

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

[Print](#)

**Crops/ fruits/
vegetables**

Images

[Pests/
diseases/
weeds](#)

Witchweed (*Striga hermonthica*) flowering on a sorghum crop.

**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



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Purple witchweed (*Striga hermonthica*)

**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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Purple witchweed (*Striga hermonthica*) infestation in maize field.

Purple witchweed (*Striga*

hermonthica) damage to maize.

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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Purple witchweed (*Striga hermonthica*)



**Virus
(TuMV)
Weeds
Whiteflies**

**Medicinal
plants**

**Fruit and
vegetable
processing**

**Natural pest
control**

Cultural



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Mar 24, 2010 - [Disclaimer](#)

Search

[Publications](#) [About us](#) [TCF](#)



[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

**Crops/ fruits/
vegetables** **Images**

Print

Pests/
diseases/
weeds

Angumois grain moth on maize.
The moth is small, pale brown,
5-7 mm long with wings folded,
wingspan 1-1.6 cm

**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



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**Storage moth (*Ephestia*
cautella).**

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of EcoPort)

Adult beetle of Maize weevil
(*Sitophilus zeamais*). Adults can

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



be found wandering over the surface of grain.

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Adult beetles of Maize weevil (*Sitophilus zeamais*) in maize. Adult emergence holes with irregular edges are apparent some weeks after the initial attack.

[pests](#)

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



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Grain moth (*Sitotroga cerealella*). The moth is small, pale brown, 5-7 mm long with wings folded, wingspan 1-1.6 cm.



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practices**



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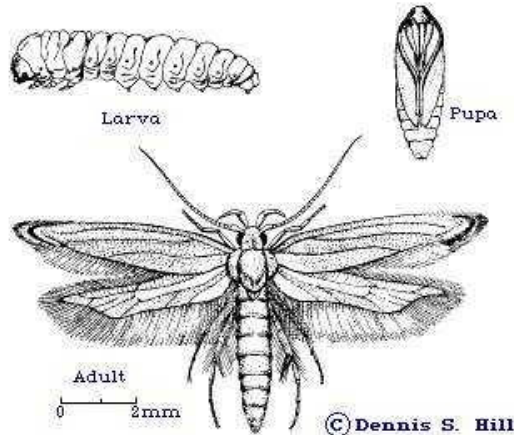
**Adult grain moth (*Sitotroga
cerealella*). The moth is small,
pale brown, 5-7 mm long with
wings folded, wingspan is 1-1.6
cm.**



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Grain moth (*S. cerealella*). The eggs are

laid singly or in clumps of variable numbers. They are white when first laid and quickly change to a reddish colour.



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Adult beetle of lesser grain borer (*Rhizopertha dominica*), line drawing. Adults are 2-3 mm long, reddish-brown and cylindrical, head not visible from above.





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Search

[Publications](#) [About us](#) [FAQ](#)

[TOP](#)

[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

**Crops/ fruits/
vegetables** **Images**

[Pests/](#)

Print

Mexican marigold

diseases/
weeds

**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**



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Mar 24, 2010 - [Disclaimer](#)

Search

[Publications](#) [Publications](#) [TOF](#)

[TOF](#)

[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

[Print](#)

**Crops/ fruits/
vegetables**

Images

[Pests/
diseases/](#)

Mar 24, 2010 - [Disclaimer](#)

Search

[Publications](#) [Publications](#) [TOF](#)

[TOF](#)

[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

[Crops/ fruits/ vegetables](#)

[Images](#)

[Pests/ diseases/](#)

[Print](#) 

Mar 24, 2010 - [Disclaimer](#)

[Search](#)

[Publications](#)  [About us](#) 

 [TOF](#)

[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

[Crops/ fruits/ vegetables](#)

[Images](#)

[Pests/ diseases/](#)

[Print](#) 

Mar 24, 2010 - [Disclaimer](#)

[Search](#)

[Publications](#)  [About us](#) 

 [TOF](#)

[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

**Crops/ fruits/
vegetables**

Images

[Pests/
diseases/](#)

[Print](#) 

Mar 24, 2010 - [Disclaimer](#)

Search

[Publications](#)  [About us](#) 

 [TOF](#)

[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

**Crops/ fruits/
vegetables**

Images

[Pests/
diseases/](#)

[Print](#) 

Mar 24, 2010 - [Disclaimer](#)

Search

[Publications](#)  [About us](#) 

 [TOF](#)

[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

**Crops/ fruits/
vegetables**

Images

[Pests/
diseases/](#)

[Print](#) 

Mar 24, 2010 - [Disclaimer](#)

Search

[Publications](#)  [About us](#) 

 [TOF](#)

[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

**Crops/ fruits/
vegetables**

Images

[Pests/
diseases/](#)

[Print](#) 

Mar 24, 2010 - [Disclaimer](#)

Search

[Publications](#)  [About us](#) 

 [TOF](#)

[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

[Print](#) 

**Crops/ fruits/
vegetables**

Images

[Pests/
diseases/
weeds](#)

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



© Warwick HRI, University of Warwick.

Two-spotted spider mite. The adult female is 0.6 mm long. The male is smaller.

Tetranychus predators - predatory mites (orange-red individuals)(*Phytoseiulus persimilis*) in a colony of the two-spotted spider mite (*Tetranychus urticae*). Spider

mites are very tiny, they rarely exceed a size of 0.5 mm.

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



© Warwick HRI, University of Warwick.

Adult of the predatory beetle *Oligota* sp. a natural enemy of mites.

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)



© F. Haas, icipe

Red spider mite on cotton.
Females are around 0.6 mm in
diameter and dark red, while
males are smaller and a lighter
red.

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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Tetranychus evansi, the common/tobacco spider mite

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plants

**Fruit and
vegetable
processing**

**Natural pest
control**

**Cultural
practices**



**Cassava green mites
(*Mononychellus tanajoa*). Real
size: 0.8 mm.**

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**Spider mites on tomato. Note
the mites and their webbing
visible between the leaves.**



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Severe spider mite damage to tomato plants.



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Spider mites on cotton leaf, they are very tiny (they rarely exceed a size of 0.5 mm).

© O.P. Sharma, NCIPM, New Delhi. India,
Bugwood.org



**Two-spotted spider mite
(*Tetranychus urticae*) on cotton
- Adult females are 0.6 mm long.**

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Spider mite damage on soybean



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Tetranychus evansi - Spider mites symptoms on tomato

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Red spider mite damage on beans

© A.M. Varela, icipe

***Mononychellus tanajoa* - Green spider mite damage on cassava**



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**Male of the cassava green mite
(*Mononychellus tanajoa*). Real
size 0.8mm.**



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Mar 24, 2010 - [Disclaimer](#)

[Search](#)

[Publications](#) [Publications](#) [TOF](#)



[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

[Print](#)

**Crops/ fruits/
vegetables**

Images

[Pests/](#)
[diseases/](#)
[weeds](#)

**African
armyworm**

**African
bollworm**

**African
cassava
mosaic virus
(ACMV)**

**African
maize**

stalkborer

Anthracnose

[Aphids](#)

**Bacterial
wilt**

**Bagrada
bug**



© Magnus Gammelgaard

**Cabbage aphids / Green peach
aphids (*Myzus persicae*) on
pepper leaf. Adult wingless
females are oval-bodied, 1.2-2.1
mm in body length, of very
variable colour.**

**Cabbage aphid, winged form. This soft
bodied, pear-shaped insect is usually
wingless and about 1/16 inch long. The
wingless female is pale yellow green.
The winged migrant form has a
yellowish green abdomen with a dark
dorsal blotch. Winged forms migrate to**

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



© Digital diagnostics, OSU

other hosts in late spring. During these migratory flights, aphids may spread virus diseases from infected volunteer plants and weeds to healthy crop plants.

Green peach aphid (*Myzus persicae*). Adult wingless females are 1.2-2.1 mm in body length and very variable in colour.

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



© Whitney Cranshaw, Colorado State University, Bugwood.org

Black bean aphids (*A. fabae*) colony (nymphs and alates) on leaf of runner bean (*Phaseolus coccineus*). Note the presence of an attendant ant (*Lasius* sp.) and, in centre of the picture, a hymenopteran parasitoid

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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ovipositing into the aphids. *A. fabae* is a dark brownish to matt black aphid. Adults are often bigger than other *Aphis* spp. Apteræ 1.5-3.1 mm, alatae 1.3-2.6 mm.

Groundnut aphid (*A. craccivora*) colony on cowpea. Apteræ are 1.4-2.2 mm long. Alatae (winged form) 1.4-2.1 mm.

**vegetable
processing**

**Natural pest
control**

**Cultural
practices**



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**Black legume aphid / Groundnut
aphid (*Aphis craccivora*) is a
relatively small aphid.
Immatures are slightly dusted
with wax, adults without wax.
Apterae are 1.4-2.2 mm long.
Alatae (winged form) 1.4-2.1
mm.**



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Cotton aphid (*Aphis gossypii*) is a small aphid. Adults range from just under 1-1.5 mm in body length.



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Mar 24, 2010 - [Disclaimer](#)

Search

[Publications](#) [About us](#) [TCF](#)

[TOF](#)

[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

Crops/ fruits/

Print 

vegetables

Images

[Pests/](#)
[diseases/](#)
[weeds](#)

**African
armyworm**

[African
bollworm](#)

**African
cassava
mosaic virus
(ACMV)**

**African
maize
stalkborer**

Anthracnose

Aphids

**Bacterial
wilt**

Bagrada

bug

Banana



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**African bollworm on French
beans. Fully grown caterpillars
are 3-4 cm long.**

**African bollworm eggs are tiny
(about 0.5 mm in diameter).**

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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Eggs of African bollworm on chickpea: yellowish-white and glistening at first, changing to dark-brown before hatching; pomegranate-shaped, diameter 0.4-0.6 mm.

**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 bollworm caterpillar (larva) is initially pale green, sometimes with black dots, and a pattern of thin dark lines running along the body, the lines being darker around the second and third segments. In later instars, the dark lines become less conspicuous, and

**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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the black spots develop red areas around them. There is a good deal of variation in colour in this species. Lighter and darker forms of both caterpillars and moths are known, for example, having white instead of black spots on the caterpillars. The caterpillar has posture when disturbed characteristic of a number of species in this family: it lifts its head and curls it under the front of the body. If even more disturbed, it lets go and drops, rolling into a spiral. Fully grown caterpillars are 3 to 4cm long. Caterpillar of African bollworm on pearl millet (two colour forms). It varies in color from bright green, pink, brown, to black, with lighter undersides.

processing

Natural pest control

Cultural practices



Alternating light and dark bands run lengthwise along their bodies, the heads are yellow and the legs are almost black. Mature larvae vary in length from 3-5cm. They drop to the ground to burrow into the soil to pupate. The larval stage lasts from 12-24 days.

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African bollworm caterpillar (3-4 cm long) feeding on French beans



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African bollworm caterpillar (3-4cm long) feeding on french beans.

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African bollworm feeding on flower of French beans (3-4 cm long)

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African bollworm caterpillar (3-4cm long) feeding on French bean flower.



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**Damage by African bollworm on
French beans**



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Young caterpillar of African bollworm feeding on okra leaf and adult moth (inset).



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**African bollworm feeding on
peas**



© A.M. Varela, icipe

African bollworm feeding on okra



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The African bollworm pupa is shiny brown, about 16 mm long



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Adult moths of African bollworm are about 14 to 18 mm long with a wingspan of 35 to 40 mm.



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**African bollworm damage in
chilli fruit**



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Mar 24, 2010 - [Disclaimer](#)

[Search](#)

[Publications](#) [Publications TOF](#)



[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

Crops/ fruits/

[Print](#) 

vegetables

Pests/
diseases/
weeds

**African
armyworm**

**African
bollworm**

**African
cassava
mosaic virus
(ACMV)**

**African
maize**

stalkborer

Anthraxnose

Aphids

**Bacterial
wilt**

Bagrada

bug

Banana

Images



Whiteflies under leaf. Adult whiteflies are about 1mm long.

© Clemson University, Department of Entomology

The cabbage whitefly. Larvae are yellow-white scales, 0.3-0.6 mm long. Adult whiteflies are about 1mm long.

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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The tobacco whitefly *Bemisia tabaci* adult (bottom right) about 1 mm long, beside two *Trialeurodes vaporariorum* adults.

**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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Silver leaf on squash - *Bemisia tabaci* - Close observation of the undersides of the leaves will show the tiny yellow/white larval scales and in severe infestations, when the plant is shaken, numerous small white

**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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adult whiteflies will flutter out and quickly resetttle. These symptoms do not differ appreciably from those of *Trialeurodes vaporariorum*, the glasshouse whitefly, which is common throughout Europe and also occurs elsewhere.

Whiteflies on citrus leaf. Adult are about 1mm long.

17/10/2011

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processing

**Natural pest
control**

**Cultural
practices**



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**The cabbage whitefly on a kale
plant. Adult are about 1mm long.**



The cabbage whitefly. Larvae are yellow-white scales, 0–0.6 mm long. Adult are about 1mm long.

© A.M. Varela, icipe

Whiteflies on beans - Adult are approximately 1mm long.



© A.M. Varela, icipe

Immature stages of the citrus woolly whitefly - Immatures secrete a woolly covering of flocculent white wax.



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Close-up of whiteflies. Adult are about 1mm long.



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Adult of the greenhouse whitefly



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**Close-up of the nymphs of the
greenhouse whitefly**



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Eggs of the spiralling whitefly



© A.M. Varela, icipe

Whitefly killed by fungus



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Whiteflies on chilli leaf



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[Search](#)

[Publications](#) [About us](#) [TOE](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

[Print](#)

Crops/ fruits/
vegetables

Images

[Pests/](#)
[diseases/](#)
[weeds](#)

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



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Close-up of the Western flower thrips (*Frankliniella occidentalis*). Immature thrips (left) and adults. Very much enlarged, real size 1 to 1.5 mm.

Close-up of thrips
(*Megalurothrips sjostedti*
(black) and *Frankliniella*

- 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)



occidentalis (yellow). Real size 1 to 1.5 mm.

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Adult and immature thrips (*Thrips tabaci*). Immatures (on top) are wingless and generally are light colored. Immatures are generally light colored without wings. Adults vary in color and have four wings lined with long hairs. The adult has four wings lined with long hairs, it is about 1 to 1.5 mm small.

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

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Thrips on onion. Thrips are 1 to 1.5 mm small.

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Thrips damage 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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**Thrips damage to flower buds
on tomato**

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



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Thrips damage on tomato leaflet



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Thrips and their feeding damage on tomato fruits. Note residues of pesticide applied seen as white stains



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Thrips damage on passionfruit



© A. M. Varela, *icipe*

Thrips damage on cabbage



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Scarred eggplants due to thrips damage.

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Thrips damage on bean pods



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Thrips damage on pea pod.

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Thrips on okra flower



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Thrips damage on chilli pod



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Search

[Publications](#) [About us](#) [TOF](#)

[TOF](#)

[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

[Print](#)

**Crops/ fruits/
vegetables**

Images

[Pests/](#)
[diseases/](#)
[weeds](#)

**African
armyworm**

**African
bollworm**

**African
cassava
mosaic virus
(ACMV)**

**African
maize
stalkborer**

Anthracnose

Aphids

[Bacterial
wilt](#)

**Bagrada
bug**



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Bacterial wilt symptoms on potato plants. The first visible symptom on foliage is a wilting of the leaves at the ends of the branches during the heat of the day with recovery at night. As the disease develops, a streaky brown discoloration of the stem may be observed on stems 2.5 cm or more above the soil line, and the leaves develop a bronze tint.

Bacterial wilt symptoms on tobacco plant. One of the distinctive symptoms is partial wilting and premature yellowing of leaves. Leaves on one side of the plant or even a half leaf may show wilting symptoms. The vascular tissues show a brown discoloration when cut. The primary and secondary roots may become brown

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



to black.

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Courtesy of
Ecoport
(www.ecoport.org)

Moko disease in banana caused by *Ralstonia solanacearum*. The pseudostems show brown vascular discoloration.

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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Bacterial wilt on tomato.

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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Bacterial wilt on sweet pepper

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processing**

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control**

**Cultural
practices**



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Bacterial wilt on sweet pepper



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Search

[Publications](#) [Publications](#) [TOF](#)

[TOF](#)

[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

**Crops/ fruits/
vegetables**

Images

[Pests/
diseases/](#)

[Print](#)

Root-knot nematode galls on tomato roots. Root-

weeds

**African
armyworm**

**African
bollworm**

**African
cassava
mosaic virus
(ACMV)**

**African
maize
stalkborer**

Anthraxnose

Aphids

**Bacterial
wilt**

**Bagrada
bug**

**Banana
weevil**

Black rot

Cabbage

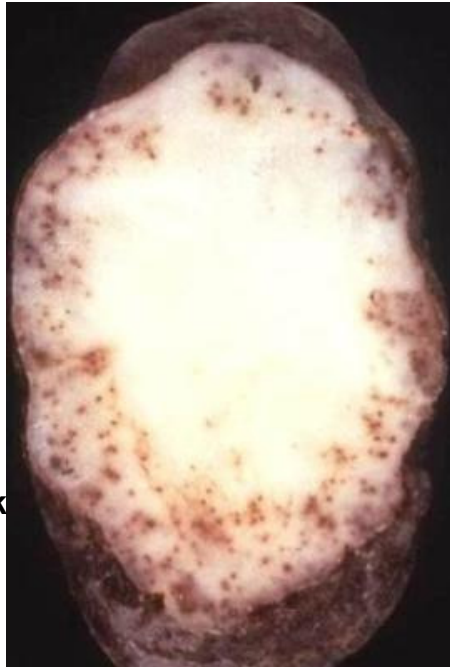


knot nematodes (*Meloidogyne incognita* / *M. javanica*) affected plants are normally stunted and eventually wilt and die. The most characteristic symptom is formation of root galls (knots) and these can be seen with the naked eye. Affected roots rot.

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**Root-knot nematode (*Meloidogyne incognita*)
damage to potato.**

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



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Root-knot nematodes. Field symptoms are typically of stunted, poorly growing

**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**



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plants with yellowing leaves. Infected root systems show characteristic knots or galls.

Okra roots damaged by root-knot nematodes. Note gall or root-knots (left) and healthy roots (right).

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potato
weevil
Termites
Thrips
Tomato
Yellow Leaf
Curl Virus
Disease
(TYLCV)
Turnip
Mosaic



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Mar 24, 2010 - [Disclaimer](#)

Search

[Publications](#) [About us](#) [TCF](#)

[TOF](#)

[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

**Crops/ fruits/
vegetables**

Images

[Pests/
diseases/](#)

[Print](#)

Powdery mildew on cabbage.

weeds

**African
armyworm**

**African
bollworm**

**African
cassava
mosaic virus
(ACMV)**

**African
maize
stalkborer**

Anthracnose © A.M. Varela, icipe

Aphids

**Bacterial
wilt**

**Bagrada
bug**

**Banana
weevil**

Black rot

Cabbage



**Powdery mildew of pea.
Symptoms are similar on green
gram.**

- 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



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Powdery mildew on mango

**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**



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**Powdery mildew on mango
fruitlet. The leaf blade is most
often affected by powdery
mildew. Petioles, stalks and
flowers are rarely affected and
fruits are occasionally infected.**

**potato
weevil
Termites
Thrips
Tomato
Yellow Leaf
Curl Virus
Disease
(TYLCV)
Turnip
Mosaic
Virus
(TuMV)
Weeds
Whiteflies
Medicinal
plants
Fruit and
vegetable
processing
Natural pest**



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**Powdery mildew on sesame (*Erysiphe
cichoracearum*)**

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control

**Cultural
practices**

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Powdery mildew on tomato (*Leveillula taurica*)



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Cooke, Department of
Primary Industries and
Fisheries, Queensland,
Australia (Courtesy of
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Powdery mildew on cucumber

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Search

[Publications](#) [About us](#) [TOF](#)

[TOF](#)

[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

[Print](#) 

**Crops/ fruits/
vegetables**

Images

[Pests/
diseases/
weeds](#)

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



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**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 cowpea. Adults
are 2-3.5 mm long.**

**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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2006

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

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



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Search

[Publications](#) [About us](#) [FOI](#)

[TOF](#)

[Home](#) [Help](#) [Contact](#)

You are here: [Home](#) > [Plant Health](#) > [Pests/ diseases/ weeds](#)

[Back](#)

**Crops/ fruits/
vegetables**

Images

[Pests/
diseases/
weeds](#)

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



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**Damage on beans by leafmining
flies**

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

- 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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Damage on tomato leaf by leafmining 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



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**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.**

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



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

**Fruit and
vegetable
processing**

**Natural pest
control**

**Cultural
practices**



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



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Leafminer damage on onions



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Leafminer damage on peas



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



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



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Leafmining fly on okra leaf



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



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



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**Okra leaf showing heavy attack
by leafmining flies.**



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