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Cowpea seed beetle

Images

Clemson University - USDA Cooperative Extension Slide Series, www.insectimages.org

Cowpea seed beetle (*Callosobruchus maculatus*) adults are 2.-3.5 mm long. The adults emerge through windows in the grain, leaving round holes that are the main evidence of damage.

Cowpea seed weevil (*C. maculatus*) on

Peter Credland, Reproduced from CABI 2006

cowpea. Adults are 2-3.5 mm long.

Cowpea seed beetle (*Callosobruchus maculatus*) adults are 2.-3.5 mm long.

Georg Goergen, Courtesy of Ecoport (www.ecoport.org)

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Leafmining flies (leafminers)

Images

Damage on beans by leafmining flies

A.M. Varela, icipe

Mines caused by maggots, and a pupa of leafmining flies on a cabbage leaf.

A.M. Varela, icipe

Damage on tomato leaf by leafmining flies.

Clemson University - USDA Cooperative Extension Slide Series, Bugwood.org

Legless maggot of the leafmining fly *(Liriomyza brassica)* with no separate head capsule, transparent when newly hatched but colouring up to a yellow orange in later instars, up to 3-4 mm long.

Jerry A. Payne, USDA Agricultural Research Service, Bugwood.org

Leafminer (*Liriomyza sativae*) pupa within tunnel of onion. They are oval, slightly flattened and about 1 - 2 mm long.

Whitney Cranshaw, Colorado State University, Insect Images (www.insectimages.org)

Leafminer adults *(Liriomyza trifolii)* are flies, they are very small, about 1 mm body length.

Georg Goergen (Courtesy of Ecoport, www.ecoport.org)

Leafminer damage on onions

Ooi P. (Courtesy of EcoPort, www.ecoport.org

Leafminer damage on peas

A.M. Varela, icipe

Leaf of okra seedling showing attack by leafmining flies. Note pupa on leaf.

A.M.Varela, icipe

Leafmining flies on okra leaf. Pupa outside mine and larva in mine.

A.M.Varela, icipe

Leafmining fly on okra leaf

A.M.Varela, icipe

Mines caused by maggots of leafmining flies on an okra leaf. Note maggots at the wide end of the mines.

A.M. Varela, icipe

Punctures caused by leafmining flies feeding and laying eggs on a leaf of an okra seedling.

A.M. Varela, icipe

Okra leaf showing heavy attack by leafmining flies.

A.M.Varela, icipe

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Anthracnose

Images

Anthracnose on mango (Colletotrichum

A. A. Seif, A. M. Milena, icipe

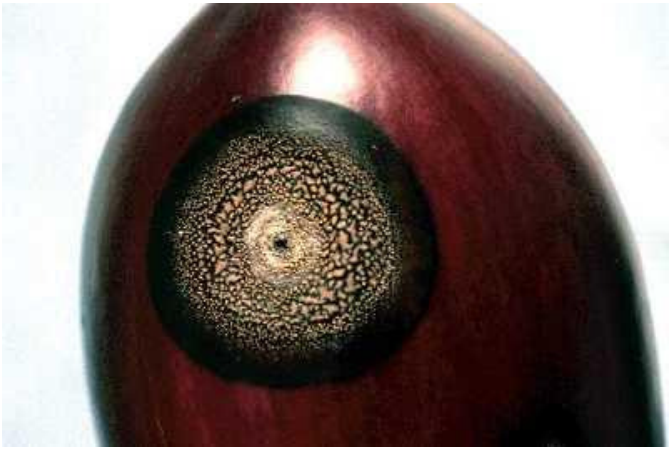
Anthracnose on avocado

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.

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.

A. A. Seif, icipe

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



Anna L. Snowdon. Reproduced from the Crop Protection Compendium, 2004 Edition. CAB International, Wallingford.

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

Clemson University - USDA Cooperative Extension Slide Series. Courtesy of Ecoport (www.ecoport.org).

Onion smudge *(Colletotrichum circinans)*. Small, round, dark blotches develop on bulbs, with a zonate pattern on the outer scale leaves.

Denis Persley and Tony Cooke, Department of Primary Industries and Fisheries, Queensland, Australia. Courtesy of Ecoport (www.ecoport.org).

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

Jim Sheppard. Courtesy of Ecoport (www.ecoport.org).

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

A. A. Seif, icipe

Anthracnose *(Colletotrichum gossypii)* on cotton boll.

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

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

Land Care Ltd. New Zealand, Courtesy of EcoPort (www.ecoport.org).

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 on fruit appear as brownish discolorations, often 20-30 mm diameter that become sunken, wrinkled and dark, with concentric

Clemson University, USDA Cooperative Extension Slide Serie (www.bugwood.org).

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 lesions is straw-coloured and contains numerous fungal fruiting bodies (acervuli). Under humid conditions, on the spots ,

Frawd JA, Courtesy of EcoPort (www.ecoport.org).

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

Grahame Jackson, Courtesy of EcoPort (www.ecoport.org).

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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Late blight

Images

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

Late blight of tomato fruit

A.M. Varela, icipe

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

B. Loehr, icipe

Symptoms of late blight on tomato.

B. Loehr, icipe

Symptoms of late blight on potato stem.

Thorsten Kraska, University of Bonn, Germany. Reproduced from the Crop Protection Compendium, 2004 Edition. © CAB International, Wallingford.

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.

Rob Williams/CAB International. Reproduced from the Crop Protection Compendium, 2004 Edition. Â© CAB International, Wallingford.

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

William E. Fry. Reproduced from the Crop Protection Compendium, 2004 Edition. © CAB International, Wallingford.

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Early blight

Images

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.

A.M. Varela, icipe

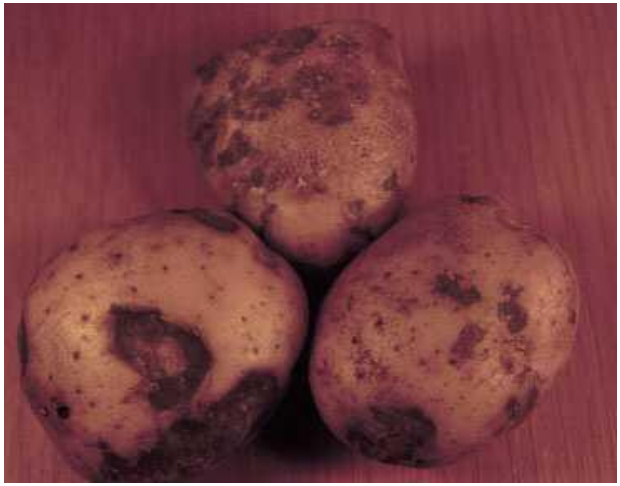
Early blight symptoms on tomato fruits. Typical fruit spots occur at the stem-end as a rot that radiates out from the area of attachment between the calyx and the fruit. The spot is usually brown to black, firm, depressed and has distinct concentric rings.

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

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



Chad Behrendt. Reproduced from University of Minnesota Extension.

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 defoliated and killed

www.plantpath.wisc.edu

Early blight symptoms on okra leaf.

M. Rutherford/CABI BioScience. Reproduced from the Crop Protection Compendium, 2004 Edition. CAB International, Wallingford.

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

Clemson University - USDA Cooperative Extension Slide Series (www.bugwood.org)

Early blight symptoms on tomato fruit

A.A. Seif, icipe

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Information of www.infonet-biovision.org

Fusarium wilt

Images

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

Jim Correll. Reproduced from the Crop Protection Compendium, 2005 Edition. © CAB International, Wallingford, UK, 2005.

***Fusarium* wilt symptoms (*Fusarium oxysporum* f.sp. *cubense*) on banana leaves. Banana cultivar 'Bluggoe' with yellowing symptoms on lower leaves**

Pith discolouration of banana pseudostem caused by Fusarium wilt.

A. A. Seif, icipe

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

A.M. Varela, icipe

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

A.M. Varela, icipe

***Fusarium* wilt on beans**

A.M. Varela, icipe

***Fusarium* wilt on pea**

A.M. Varela, icipe

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

A.A. Seif, icipe

Wilting of okra plant due to *Fusarium* wilt

A.M. Varela & A.A. Seif, icipe

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

A. A. Seif & B. Nyambo, icipe

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

A. A. Seif & B. Nyambo, icipe

Chili plant infected with fusarium wilt.

A.A. Seif & B. Nyambo, icipe

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

http://ipm.wsu.edu

Information of www.infonet-biovision.org

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Tomato Yellow Leaf Curl Virus Disease (TYLCV)

Images

Tomato yellow leaf curl virus. Note thickened shoots.

A.A. Seif, icipe

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

A.A. Seif, icipe

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

Ian D. Bedford. Reproduced from the Crop Protection Compendium, 2005 Edition. CAB International Publishing, Wallingford.

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Cutworms

Images

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

Ooi P., Courtesy of Ecoport (www.ecoport.org)

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.

Ooi P., Courtesy of Ecoport (www.ecoport.org)

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

Ooi P., Courtesy of Ecoport (www.ecoport.org)

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

A.M. Varela, icipe

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Diamondback moth (DBM)

Images

Diamondback moth feeding on kales. A fully-grown caterpillar is about one cm long. Head

A.M. Varela, icipe

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.

F. Haas, icipe

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.

C. Smart/NYSAES/Cornell University

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.

F. Haas, icipe

Diamondback moth larvae

Anne Bruntse, BioVision

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.

MOFGA, Eric Sideman

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.

A. M. Varela, icipe

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

A. M. Varela, icipe

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

Alton N. Sparks, Jr., The University of Georgia (www.insectimages.org)

A. M. Varela, icipe

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.

A.M. Varela, icipe

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

A. M. Varela, icipe

Diamondback moth parasitoid (*Cotesia plutellae*)

A. M. Varela

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.

A. M. Varela, icipe

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Larger grain borer

Images

NRI/MAFF. Reproduced from the Crop Protection Compendium, 2004 Edition. © CAB International, Wallingford, UK, 2004

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

Larger grain borer (*Prostephanus truncatus*). Adult beatle, 3-4.5mm

Georg Goergen/IITA Insect Museum, Cotonou, Benin. Reproduced from the Crop Protection Compendium, 2004 Edition. © CAB International, Wallingford, UK, 2004

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 spread. Subsequently, there have been predator releases in Benin, Ghana, Tanzania and Malawi. Only in the case of Tanzania

Georg Goergen, Courtesy of Ecoport. www.ecoport.org

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 in integrated pest management.

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Spotted stemborer

Images

Spotted stemborer (*Chilo partellus*)

Agricultural Research Council of South Africa. Courtesy of Ecoport (www.ecoport.org)

Stemborer damage.

D. Cugala, Stemborer team, icipe

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

Stemborer team, icipe

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

Georg Goergen/IITA Insect Museum, Cotonou, Benin. Reproduced from the Crop Protection Compendium.

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Fruit flies

Images

Male Mediterranean fruit fly or medfly *(Ceratitis capitata)* resting on a leaf. Adult medflies are 4

Scott Bauer, USDA Agricultural Research Service, www.insectimages.org

to 7 mm long, brightly coloured, usually in brown-yellow patterns. The wings are spotted or banded with yellow and brown margins.

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

Scott Bauer, USDA Agricultural Research Service, www.insectimages.org

Melon fly *(Bactrocera cucurbitae)*

Scott Bauer. Courtesy of Ecoport (www.ecoport.org)

African invader fly *(Bactrocera invadens)*

R.C. Copeland, icipe

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

Georg Goergen, Courtesy of EcoPort, www.ecoport.org

Mango fruit fly *(Ceratitis cosyra)*

R.C. Copeland, icipe

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

A. M. Varela, icipe

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

Coutin R./OPIE, Courtesy of Ecoport (www.ecoport.org)

Fruit fly maggots in water melon fruit

A.M. Varela, icipe

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.

A.A. Seif, icipe

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

M.K. Billah, icipe

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

M. K. Billah. icipe

Homemade fruit fly trap in a mango tree

A. M. Varela, icipe

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Mealybugs

Images

G. Goergen, Courtesy of Ecoport (www.ecoport.org).

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.

Whitney Cranshaw, Colorado State University, (www.insectimages.org). Courtesy of Ecoport (www.ecoport.org)

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

David Cappaert, Michigan State University, Bugwood.org

Johnson M. Courtesy of Ecoport

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

(www.ecoport.org).

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

Jeffrey W. Lotz, Florida Department of Agriculture and Consumer Services, (www.Bugwood.org)

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.

Johnson M., Courtesy of Ecoport (www.ecoport.org).

A.M. Varela, icipe

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.

A.M. Varela, icipe

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

Bedford ECG, De Villiers EA (Courtesy of EcoPort, www.ecoport.org)

Mass of mealybugs on passion fruit.

A. M. Varela, icipe

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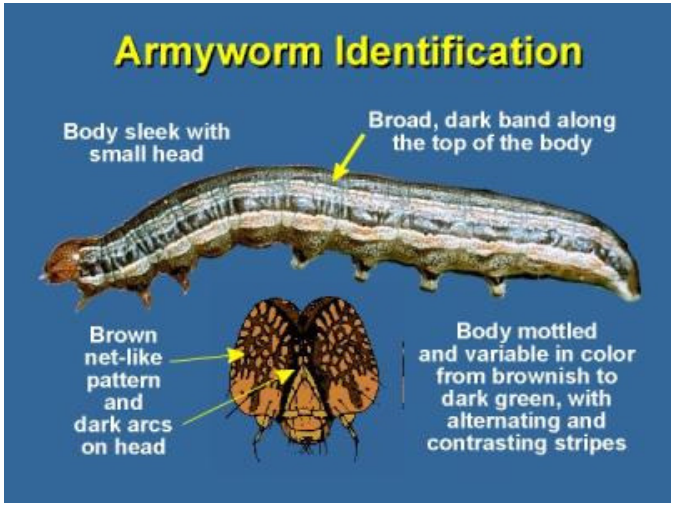
African armyworm

Images

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

University of Arkansas

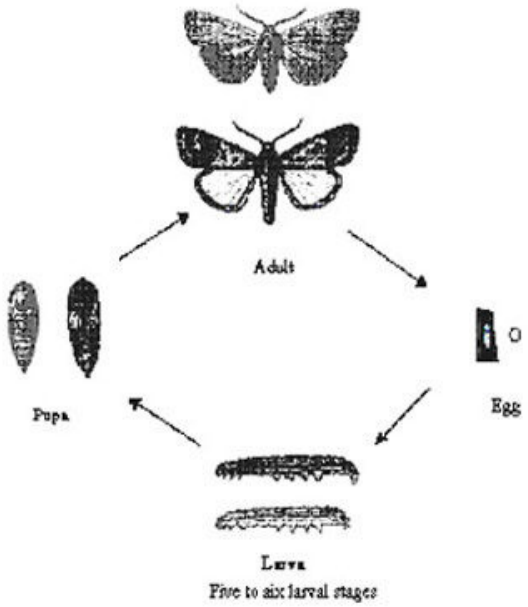
Armyworm identification. The caterpillars can eat the entire leaves of field crops and grasses. When feeding, they chew from the leaf edges until only the midrib is left. They feed on various crops and grasses during their migration, and often bare crops of tender leaves after passing through. They travel from field to field in great numbers,



University of Nebraska - Lincoln

hence the name "armyworm".

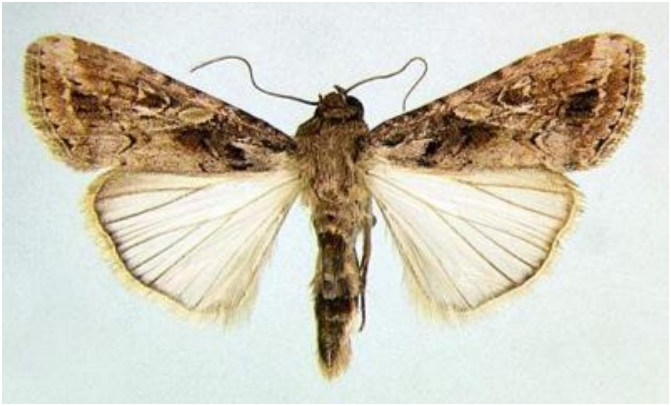
Lifecycle of armyworm 10 to 300 eggs are laid by an adult female moth, on the leaves. The eggs are white and become dark brown just before hatching (about 0.5 mm in diameter). Depending on temperature the eggs hatch after 2 to 5 days. Larval stage takes 14 to 22 days. Pupal stage lasts 7 to 15 days. Adult moth lifespan is 5 to 16 days. In East Africa,



IRRI Rice doctor

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.

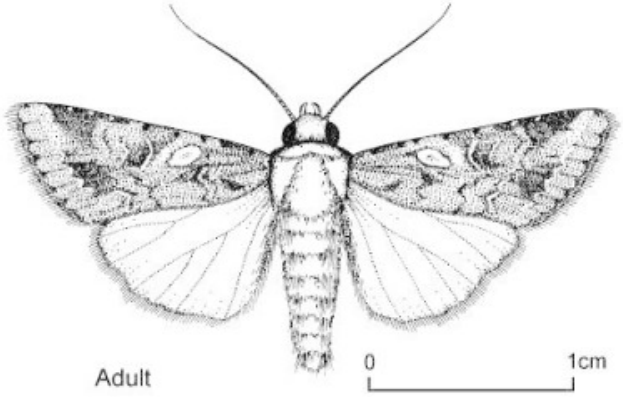


Georg Goergen/IITA Insect Museum, Cotonou, Benin. Reproduced from the Crop Protection Compendium, 2004 Edition.

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

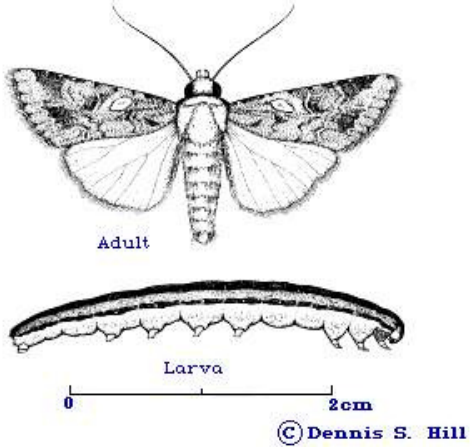
Georg Goergen/IITA Insect Museum, Cotonou, Benin. Reproduced from the Crop Protection Compendium, 2004 Edition.

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.



Dennis S. Hill. Reproduced from the Crop Protection Compendium, 2004 Edition.

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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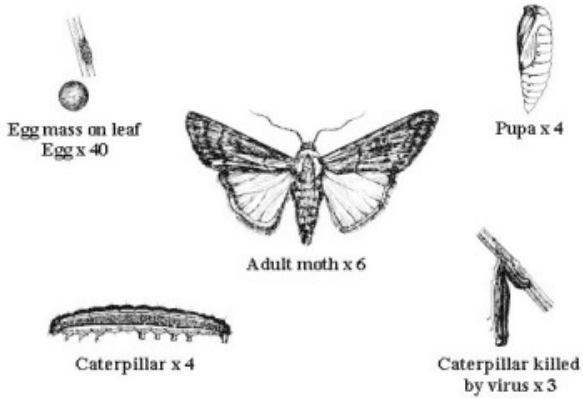
Armyworm, life stages - line drawing. Egg ca 0.5 mm diameter, conical with a slightly rounded apex. Gregarious larvae with velvety-black upper surface with pale lateral lines, green or yellow ventral surface. Pupae mahogany-brown, 10 to 14 mm long, with a smooth, shiny surface.



Dennis S. Hill. Reproduced from the Crop Protection Compendium, 2004 Edition.

Armyworm, Pupae and soil cocoons

www.larsen-twins.dk

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Banana weevil

Images

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

A. M. Varela, icipe

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

Georg Goergen/IITA Insect Museum, Cotonou, Benin. Reproduced from the Crop Protection Compendium, 2004 Edition. CAB International, Wallingford.

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

A. M. Varela, icipe

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

A. M. Varela, icipe

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

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Sweet potato weevil

Images

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

Land Care Ltd. New Zealand. Courtesy of EcoPort (www.ecoport.org)

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

Georg Goergen. Courtesy of EcoPort (www.ecoport.org)

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

Clemson University - USDA Cooperative Extension Slide Series (www.bugwood.org)

Sweet potato weevil symptoms on tuber.

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

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Couch grass

Images

Couch grass (*Cynodon dactylon*) is a

perennial grass, with underground rhizomes and on the ground runners.

Charles T. Bryson, USDA ARS, www.insectimages.org

Couch grass flower

Charles T. Bryson, USDA ARS, www.insectimages.org

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Damping-off diseases

Images

Damping-off (*Rhizoctoni solani*) on beans

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

***Rhizoctonia solani* on brassica**

McKenzie, LandCare Ltd. New Zealand.
Courtesy of Ecoport (www.ecoport.org)

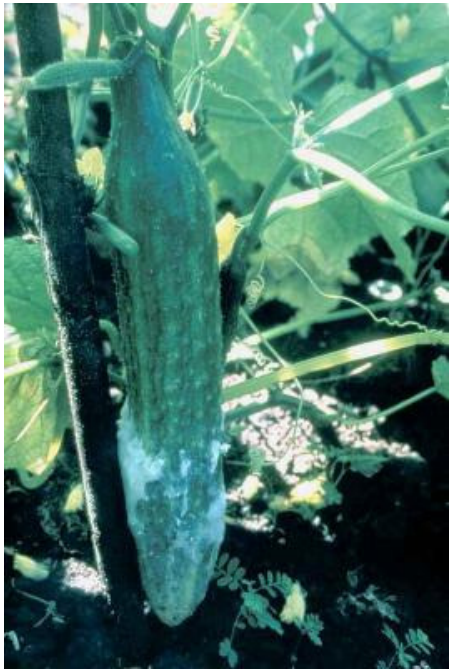
***Rhizoctoni solani* on potato tuber**

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

Damping-off of rice

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

Damping-off of cucumber



Gerlach W., Courtesy of EcoPort (www.ecoport.org)

Damping-off of groundnut

Clemson University - USDA Cooperative Extension Slide Series (www.insectimages.org)

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

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

Okra seedlings affected by damping-off

A.A. Seif & A.M. Varela, icipe

Damping-off disease in chilli field

A. A. Seif & B. Nyambo, icipe

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Pests/ diseases/ weeds

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,

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





African 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 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


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 Mosaic Virus (TuMV)

Weeds

Whiteflies

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Pests/ diseases/ weeds

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Fruit and vegetable processing

Natural pest control

Cultural practices

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- **Pests and diseases (Images for identification, Symptoms, Sustainable preventive and curative management, Biology and ecology)**

- **Medicinal plants with income generating potential (under**

construction) (Agronomic aspects, Medicinal properties and uses, Nutritional values, Recipes)

- **Fruit and vegetable processing (under construction) (How to make tomato pulp and peeled preserves, Jars, How to dry, Construction of a dryer)**

- **Natural pest control (Description of different control methods: Biopesticides, Plant nutrition, Plant extracts & microbials, Natural enemies, Physical methods)**

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- **Cultural control practices (Composting, Field sanitation, Green manure, Crop rotation, Intercropping and Push-Pull, Mulching, Conservation tillage, Weed management)**

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More information will follow soon on preservation and food processing, juices and jam, grain storage, seed production etc.

- **Crops, frui**

Identification of pests and diseases, Organic management)

- **Pests and diseases (Images for identification, Symptoms, Sustainable preventive and curative management, Biology and ecology)**

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