Sustainable Strategies to Enhance Sweet Potato Yields and Minimize Losses to Pests and Diseases in the Caribbean

Leaf Feeders and Stem Borers affecting Sweet Potato in the Region

Jhaman Kundun

CARDI

27th October, 2021

Presentation Outline

- Leaf feeders
  - Insect – economic important
    - Management – IPM
  - Insects – minor
    - Management – IPM
  - Mites
    - Management - IPM
- Stem feeder
  - Insect – economic important
    - Management – IPM
- Summary

Leaf Feeders

INSECTS

MITES

Insects

- **Sweet potato leaf beetle**, *Typophorus nigritus viridicyaneus* (Coleoptera: Chrysomelidae)
- **Tortoise beetles**
  - *Metriona spp*. (Coleoptera: Chrysomelidae)
  - *Chelymorpha multipunctata* (Coleoptera: Chrysomelidae)
  - *Deloyala spp.* (Coleoptera: Chrysomelidae)
- **Cucumber beetle** *Diabrotica spp.* (Coleoptera: Chrysomelidae)
- **Armyworm** *Spodoptera spp.* (Lepidoptera: Noctuidae)
- **Hornworm** *Agrius cingulatus* (Lepidoptera: Sphingidae)
- **Leaf webber** *Trichotaphe spp.* (Lepidoptera: Gelechiidae)
- **Leaf hopper** *Empoasca spp.* (Hemiptera: Cicadellidae)
- **Sweet potato whitefly** *Bemisia tabaci* (Hemiptera: Aleyrodidae)
- **Thrips** *Frankliniella spp*. (Thysanoptera: Thripidae)

Sweet potato leaf beetl

Luke Tembrock, 2018

Life Stages

iNaturalis, 2021

- Blue-green metallic adult (~6 -7.5 mm long), body is sub-cylindrical to oval shaped
- Distinct larval and pupal stages
- Adult beetles lay eggs at the base of the plant or on lower leaves near to the soil.

Sweet potato leaf beetle

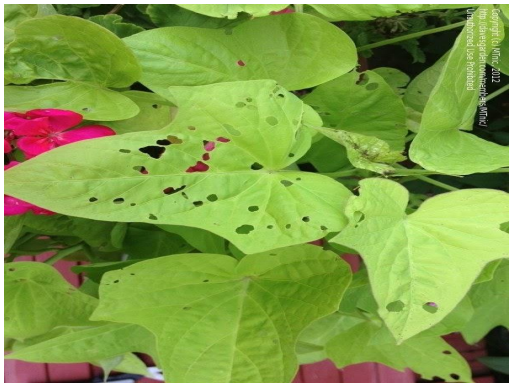
Life Cycle

- **Eggs** are laid near the root of the sweet potato plant
- **Larval** instars feed on the root and does not leave until mature
- **Pupa**, mature larvae pupates in the soil
- **Adults** emerge and make their way to the foliage and begin to feed.

Sweet potato leaf beetle

Damage

- Adults feed mainly on the foliage leaving large holes in the lamina of the leaf.



- Damage to the sweet potato roots is caused mainly by larval stage that create shallow tunnels on the surface of the roots/tubers.

- Farmers report losses up to 90%

Clarke-Harris et al., 2010

Sweet potato leaf beetle

Management - IPM

Cultural practices:

Prevent entry into crop area:

i. Remove weedy areas surrounding the plot which may harbour the beetle.

ii. Clean planting materials.

iii. Molding the soil to reduce cracks.

iv. Practice crop rotation can assist in protecting the crop from damage.

Sweet potato leaf beetle

Management - IPM

Varietal

- Tolerant varieties
- Early maturing & deep rooted varieties

Biological

- Entomopathogens & other soil treatments targeting larval and pupal life stages.

Sweet potato leaf beetle

Management - IPM

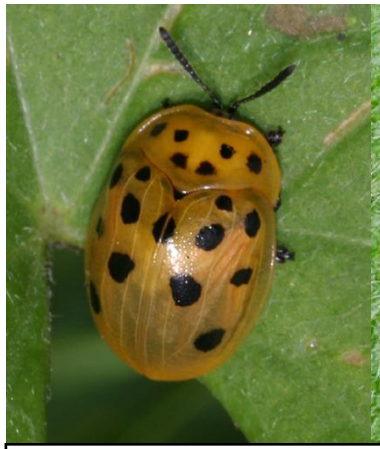
Chemical

- Selective insecticides (low-persistence) in combination with cultural practices.

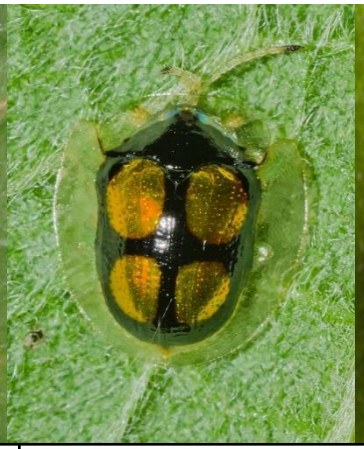
- Insecticide usage in early growth stages at recommended rates

Minor Insect Pests

Tortoise beetles



Chelymorpha multipunctata



Deloyala sp.

Metriona sp.

Adults are oval & slightly flattened, with the edge of the body very extended, covering most of the head and legs & looking somewhat turtle-shaped.

Minor Insect Pests

Tortoise beetles

Description

- Eggs are laid on the undersides of sweet potato leaves. Larvae hatch in 7- 10 days & feed for 3-4 weeks before pupating & emerging as adults

- Larvae are broad & flattened, about 9 mm long, with spiny sides & a hook along the abdomen that they use to cover themselves in faeces, which helps hide them from predators.

Minor Insect Pests

Tortoise beetles

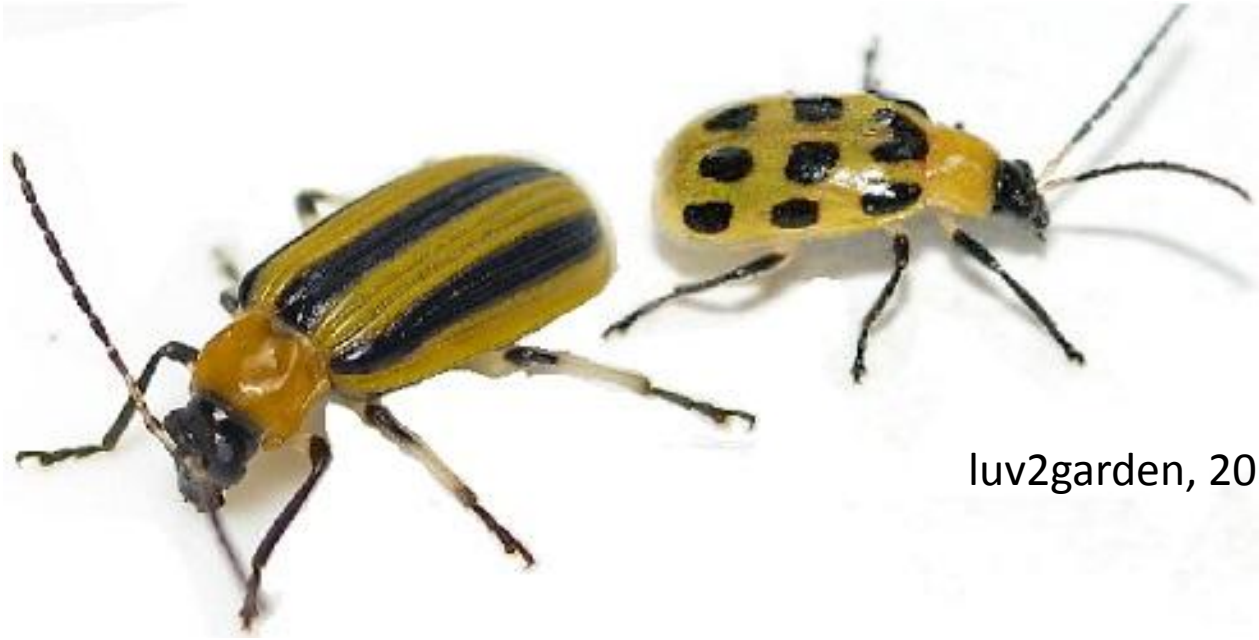
Damage

Adults & larvae feed on foliage, making large round holes all over the leaf. Young larvae initially eat only the outer layers of the leaf, but as they grow they begin to eat their way through.

Pestnet, 2021

Minor Insect Pests

Cucumber beetle



luv2garden, 2021

Striped

Spotted

Minor Insect Pests

Damage

Adult spotted cucumber beetles will chew irregular shaped holes in sweet potato foliage.

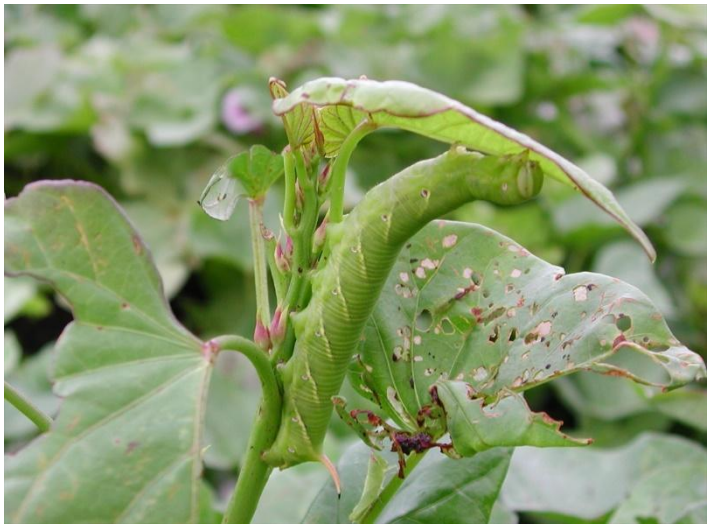
However the larval stage of this insect will bore into the outer skin of maturing sweet potato roots, rendering them unmarketable.

Minor Insect Pests

Armyworm & Hornworm

Armyworm

proliferates rapidly & damages leaves



Hornworm

devouring the leaves & leaving only the sweet potato vines

Minor Insect Pests

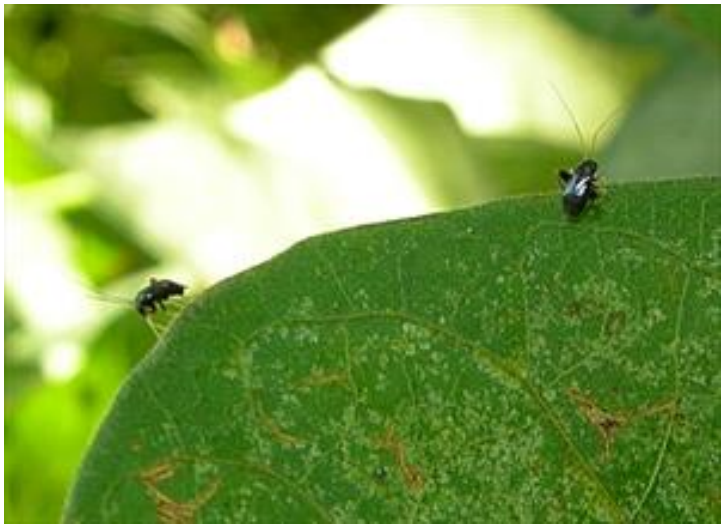
Leaf webber/miner

Planet Natural, 2004

Minor Insect Pests

Leaf Hoppers

Penn State University, USA)



Pestnet, 2021

Minor Insect Pests

Sweet potato whitefly

UC IPM, 2019

Minor Insect Pests

Sweet potato whitefly

Damage

Feeding, which causes leaves to yellow and curl, and by the production of honeydew, which causes leaves to appear shiny or blackened (from sooty mold growing on the honeydew).

Vectors

Minor Insect Pests

Thrips

Minor Insect Pests

Thrips

Damage

Thrips rasp the tender parts of center leaves and/or terminal buds with their sharp mouthparts and feed on escaping juices.

Leaves develop silvery blotches or curl upward.

Minor Insect Pests

Management - IPM

Cultural

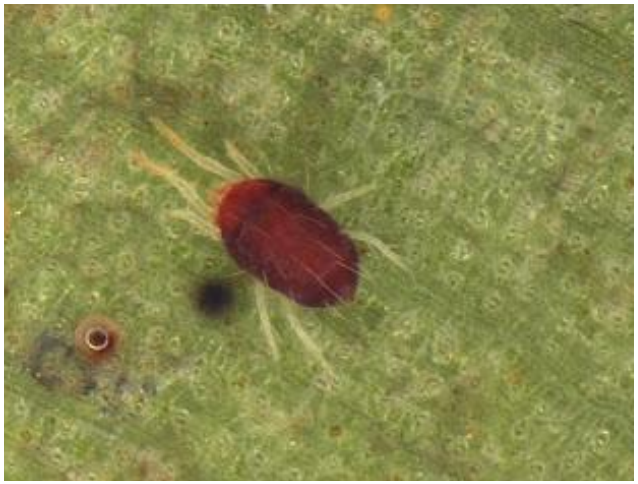
- Crop healthy
  - Adequate fertilization
  - Irrigation
- Weeds control

Chemical

- Selective

Mites

Spider mites *Tetranychus spp.* (Acari: Prostigmata: Tetranychidae)



Discreption

Tiny (1/50th of an inch) eight legged creatures resemble minute spiders.

There may also be downy webs (they produce these for protection) on the undersides of the leaves.

Mites

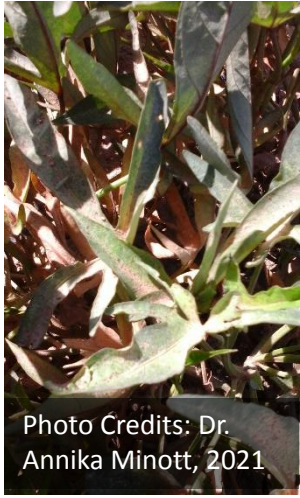


Photo Credits: Dr. Annika Minott, 2021

Spider mites

Damage

- Feed by sucking the plant juice & when present in sufficient numbers they can weaken, stunt or even kill infested plants (or parts of them).

- 1st signs of damage are small light colored specks on the leaves, and in extreme cases these may become discolored & scorched and eventually die and fall off.

Spider Mites

Management - IPM

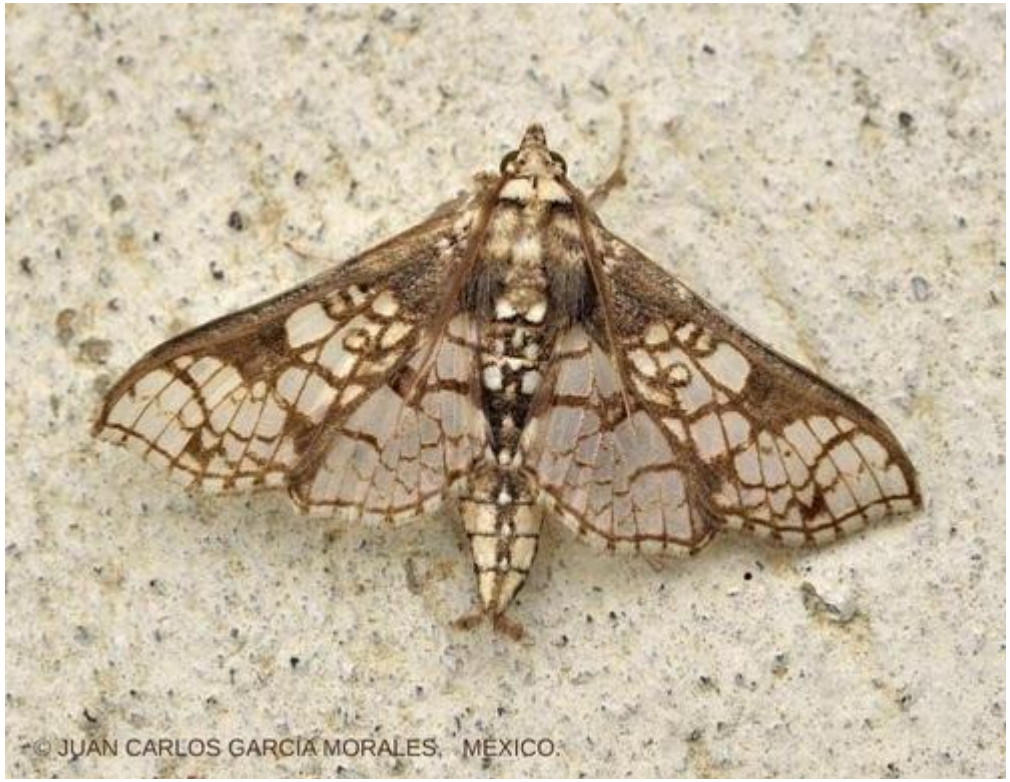
- Cultural
- Natural enemies
  - Predatory insects
  - Buy predatory mites
  - Provide habitat to encourage nectar production plants
- Mechanical
  - Strong jet of water to wash them off
- Bio-insecticide
  - Insecticidal soap, neem (neem seed oil works the best)

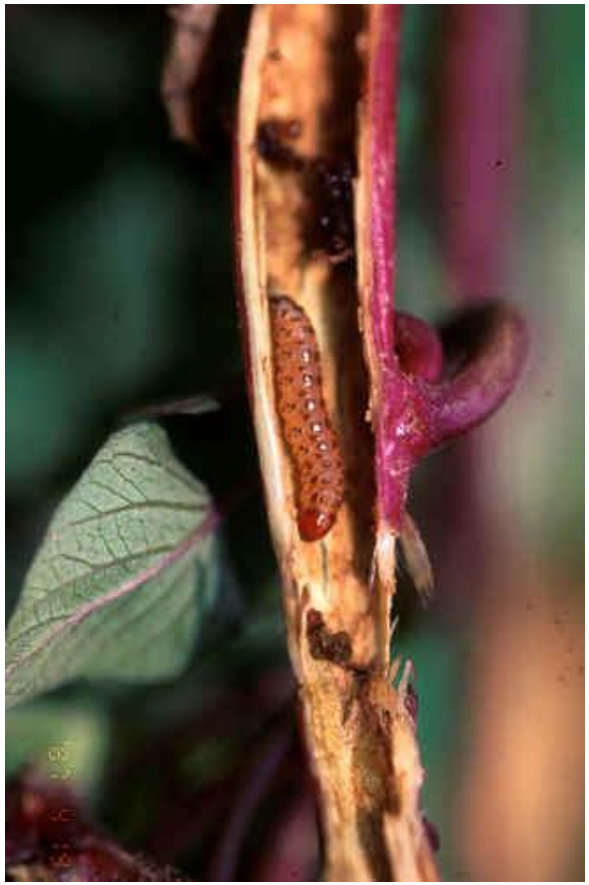
Stem Feeder

INSECT

Insect

Stem borer *Megastes grandalis* (Lepidoptera: Pyralidae)





Stem borer

- Unique to Guyana and Trinidad & Tobago

- 2nd economic importance

Stem borer

Life Cycle

- **Eggs**: laid singly or in clusters of less than five; they are bright green & turn purple at hatching.

- **Larva**: Mature larvae are white with a pink colour and they have a dark head capsule.

- **Pupa**: Fully grown larvae spin a cocoon inside the stem.

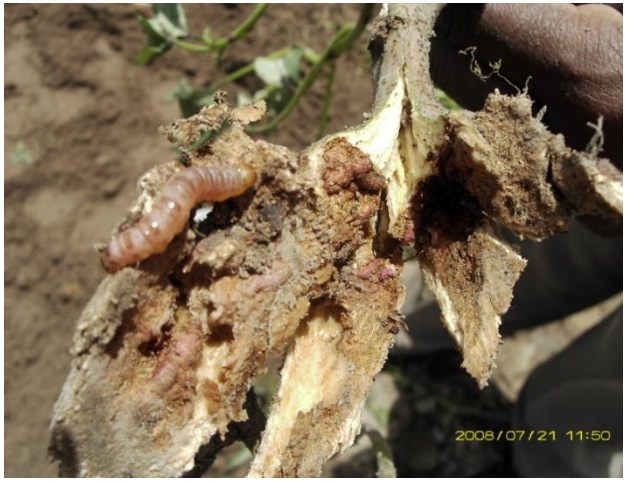
- **Adults** exit the stems after app. 14 days.

STEM BORER

Megastes grandalis Guene (Lepidoptera: Pyralidae)

Sweet potato root (l) &
crown (r) damaged by larvae

Photographer:
TTABA/ INIVIT presonnel



Damage

Damage results from the larva boring from the stem to the main roots.

Newly hatched larvae feed on the surface of the vine or may burrow immediately into the stem where they tunnel & feed.

Stem borer

Symptoms

- Damage is insidious as infested plants can appear symptomless.

- Swelling and splitting of the stems and the deposit of frass external to the split stem or on the ground may be observed. Silken threads may also be seen at split stems.

Stem borer

Other symptoms include:

stunted plants

leaf shedding

lack of storage root production.

Stem borer

Management – IPM

Cultural

- Molding the crop late in the growth stage, i.e. greater than 7 weeks, prevents adults from exiting the stems.

- Removal of alternate hosts (e.g., morning glory family) can reduce population build-up.

Stem borer

Management – IPM

Varietal

Differential tolerance levels reported

- Leaf shape

  Eggs survive poorly on narrow leaves when compared to wide leaves

- Ability of the plant to correct the damage to the food transport channels by the larva boring into the stem.

Stem borer

Management – IPM

Biological

Natural enemies – larvae

- *Masicera abdominalis*
- *Sarcodexia sternodontis*
- *Xyphostoma azteca*

Natural enemy – egg

- *Trichogramma minutum*

Stem borer

Management – IPM

Chemical

A systemic insecticide applied at the recommended rate (eg. Fipronil)

The cryptic nature of this stem borer reduces the effectiveness of chemical applications.

Summary

- Leaf & Stem feeders can be mostly minor pests
- Very few occasions they will require targeted treatment
- IPM practices particularly cultural measures are important in keeping populations in check.

END & Thank You