennsylvania State University) for their help in the identification of larval specimens, and Mr. Anthony Trought for conducting confirmatory laboratory studies on the Pyralid species. We would also like to recognise Mr. M. Alam and Mr. Phillip Chung who did some of the photography.

We would also like to thank Mary Wodecki-Ricard (PSU) for her work in completing this project, and Dr. Charles Pitts (PSU) for essential advice and encouragement.

Support for this publication was provided by the Caribbean Agricul-

tural Research and Development Institute (CARDI) and Integrated Pest Management Collaborative Support Program (IPM CRSP). The IPM CRSP is an initiative of the United States Agency for International Development (USAID).

This publication was made possible through support provided by the United States Agency for International Development (USAID) under terms of Grant No. LAG-G-00-93-0053-00 made to Virginia Polytechnic Institute and State University (Virginia Tech).

The opinions expressed herein are those of CARDI and IPM CRSP and do not necessarily reflect the views of the USAID.

Published by

The Pennsylvania State University

1998
