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- African armyworm
- African bollworm
- African cassava mosaic virus (ACMV)
- African maize

Images

Anthracnose on mango (Colletotrichum gloeosporioides). Anthracnose initially appears as small black spots. On leaves, the spots can grow to form an irregular patch. On young fruit, pin-sized, brown or black, sunken spots develop.

- stalkborer
- Anthracnose
- Aphids
- Bacterial wilt
- Bagrada bug
- Banana weevil
- Black rot
- Cabbage looper
- Cabbage moth
- Cabbage webworm
- Couch grass
- Cowpea seed beetle
- Cutworms
- Damping-off diseases

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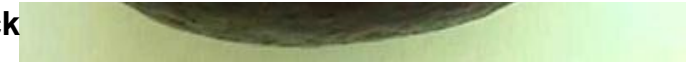
Anthracnose on avocado

Anthracnose on avocado fruit. Anthracnose *(Colletotrichum gloeosporioides)* on avocado fruit. This fungal disease is primarily a post-harvest problem when fruit is at maturity stage.

- Diamondback moth (DBM)
- Downy mildew
- Early blight
- Fruit flies
- Fusarium wilt
- Larger grain borer
- Late blight
- Leafmining flies (leafminers)
- Mango seed weevil
- Mealybugs
- Powdery mildew
- Purple witchweed
- Root-knot



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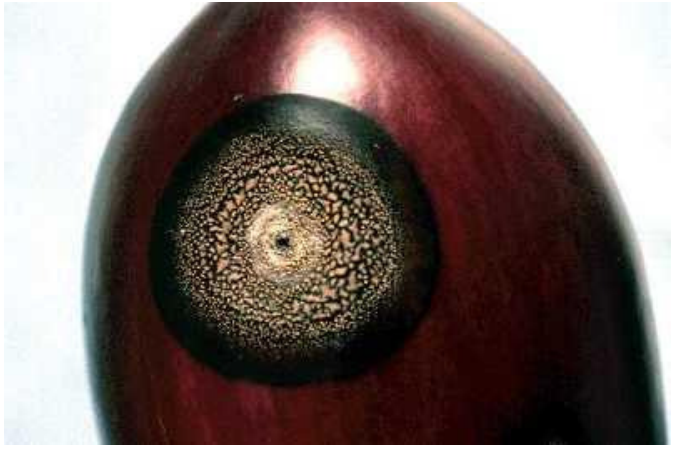
Anthracnose symptoms on eggplant, following artificial inoculation via needle puncture of fruit.



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- nematodes
- Snails (Giant East African Snail)
- Spider mites
- Spotted stemborer
- Storage pests
- Sweet potato weevil
- Termites
- Thrips
- Tomato Yellow Leaf Curl Virus Disease (TYLCV)
- Turnip Mosaic

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Anthracnose *(Colletotrichum coccodes)* on tomato. Infected fruits exhibit small, slightly sunken, water-soaked circular spots. In moist weather, the centres of the spots turn pinkish in colour

Onion smudge *(Colletotrichum circinans)*. Small, round, dark blotches develop on bulbs, with a

- Virus (TuMV)
- Weeds
- Whiteflies

Medicinal plants

Fruit and vegetable processing

Natural pest control

Cultural practices

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zonate pattern on the outer scale leaves.

Anthracnose *(Colletotrichum lindemuthianum)* on dry bean seeds. The fungus produces black, sunken lesions (spots). These spots penetrate deep into the pods and may cause shriveling of

the young pods. In damp weather, the centres of the spots become covered with a pin spore mass. Infected seeds become yellow later turning to brown or black

© A. A. Seif, icipe

Anthracnose *(Colletotrichum musa)* on banana. As is in most fruits, symptoms manifest during ripening of the fruits. They are round, sunken, dark brown to black in colour, and when it is damp they become covered with a mass of pink spores

Anthracnose *(Colletotrichum gossypii)* on cotton boll. Symptoms consist of dark, sunken, circular spots. These spots under moist weather are covered with a mass of pinkish spores

Anthracnose *(Colletotrichum coffeanum)* on coffee *(Coffea arabica)* plant. Branch with mummified berries.

© Jürgen Kranz. Courtesy of Ecoport (www.ecoport.org).

Antracnose *(Colletotrichum capsici)* on sweet pepper *(Capsicum annuum)*. The fungus produces dark, round, sunken spots on the fruits. These spots under moist weather are covered with a spore mass pinkish in colour

© Jürgen Kranz, Courtesy of EcoPort (www.ecoport.org).

Anthracnose on sugarcane. *(Glomerella tucumanensis* (produces tiny reddish

lesions (2-3 mm long and about 0.5 mm wide) on the upper surface of the lamina and their abundance gives it a rusty-brown appearance. In the mid-rib, lesions usually start as minute red spots on the upper surface and develop in both directions, forming small, long lesions. The spots are red to begin with, but later become straw coloured with dark reddish-brown margins.

Anthracnose *(Colletotrichum orbiculare)* damage to pumpkin leaf *(Cucumis sativus)*. On cucurbits, leaf spots are often large, about 10 mm in size and pale-brown to gray in color, with distinct margins. The lesions

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on fruit appear as brownish discolorations, often 20-30 mm diameter that become sunken, wrinkled and dark, with concentric rings of fungal fruiting bodies.

Anthracnose on sorghum. Typical anthracnose symptoms are circular-elliptical dark spots, sometimes with a red pigmentation, which vary in size from 2 mm to more than 2 cm. The centre of mature

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lesions is straw-coloured and contains numerous fungal fruiting bodies (acervuli). Under humid conditions, on the spots , grey/cream/salmon-coloured spore masses are produced.

Anthracnose on yam. On cotyledons and leaves, lesions are often dark, necrotic, angular or irregular in shape. They may be pale with less necrosis. A more general spreading necrosis turning to a leaf blight may also occur

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Anthracnose on soybean. *(Colletotrichum truncatum / C. dermatium forma truncatum)* Infected tissues are covered with black fruiting bodies (conidiomata) which produce minute black spines (setae) that

can be seen with the unaided eye.

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- African cassava mosaic virus (ACMV)
- African maize stalkborer
- Anthracnose

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Late blight (*Phytophthora infestans*) sporulation symptoms on potato leaf in the field

- Aphids
- Bacterial wilt
- Bagrada bug
- Banana weevil
- Black rot
- Cabbage looper
- Cabbage moth
- Cabbage webworm
- Couch grass
- Cowpea seed beetle
- Cutworms
- Damping-off diseases
- Diamondback moth (DBM)

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Late blight of tomato fruit

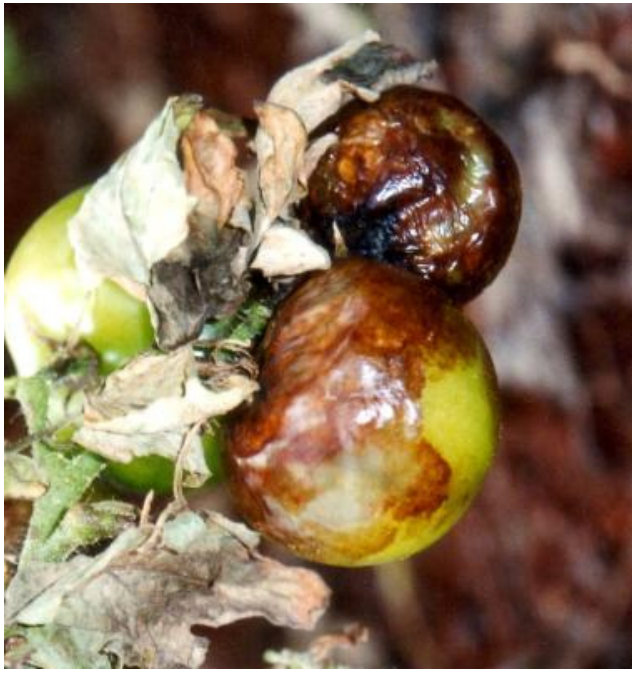
Late blight on tomatoes. Note scorched appearance of leaves stems and fruits.

- Downy mildew
- Early blight
- Fruit flies
- Fusarium wilt
- Larger grain borer
- Late blight
- Leafmining flies (leafminers)
- Mango seed weevil
- Mealybugs
- Powdery mildew
- Purple witchweed
- Root-knot nematodes
- Snails

© B. Loehr, icipe

Symptoms of late blight on tomato.

- **(Giant East African Snail)**
- **Spider mites**
- **Spotted stemborer**
- **Storage pests**
- **Sweet potato weevil**
- **Termites**
- **Thrips**
- **Tomato Yellow Leaf Curl Virus Disease (TYLCV)**
- **Turnip Mosaic Virus (TuMV)**



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Symptoms of late blight on potato stem.

- Weeds
- Whiteflies
- Medicinal plants
- Fruit and vegetable processing
- Natural pest control
- Cultural practices

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Late blight on tomato. Symptoms are irregular, greenish-black, water soaked patches, which appear on the leaves. The spots soon

turn brown and many of the affected leaves wither, yet frequently remain attached to the stem.

Late blight on potato tubers. Infected potato tubers exhibit wet and dry rots (Late Blight)

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- **African bollworm**
- **African cassava mosaic virus (ACMV)**
- **African maize stalkborer**
- **Anthracnose**
- **Aphids**
- **Bacterial wilt**
- **Bagrada bug**

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Early blight on tomato leaf. Leaf spots of early blight are circular, up to 1.2cm in diameter, brown, and often show a circular pattern, which distinguishes this disease from other leaf spots on tomato.

Early blight symptoms on tomato fruits. Typical fruit spots occur at the stem-end as a rot that radiates out from the area of attachment between the calyx and the

- Banana weevil
- Black rot
- Cabbage looper
- Cabbage moth
- Cabbage webworm
- Couch grass
- Cowpea seed beetle
- Cutworms
- Damping-off diseases
- Diamondback moth (DBM)
- Downy mildew
- Early blight
- Fruit flies
- Fusarium

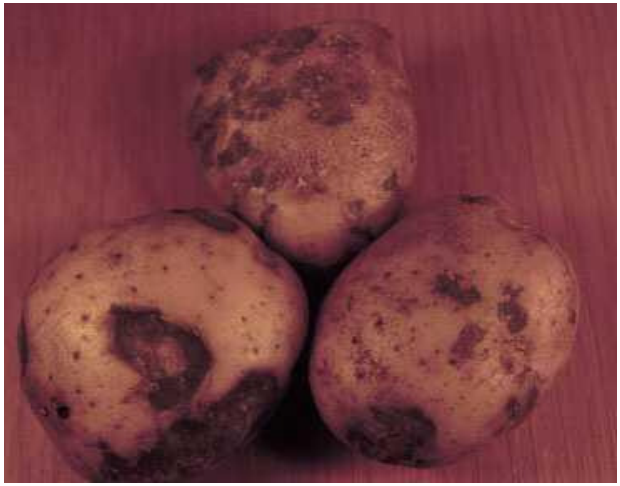
fruit. The spot is usually brown to black, firm, depressed and has distinct concentric rings.

© Allen Stevens and Jon Watterson, Seminis Vegetable Seeds, Inc.

Early blight on tomato. Leaf spots of early blight are circular, up to 1.2 cm in diameter, brown, and often show a circular pattern, which distinguishes this disease from other leaf spots on tomato.

© BioVision

- wilt
- Larger grain borer
- Late blight
- Leafmining flies (leafminers)
- Mango seed weevil
- Mealybugs
- Powdery mildew
- Purple witchweed
- Root-knot nematodes
- Snails (Giant East African Snail)
- Spider mites
- Spotted



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Early blight on potato tubers, early blight results in surface lesions that appear a little darker than adjacent healthy skin. Lesions are usually slightly sunken, circular or irregular, and vary in size up to 1.9 cm in diameter. There is usually a well defined and sometimes slightly raised margin between healthy and diseased tissue. Internally, the tissue shows a brown to black corky, dry rot, usually not more than 6mm. Deep cracks may form in older lesions.

Early blight on potato leaf. Affected leaves exhibit brown spots with concentric rings. Leaf spotting first appears on the oldest leaves and progresses upward on the plant. Entire plant could be

- stemborer
- Storage pests
- Sweet potato weevil
- Termites
- Thrips
- Tomato Yellow Leaf Curl Virus Disease (TYLCV)
- Turnip Mosaic Virus (TuMV)
- Weeds
- Whiteflies

Medicinal plants

Fruit and

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defoliated and killed

Early blight symptoms on okra leaf.

vegetable processing

Natural pest control

Cultural practices

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Early blight (*Alternaria solani* symptoms on tomato leaf.

Early blight symptoms on tomato fruit

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vegetables

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- African armyworm
- African bollworm
- African cassava mosaic virus (ACMV)
- African maize stalkborer
- Anthracnose
- Aphids
- Bacterial wilt
- Bagrada bug
- Banana

Images

Fusarium wilt (*Fusarium oxysporum* f.sp. *lycopersici*) symptoms on tomato plant in field crop.

Fusarium wilt symptoms (*Fusarium oxysporum* f.sp. *cubense*) on banana leaves.

weevil
Black rot
Cabbage looper
Cabbage moth
Cabbage webworm
Couch grass
Cowpea seed beetle
Cutworms
Damping-off diseases
Diamondback moth (DBM)
Downy mildew
Early blight
Fruit flies
Fusarium wilt

Banana cultivar 'Bluggoe' with yellowing symptoms on lower leaves

Pith discolouration of banana pseudostem caused by Fusarium wilt.

- Larger grain borer
- Late blight
- Leafmining flies (leafminers)
- Mango seed weevil
- Mealybugs
- Powdery mildew
- Purple witchweed
- Root-knot nematodes
- Snails (Giant East African Snail)
- Spider mites
- Spotted stemborer

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Fusarium **wilt on passionfruit. Note browning of water conducting tissues**

- **Storage pests**
- **Sweet potato weevil**
- **Termites**
- **Thrips**
- **Tomato Yellow Leaf Curl Virus Disease (TYLCV)**
- **Turnip Mosaic Virus (TuMV)**
- **Weeds**
- **Whiteflies**

Medicinal plants

Fruit and vegetable

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***Fusarium* wilt on passionfruit. Close-up of a cut stem showing brownish water-conducting tissues.**

- **processing**
- **Natural pest control**
- **Cultural practices**

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***Fusarium* wilt on beans**

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***Fusarium* wilt on pea**

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Cut roots of pea plant infected with *Fusarium wilt*. Note reddish discolouration

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Wilting of okra plant due to *Fusarium* wilt

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Chili field infected with *fusarium* wilt. Note gaps due to death of plants.

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Sweet pepper root infected with *Fusarium* wilt. Note brown discolouration of vascular tissues.

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Chili plant infected with fusarium wilt.

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Fusarium wilt *Fusarium oxysporum* f. sp. *spinaciae*) on spinach seedling

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Aphids

Bacterial

Images

Tomato yellow leaf curl virus. Note thickened shoots.

Tomato yellow leaf curl virus. Note multiple shoots, thickened shoots and deformed yellow

- wilt
- Bagrada bug
- Banana weevil
- Black rot
- Cabbage looper
- Cabbage moth
- Cabbage webworm
- Couch grass
- Cowpea seed beetle
- Cutworms
- Damping-off diseases
- Diamondback moth (DBM)
- Downy mildew

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Tomato plant infected with Tomato Yellow Leaf Curl. Note upward and inward rolling of the leaf margins.

- Early blight
- Fruit flies
- Fusarium wilt
- Larger grain borer
- Late blight
- Leafmining flies (leafminers)
- Mango seed weevil
- Mealybugs
- Powdery mildew
- Purple

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- Aphids
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Black cutworm (*Agrotis ipsilon*). Early instars are about 7 to 12 mm long. Fully grown caterpillars are 3.5 to 5 cm long.

Black cutworm (*Agrotis ipsilon*). Pupae are brown to dark brown and approximately 1.7 to 2.5 cm in length and 5 mm in width.

- bug
- Banana weevil
- Black rot
- Cabbage looper
- Cabbage moth
- Cabbage webworm
- Couch grass
- Cowpea seed beetle
- Cutworms
- Damping-off diseases
- Diamondback moth (DBM)
- Downy mildew
- Early blight
- Fruit flies

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Turnip moth (*Agrotis segetum*). The adult moth is about 2 cm long and has a wingspan of 4 to 4.5 cm.

- **Fusarium wilt**
- **Larger grain borer**
- **Late blight**
- **Leafmining flies (leafminers)**
- **Mango seed weevil**
- **Mealybugs**
- **Powdery mildew**
- **Purple witchweed**
- **Root-knot nematodes**
- **Snails (Giant East African Snail)**
- **Spider mites**

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Okra seedling damaged by cutworm caterpillar (right). Note healthy seedling on the left. Close-up of cutworm (inset)

- Spotted stemborer
- Storage pests
- Sweet potato weevil
- Termites
- Thrips
- Tomato Yellow Leaf Curl Virus Disease (TYLCV)
- Turnip

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Aphids
Bacterial wilt
Bagrada bug
Banana

Images

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Diamondback moth feeding on kales. A fully-grown caterpillar is about one cm long. Head capsule is pale to pale-greenish or pale-brown, mottled with brownish and black-brown spots.

Eggs of the diamondback moth are tiny, flat and oval in shape, they are yellowish and less than 1 mm in size.

- weevil
- Black rot
- Cabbage looper
- Cabbage moth
- Cabbage webworm
- Couch grass
- Cowpea seed beetle
- Cutworms
- Damping-off diseases
- Diamondback moth (DBM)
- Downy mildew
- Early blight
- Fruit flies
- Fusarium wilt

Caterpillar of a diamondback moth feeding on leaf. A fully-grown caterpillar is about one cm long. Head capsule is pale to pale-greenish or pale-brown, mottled with brownish and black-brown spots.

- Larger grain borer
- Late blight
- Leafmining flies (leafminers)
- Mango seed weevil
- Mealybugs
- Powdery mildew
- Purple witchweed
- Root-knot nematodes
- Snails (Giant East African Snail)
- Spider mites
- Spotted stemborer

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Young diamontback moth caterpillars. Note first instar caterpillars feeding inside mines and second instar caterpillars feeding on the leaf surface. A full-grown larva is about one cm long.

- Storage pests
- Sweet potato weevil
- Termites
- Thrips
- Tomato Yellow Leaf Curl Virus Disease (TYLCV)
- Turnip Mosaic Virus (TuMV)
- Weeds
- Whiteflies

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Diamondback moth larvae

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Pupa is 5 to 6 mm long, about four times as long as the width. It is covered with a white silken cocoon. Initially pupa is pinkish-white to pinkish-yellow.

- **processing**
- **Natural pest control**
- **Cultural practices**

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Diamondback moth pupal colour changes to brown before adult emergence. The developing moth can be seen through the cocoon. The pupa is 5 to 6 mm long.

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Coccon of the parasitic wasp *Diadegma semiclausum*. The wasp larva spins a brown, rounded cocoon within the silk cocoon of diamondback moth.

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Diamondback moth adult on cabbage leaf. The adult is greyish brown with a nine mm long body and a wingspan of about 1.2 to 1.5 cm

Diamondback moth adult. The adult is greyish brown with a nine mm long body and a wingspan of about 1.2 to 1.5 cm

Cabbage damaged by the diamondback moth. The caterpillar is a surface feeder and with its chewing mouth parts it feeds voraciously on the leaves leaving a papery epidermis intact. This type of damage gives the appearance of transluscent windows in the leaf blades.

Caterpillars and in some cases pupae are found on the damaged leaves. In cases of severe infestation entire leaves could be lost.

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Diamondback moth parasitoid (*Diadegma semiclausum*). This parasitic wasp was introduced and is now established in East Africa highlands.

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Diamondback moth parasitoid (*Cotesia plutellae*)

Diamondback moth caterpillar parasitied by *Cotesia plutella*. Note silky cocoon of the parasitoid near dead DBM caterpillar. The wasp larva emerges from the caterpillar and spins a white cocoon from which the adult wasp emerges.

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Larger grain borer (*Prostephanus truncatus*). The adult beatle is 3-4.5 mm long.

Larger grain borer (*Prostephanus truncatus*).

Bagrada bug
Banana weevil
Black rot
Cabbage looper
Cabbage moth
Cabbage webworm
Couch grass
Cowpea seed beetle
Cutworms
Damping-off diseases
Diamondback moth (DBM)
Downy mildew
Early blight

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Adult beatle, 3-4.5mm

Predator of LGB (*Teretrius nigrescens*). Initial releases of *T. nigrescens* were in Togo in 1991 and in Kenya in 1992. In both countries it became well established and

- Fruit flies
- Fusarium wilt
- Larger grain borer
- Late blight
- Leafmining flies (leafminers)
- Mango seed weevil
- Mealybugs
- Powdery mildew
- Purple witchweed
- Root-knot nematodes
- Snails (Giant East African Snail)

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spread. Subsequently, there have been predator releases in Benin, Ghana, Tanzania and Malawi. Only in the case of Tanzania does it appear that there has been any difficulty in the predator becoming quickly and easily established. However, despite the successful introductions, there are still regular outbreaks of *P. truncatus* and farmers still suffer losses. It has been concluded by Holst et al. (2000b) that *T. nigrescens* does not offer a good example of classical biological control but as the predator is able to reduce the density of the pest it is considered that it has, nevertheless, a role to play

Spider mites
Spotted stemborer
Storage

in integrated pest management.

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Spotted stemborer (*Chilo partellus*)

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- Anthracnose
- Aphids
- Bacterial wilt
- Bagrada bug
- Banana weevil
- Black rot
- Cabbage looper
- Cabbage moth
- Cabbage webworm
- Couch grass
- Cowpea

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Stemborer damage.

- seed beetle
- Cutworms
- Damping-off diseases
- Diamondback moth (DBM)
- Downy mildew
- Early blight
- Fruit flies
- Fusarium wilt
- Larger grain borer
- Late blight
- Leafmining flies (leafminers)
- Mango seed weevil
- Mealybugs
- Powdery

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Broken stem due to damage by the spotted stemborer *Chilo partellus*

- mildew
- Purple witchweed
- Root-knot nematodes
- Snails (Giant East African Snail)
- Spider mites
- Spotted stemborer
- Storage pests
- Sweet potato weevil
- Termites
- Thrips
- Tomato Yellow Leaf Curl Virus

© Stemborer team, icipe

Spotted stemborer (*Chilo partellus*) - Adults are relatively small moths with wing lengths ranging from 7 to 17 mm (1.7cm).

- Disease (TYLCV)
- Turnip Mosaic Virus (TuMV)
- Weeds
- Whiteflies

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Banana

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Male Mediterranean fruit fly or medfly *(Ceratitis capitata)* resting on a leaf. Adult medflies are 4 to 7 mm long, brightly coloured, usually in brown-yellow patterns. The wings are spotted or banded with yellow and brown margins.

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Adult mediterranean fruit flies *(Ceratitis capitata)* are 4 to 7 mm long, brightly coloured, usually in brown-yellow patterns. The wings

- weevil
- Black rot
- Cabbage looper
- Cabbage moth
- Cabbage webworm
- Couch grass
- Cowpea seed beetle
- Cutworms
- Damping-off diseases
- Diamondback moth (DBM)
- Downy mildew
- Early blight
- Fruit flies
- Fusarium wilt

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are spotted or banded with yellow and brown margins.

Melon fly *(Bactrocera cucurbitae)*

- **Larger grain borer**
- **Late blight**
- **Leafmining flies (leafminers)**
- **Mango seed weevil**
- **Mealybugs**
- **Powdery mildew**
- **Purple witchweed**
- **Root-knot nematodes**
- **Snails (Giant East African Snail)**
- **Spider mites**
- **Spotted stemborer**

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African invader fly *(Bactrocera invadens)*

- **Storage pests**
- **Sweet potato weevil**
- **Termites**
- **Thrips**
- **Tomato Yellow Leaf Curl Virus Disease (TYLCV)**
- **Turnip Mosaic Virus (TuMV)**
- **Weeds**
- **Whiteflies**

Medicinal plants

Fruit and vegetable

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Natal fruit fly *(Ceratitis rosa)*, wing length 4 to 6 mm.

processing

Natural pest control

Cultural practices

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Mango fruit fly *(Ceratitis cosyra)*

Pumpkin fly *(Daccus bivittatus)* on a chilli pod

Larvae of the Mediterranean fruit fly *(Ceratitis capitata)* pupate in the soil.

Fruit fly maggots in water melon fruit

Egg laying marks by fruit flies on an orange fruit. Following oviposition there may be some necrosis around the puncture mark ('sting'). This is followed by decompostion of the fruit.

African invader fly *(Bactrocera invadens)* attack on green banana

© M.K. Billah, icipe

Mango fruit fly *(Ceratitis cosyra)* damage symptoms on mango

Homemade fruit fly trap in a mango tree

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Print

Crops/ fruits/ vegetables

Pests/ diseases/ weeds

- African armyworm
- African bollworm
- African cassava mosaic virus (ACMV)
- African maize stalkborer
- Anthracnose
- Aphids
- Bacterial wilt
- Bagrada

Images

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Cassava mealybug (*Phenacoccus manihoti*). Female mealybugs are 0.5 - 1.4 mm long and their body is usually covered with a waxy secretion.

Citrus mealybug (*Planococcus citri*). Mealybug parasitized by *Leptomastix dactylopii* wasp.

- bug
- Banana weevil
- Black rot
- Cabbage looper
- Cabbage moth
- Cabbage webworm
- Couch grass
- Cowpea seed beetle
- Cutworms
- Damping-off diseases
- Diamondback moth (DBM)
- Downy mildew
- Early blight
- Fruit flies

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Long-tailed mealybug (*Pseudococcus longispinus*). The body of the adult female is 2.0-3.6 mm long, soft, elongate oval and somewhat flattened.

- Fusarium wilt
- Larger grain borer
- Late blight
- Leafmining flies (leafminers)
- Mango seed weevil
- Mealybugs
- Powdery mildew
- Purple witchweed
- Root-knot nematodes
- Snails (Giant East African Snail)
- Spider mites

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Pink hibiscus mealybug (*Maconellicoccus hirsutus*). Pink eggs in an egg mass.

© Johnson M. Courtesy of Ecoport

- Spotted stemborer
- Storage pests
- Sweet potato weevil
- Termites
- Thrips
- Tomato Yellow Leaf Curl Virus Disease (TYLCV)
- Turnip Mosaic Virus (TuMV)
- Weeds
- Whiteflies

Medicinal plants

(www.ecoport.org).

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Pink hibiscus mealybug (*Maconellicoccus hirsutus*). The adult female is 2.5-4 mm long, soft-bodied, elongate oval and slightly flattened.

Pink hibiscus mealybug (*Maconellicoccus hirsutus*). Adult male. Males have one pair of very simple wings, long antennae, white wax filaments projecting posteriorly and lack mouthparts.

Fruit and vegetable processing

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Cultural practices

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Mealybugs on citrus. Mealybugs excrete honeydew, which leads to the growth of sooty mould on fruit and leaves.

Female mealybugs on

passionfruit leaf. Female mealybugs are 3 to 5 mm long and their body is usually covered with a waxy secretion.

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Mealybugs on pineapple. Severe infestation of pineapple mealybug on the fruit

Mass of mealybugs on passion fruit.

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Crops/ fruits/ vegetables

Pests/ diseases/ weeds

African armyworm

African bollworm

African cassava mosaic virus (ACMV)

African maize stalkborer

Anthracnose

Aphids

Bacterial

Images

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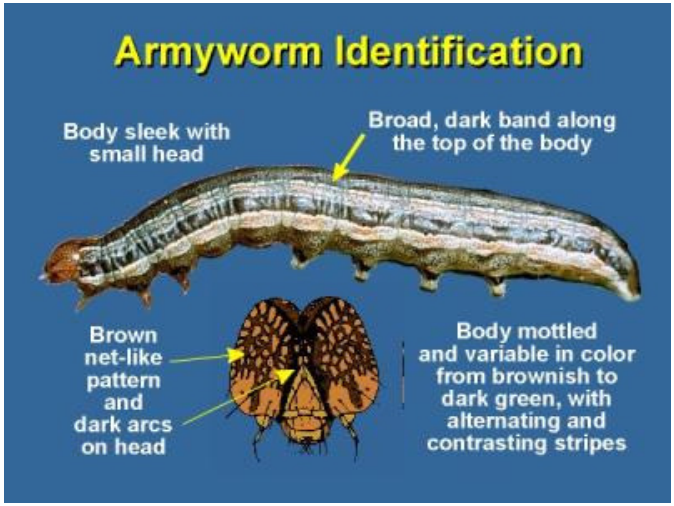
African armyworm. Mature larvae measure up to 4 cm. This is the gregarious form (caterpillars growing crowded).

Armyworm identification. The caterpillars can eat the entire leaves of field crops and grasses. When feeding, they

- wilt
- Bagrada bug
- Banana weevil
- Black rot
- Cabbage looper
- Cabbage moth
- Cabbage webworm
- Couch grass
- Cowpea seed beetle
- Cutworms
- Damping-off diseases
- Diamondback moth (DBM)
- Downy mildew

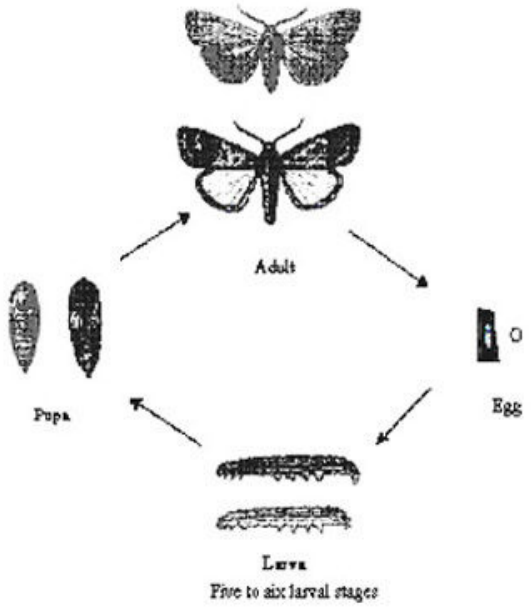


© University of Nebraska - Lincoln

chew from the leaf edges until only the midrib is left. They feed on various crops and grasses during their migration, and often bare crops of tender leaves after passing through. They travel from field to field in great numbers, hence the name "armyworm".

Lifecycle of armyworm 10 to 300 eggs are laid by an adult female moth, on the leaves. The eggs are white and become dark brown just before hatching (about 0.5 mm in diameter). Depending on temperature the eggs hatch after 2 to 5 days. Larval stage

- Early blight
- Fruit flies
- Fusarium wilt
- Larger grain borer
- Late blight
- Leafmining flies (leafminers)
- Mango seed weevil
- Mealybugs
- Powdery mildew
- Purple witchweed
- Root-knot nematodes
- Snails (Giant East African



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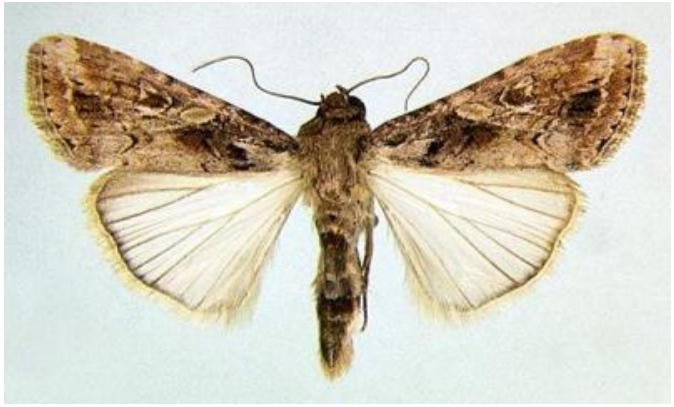
takes 14 to 22 days. Pupal stage lasts 7 to 15 days. Adult moth lifespan is 5 to 16 days. In East Africa, the lifecycle lasts about 25 days at an average temperature of 26 degree Celsius.

Armyworm, adult male moth *S. exempta* (museum set specimen). 1.4 to 1.8 cm long and with a wingspan of about 3 cm.

- Snail)
- Spider mites
- Spotted stemborer
- Storage pests
- Sweet potato weevil
- Termites
- Thrips
- Tomato Yellow Leaf Curl Virus Disease (TYLCV)
- Turnip Mosaic Virus (TuMV)
- Weeds
- Whiteflies



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Armyworm, adult female moth (*S. exempta*) (museum set specimen). 1.4 to 1.8 cm long and with a wingspan of about 3 cm.

- **Medicinal plants**
- **Fruit and vegetable processing**
- **Natural pest control**
- **Cultural practices**

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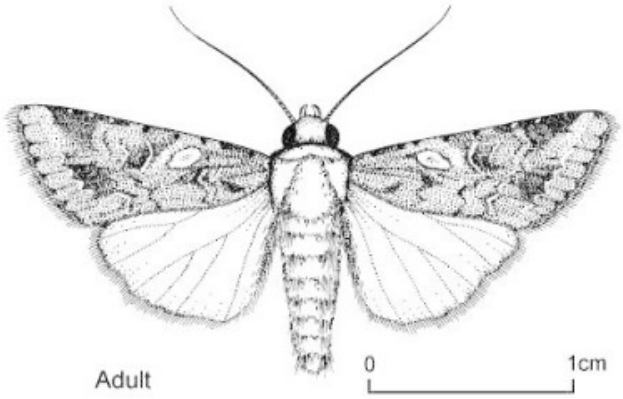
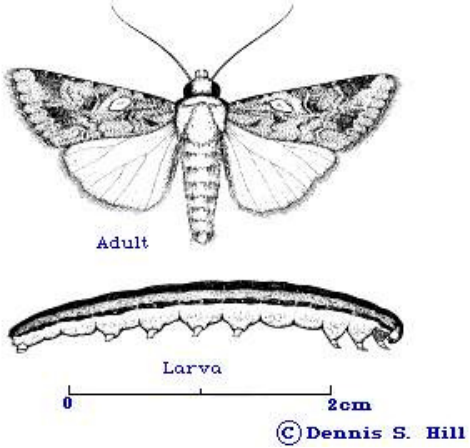
Armyworm, adult moth - line drawing. Stout-bodied moths of typical noctuid appearance, 1.4 to 1.8 cm long with a 2.9 to 3.2 cm wingspan.



Armyworm, adult and caterpillar - line drawing. The pupa is red-brown and is approximately 2 cm long. Adults have a wingspan of about 3 cm.



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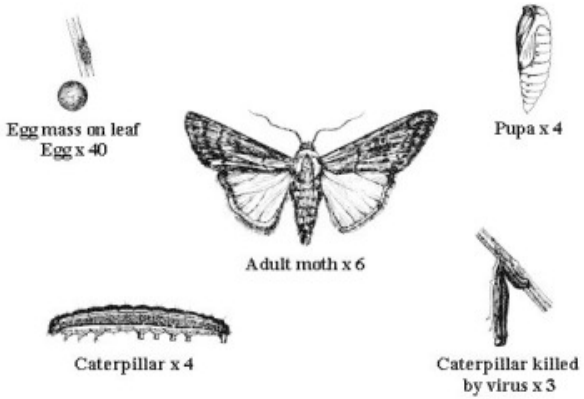
Armyworm, life stages - line drawing. Egg ca 0.5 mm diameter, conical with a slightly rounded apex. Gregarious larvae with velvety-black upper surface with pale lateral lines, green or yellow ventral surface.



Pupae mahogany-brown, 10 to 14 mm long, with a smooth, shiny surface.

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Armyworm, Pupae and soil cocoons

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Crops/ fruits/ vegetables

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- African armyworm
- African bollworm
- African cassava mosaic virus (ACMV)
- African

Images

Banana weevil in banana corm. Adults attain a body lenght of 1 to 1.6 cm.

- maize stalkborer
- Anthracnose
- Aphids
- Bacterial wilt
- Bagrada bug
- Banana weevil
- Black rot
- Cabbage looper
- Cabbage moth
- Cabbage webworm
- Couch grass
- Cowpea seed beetle
- Cutworms
- Damping-off

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Banana Weevil Borer (*Cosmopolites sordidus*). Adults attain a body lenght of 1-1.6 cm and ar black or very dark brown.

- **diseases**
- **Diamondback moth (DBM)**
- **Downy mildew**
- **Early blight**
- **Fruit flies**
- **Fusarium wilt**
- **Larger grain borer**
- **Late blight**
- **Leafmining flies (leafminers)**
- **Mango seed weevil**
- **Mealybugs**
- **Powdery mildew**
- **Purple witchweed**

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Grubs of banana weevils in tunnel in banana corm. The fully-grown larva is about 1 cm long.

- Root-knot nematodes
- Snails (Giant East African Snail)
- Spider mites
- Spotted stemborer
- Storage pests
- Sweet potato weevil
- Termites
- Thrips
- Tomato Yellow Leaf Curl Virus Disease (TYLCV)
- Turnip

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Pupa of banana weevil is white and about 12 mm long (picture much enlarged). As it develops, the shape of the adult becomes visible.

- Mosaic Virus (TuMV)
- Weeds
- Whiteflies

Medicinal plants

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Banana corm damaged by banana weevil. Note tunnelling by weevil grubs and rotting of corm.

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vegetables

[Pests/ diseases/ weeds](#)

African armyworm
African bollworm
African cassava mosaic virus (ACMV)
African maize stalkborer
Anthracnose
Aphids
Bacterial wilt
Bagrada bug
Banana

Images

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Sweet potato weevil. Adult female, body length 6 to 8 mm.

Sweet Potato Weevil. Adults are entirely black, with a body length of 6 to 8 mm.

- weevil
- Black rot
- Cabbage looper
- Cabbage moth
- Cabbage webworm
- Couch grass
- Cowpea seed beetle
- Cutworms
- Damping-off diseases
- Diamondback moth (DBM)
- Downy mildew
- Early blight
- Fruit flies
- Fusarium wilt

Sweet potato weevil larvae on sweet potato. The full-grown larva about 8 mm long.

- Larger grain borer
- Late blight
- Leafmining flies (leafminers)
- Mango seed weevil
- Mealybugs
- Powdery mildew
- Purple witchweed
- Root-knot nematodes
- Snails (Giant East African Snail)
- Spider mites
- Spotted stemborer

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Sweet potato weevil symptoms on tuber.

© Courtesy of

Storage pests
Sweet potato weevil
Termites
Thrips
Tomato

Institute of Plant Biotechnology for developing Countries, Ghent University, Belgium (www.ipbo.ugent.be)

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Images

Couch grass (*Cynodon dactylon*) is a perennial grass, with underground rhizomes and on the ground

- African bollworm
- African cassava mosaic virus (ACMV)
- African maize stalkborer
- Anthracnose
- Aphids
- Bacterial wilt
- Bagrada bug
- Banana weevil
- Black rot
- Cabbage looper
- Cabbage moth

runners.

Couch grass flower

- Cabbage webworm
- Couch grass
- Cowpea seed beetle
- Cutworms
- Damping-off diseases
- Diamondback moth (DBM)
- Downy mildew
- Early blight
- Fruit flies
- Fusarium wilt
- Larger grain borer

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Crops/ fruits/ vegetables

Pests/ diseases/ weeds

African armyworm
African bollworm
African cassava mosaic virus (ACMV)
African maize stalkborer
Anthracnose
Aphids
Bacterial wilt

Images

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Damping-off (*Rhizoctoni solani*) on beans

Rhizoctonia solani on brassica

- Bagrada bug
- Banana weevil
- Black rot
- Cabbage looper
- Cabbage moth
- Cabbage webworm
- Couch grass
- Cowpea seed beetle
- Cutworms
- Damping-off diseases
- Diamondback moth (DBM)
- Downy mildew
- Early blight

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Rhizoctoni solani **on potato tuber**

- **Fruit flies**
- **Fusarium wilt**
- **Larger grain borer**
- **Late blight**
- **Leafmining flies (leafminers)**
- **Mango seed weevil**
- **Mealybugs**
- **Powdery mildew**
- **Purple witchweed**
- **Root-knot nematodes**
- **Snails (Giant East African Snail)**

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Damping-off of rice

- **Spider mites**
- **Spotted stemborer**
- **Storage pests**
- **Sweet potato weevil**
- **Termites**
- **Thrips**
- **Tomato Yellow Leaf Curl Virus Disease (TYLCV)**
- **Turnip Mosaic Virus (TuMV)**
- **Weeds**
- **Whiteflies**

Medicinal

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Damping-off of cucumber

plants

Fruit and vegetable processing

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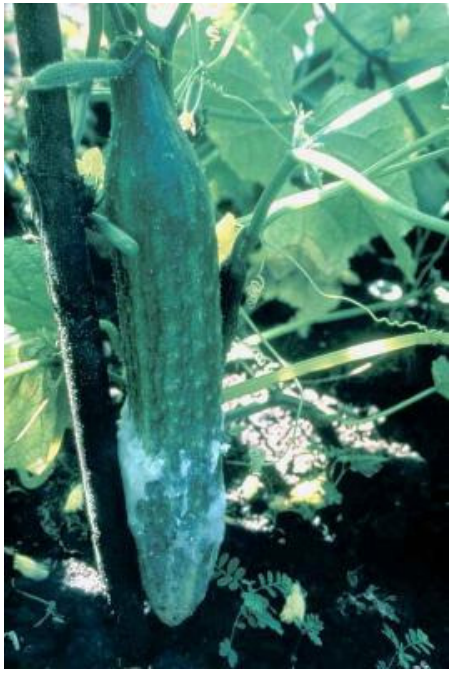

Damping-off of groundnut

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Damping-off (*Phytium* spp.) of carrots

© David B. Langston, University of Georgia (www.bugwood.org)

Okra seedlings affected by damping-off

Damping-off disease in chilli field

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vegetables

Pests/ diseases/ weeds

African armyworm
African bollworm
African cassava mosaic virus (ACMV)
African maize stalkborer
Anthracnose
Aphids
Bacterial wilt
Bagrada bug
Banana

Pests, diseases and weeds

Find sustainable management and preventive measures against common pests and diseases of major crops, fruits and vegetables and indigenous crops in East Africa, click on the image below or on the link list on the left side to get more information


African


African


African


African maize


Anthracnose


Aphids


Bacterial wilt


Bagrada bug

- weevil
- Black rot
- Cabbage looper
- Cabbage moth
- Cabbage webworm
- Couch grass
- Cowpea seed beetle
- Cutworms
- Damping-off diseases
- Diamondback moth (DBM)
- Downy mildew
- Early blight
- Fruit flies
- Fusarium wilt

Banana weevil

Black rot

Cabbage

Cabbage moth

Cabbage

Couch grass

Cowpea seed

Cutworms

Damping-off

Diamondback

Downy mildew

Early blight

Fruit flies

Fusarium wilt

Larger grain

Late blight

- Larger grain borer
- Late blight
- Leafmining flies (leafminers)
- Mango seed weevil
- Mealybugs
- Powdery mildew
- Purple witchweed
- Root-knot nematodes
- Snails (Giant East African Snail)
- Spider mites
- Spotted stemborer

Leafmining

Mango seed

Mealybugs

Powdery

Purple witchweed

Root-knot nematodes

Snails (Giant East African

Spider mites

Spotted stemborer

Storage pests

Sweet potato weevil

Termites

Thrips

Tomato Yellow Leaf Curl

Turnip Mosaic Virus (TuMV)

Weeds

Whiteflies

Storage pests
Sweet potato weevil
Termites
Thrips
Tomato Yellow Leaf Curl Virus Disease (TYLCV)
Turnip Mosaic Virus (TuMV)
Weeds
Whiteflies
Medicinal plants
Fruit and vegetable

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evil

Mango seed weevil
Scientific name: *Sternochetus mangiferae*
Family: Curculionidae
Type: pest (insect/mite)
Common names: Mango nut weevil, Mango stone weevil
Host plants: Mango

nation on Pest and Damage

distribution

processing

Natural pest control

Cultural practices

Introduction

The mango seed weevil is one of major pest of mangoes in East Africa. The larva, which is the damaging stage of the pest, enters the fruit burrowing through the flesh into the seeds, where they feed until pupation, destroying the seed. Early attack (when the fruits are forming) leads to premature fruit fall. If the attacks occur at a later stage, fruit infestation is very difficult to detect, since there are no external signs of infestation, except for an inconspicuous egg-laying scar, and consequent feeding activity in the seed remains undetected.

Weevils leave the fruit after it has fallen and decayed or when the fruit is ripe. Thus, yield is usually not significantly affected. When the adult emerges, it tunnels through the flesh into the open, leaving a hole in the fruit skin. In late-maturing varieties, it causes post-harvest damage to the pulp as the tunnel turns hard making the fruit unmarketable. This hole also serves as an entry point for secondary fungal infection.

Mango seed weevil is a quarantine pest. Probably its greatest significance as a pest is to interfere with the export of fruit because of quarantine restrictions imposed by importing countries and the market requirement for blemish-free fruit. This is particularly troublesome in the case of the mango seed weevil because, in many instances, weevil attack remains undetected in the field, and is first noticed in storage or in transit.

Weevil feeding reduces the germination capacity of seeds. All the evidence suggests that weevils spread into clean areas through the movement of infested fruit for propagation and consumption. In Australia, young orchards planted from weevil-free-nursery stock have been shown to be free of seed weevil infestation for a number of years after establishment, even in areas known to have seed weevil (Pinese and Holmes 2005).

Host range

Complete development of the mango seed weevil is only possible on mangoes.

Symptoms

Infected fruits are difficult to detect to the untrained eye. The cuts made by egg-laying females are small and generally soon heal, leaving very small, dark, crescent-shaped marks on the fruit skin. Infested fruit present internal rot on the outer surface

of the stone. The stones also show holes and the cotyledons turn black and become a rotten mass. When the adult emerges a hole is visible in the fruit skin, which also serves as an entry point for secondary fungal infection.

Affected plant stages

Fruiting stage and post-harvest.

Affected plant parts

Fruits and seeds.

Symptoms by affected plant part

Fruits: internal feeding.
Seeds: internal feeding.

Biology and Ecology of the Mango Seed Weevil

Eggs are elliptical, about 0.8 mm long and 0.3 mm wide and are creamy-white in colour when freshly laid. They are laid singly in small cavities made by the female in the skin of young fruits. There are reports that eggs may also be laid into

inflorescences. The female then covers each egg with a brown exudate and cuts a very small crescent-shaped area (of 0.3 mm) in the fruit, near the back end of the egg. The wound creates a sap flow, which hardens and covers the egg with a protective coating. Several eggs may be laid in each fruit. Incubation requires 5 to 7 days.

Close-up of an egg-laying mark of mango seed weevil

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Larvae are white grubs with a curved body, brown heads and legless. Newly hatched larvae are extremely slender and elongated and about one mm long. Mature larvae are about 17 mm long. After hatching, the larva burrows through the flesh of the fruit and into the seed where they feed until pupation. The development of the larva is usually completed within the maturing seed, but also very occasionally within the flesh.

Grub of mango seed weevil

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The pupae are whitish when newly formed, but change to a very pale red colour just before the adult emerges. They are about eight mm long and seven mm wide. Pupation takes place in the seed within the stone of the fruit.

Pupa of mango seed weevil inside a mango stone

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The adults are weevils with a compact body, about 8 mm long. They are dark greyish-brown with paler patches. They are usually active at dusk. Adults can fly, but they are not known to be strong fliers; however, there are reports that they are able to fly longer distances than previously thought. They pretend to be dead when touched or disturbed.

Adults are well camouflaged on the bark of mango tree trunks, in branch terminals, or in crevices near mango trees during non-fruiting periods. They may also live in leaf litter around the tree. During flowering the adults leave their sheltered areas and move into the canopy of the tree to feed on new growth and to mate. Females start egg laying 3 to 4 days after mating, when the fruit is about marble-size. Adult weevils feed on mango leaves, tender shoots or flower buds. They can live for two years.

The total life cycle takes 40 to 50 days.

Mango seed weevils

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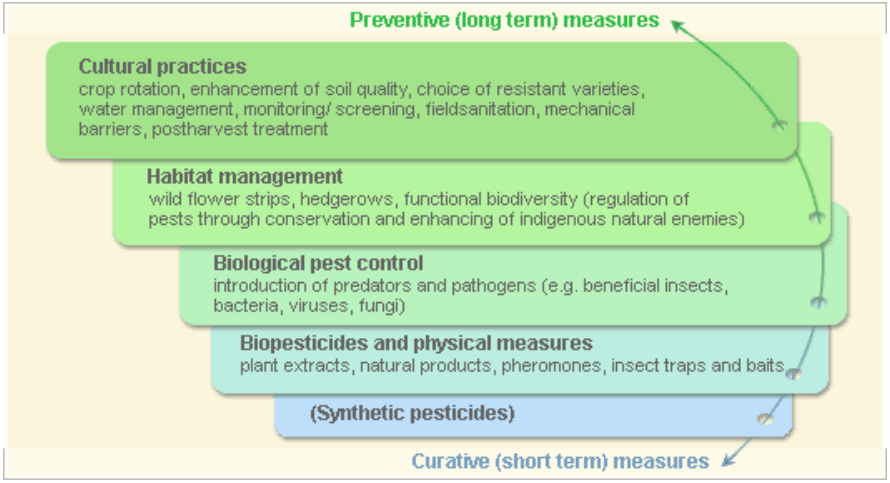
Pest and Disease Management

Pest and disease management: General illustration of the concept of *infonet-*

biovision



These illustration shows the methods promoted on infonet-biovision. The methods shown at the bottom have a long-term effect, while methods shown at the top have a short-term effect. In organic farming systems, methods with a long-term effect are the basis of crop production and should be used with preference. On the other hand methods with a short-term effect should be used in emergencies only. On infonet we do not promote synthethic pesticides.

Further below you find concrete preventive and curative methods against Mango seed weevils.

Cultural practices

Monitoring

Weevil attack can be detected by monitoring for egg-laying marks on young fruit. Regular fruit scouting is important to detect adult activity during fruit growth.

Sanitation

Good orchard sanitation is very important. Collect and destroy all scattered stones and fallen fruits. Chop them finely or bury them deeply (about 50 cm deep).
Keep the tree basins clean, remove fallen fruit, seed and plant debris to prevent hiding of adult weevils.

Orchard quarantine

Avoid movement of fruits from areas known to have mango seed weevils to areas where young orchards, free of seed weevil, have been established.
A strict policy of not bringing mango fruit into the orchard and its surroundings will greatly reduce the chance of infestation.

Biopesticides and physical methods

Sticky bands

In areas with a history of high infestation, applying sticky bands at the upper end of tree trunks when the trees start flowering helps reducing migration of weevils to branches for egg laying. For more information on sticky traps click here

Information Source Links

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www.icipe.org

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