CABI plantwise

CABI PEST AND DISEASE PHOTOGUIDE TO

Coffee disorders

KNOWLEDGE FOR LIFE

Introduction

This photo booklet has been produced by the CABI-led **Plantwise** programme (www.plantwise.org) to aid extension officers and other plant health advisors in diagnosing the most common pests, diseases and abiotic problems of coffee around the world. The symptoms presented on a real plant sample can be compared with the photos in this guide to identify possible causes.

The booklet is organized into two broad sections, one showing the common insect pests that attack the crop and the other showing the various symptoms of poor health. In the symptoms section, the images are arranged by plant part, with similar-looking symptoms displayed together. Some biotic and abiotic factors cause more than one type of symptom, so there may be multiple images in different parts of the photo booklet for a specific problem. The photos for a particular problem are cross-referenced to make it easy to find all the relevant photos.

Contents

Striped mealy bug

Ferrisia virgata

Worldwide

Photo: Georg Goergen/IITA Insect Museum, Cotonou, Benin

- Small, segmented, slow moving dusty white insects visible on leaves, young shoots and berries. Live in colonies usually on young tissue.
- Unlike other mealybugs adult female has a pair of conspicuous dark longitudinal stripes, long glassy wax threads, an obvious tail and secretes a waxy powder.
- Narrower body shape than other similar mealybugs.

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Cacao mealy bug

Planococcus lilacinus

Worldwide

Photo: Peter A.C. Ooi/Tropical Press Sdn Bnd

- Small, segmented, slow moving insects with a dusty white-lilac coating. May be hidden under a crust of greenish-white fungus.
- Wider body shape and more rounded than other similar mealybugs.

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Citrus mealy bug

Planococcus citri

Worldwide

Photo: J.W. Lotz, Florida Department of Agriculture and Consumer Services, Bugwood.org

- Masses of small, segmented, slow moving insects with a dusty white coating. May be hidden under a crust of greenish-white fungus.
- Often whiter and more waxy than other similar mealybugs.

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Kenyan mealy bug

Planococcus kenyae

Africa

Photo: R. Reeder, CABI

- This mealybug has a more prominent central line down the back of the adult compared to other similar mealybugs.
- They have less wax than the citrus mealybug and the colour of the underlying insect is easier to see.

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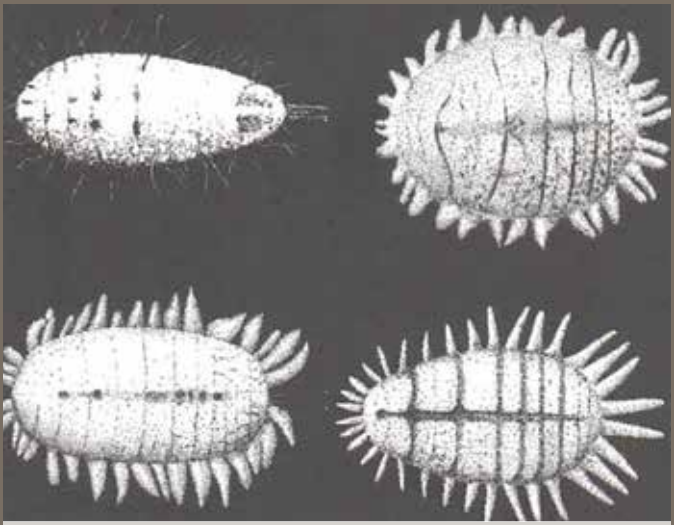
Various Mealybugs

Common on young growth of coffee



- Morphology of the four most common types of foliar feeding mealybugs on coffee.
- Top left *Ferrisia virgata*.
- Top right *Planococcus lilacinus*.
- Bottom left *Planococcus citri*.
- Bottom right *Planococcus kenyae*.

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Pinapple mealy bug

Dysmicoccus brevipes

Worldwide

Photo: Crown Copyright

- Similar to other mealybugs with a dusty pale pink or white coating and waxy white filaments protruding from the sides.
- Occurs mainly on the roots and neck of the stem (root collar), less common on the young plant growth.

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Root mealy bugs

Neorhizoecus coffeae or *Geococcus coffeae* Caribbean and S America

Photo: Scot Nelson

- Masses of small, segmented, oval and slow moving clustering on the roots.
- Occur and feed mainly on roots and perhaps the root collar area, causes reduced vigour, slow growth and death of the plant.
- Cotton-like white masses with adult insects embeded within with eggs visible on surface of roots.

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Red wax scales

Ceroplastes rubens

Worldwide

Photo: Guo Shupu

- Adult female *C. rubens* have a pink wax cover, not very convex, and roughly five sided when viewed from above.
- Pest of many different crops usually attacking the younger growth.

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White wax scale

Ceroplastes destructor, C. brevicauda Africa and Oceania

Photo: AgrEvo

- White waxy scale insects.
- Adult females are oval, sometimes with some marginal indentation, 2.5-6.5 mm long.
- Eye-spots are black, relatively small, present on each side of the head region.
- Never found on branches older than 2 years old.

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Soft green scales

Coccus species C. viridis, mostly.

Worldwide

Photo: US National Collection of Scale Insects Photographs Archive, USDA ARS, Bugwood.org

- Flat, oval (about 3 x 2 mm), green with irregular loop of blackish spots showing through middle of the back.
- Found in clusters or rows they are immobile or slowly moving insects.
- Often seen on the underside of leaves, along leaf veins also attack green shoot tips and sometimes berries.

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Star scale

Asterolecanium coffeae (related species shown) Africa

Photo: Phil Taylor, CAB

- Starshaped scales about 1.5 mm long reddish-brown and covered with hair-like strands, especially around its edges (fringes).
- Does not produce honey dew.
- Often found at the nodes feeding at the base of the leaf stalk.
- Causes the twigs to twist at feeding point and leaves to turn brown and hang down, above the feeding, long whip-like branches are produced as a result of feeding.

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Dark scale

Saissetia species

Worldwide

Photo: US National Collection of Scale Insects Photographs Archive, USDA ARS, Bugwood.org

- Slow moving , dark coloured, shiny brown dome-shaped oval insects, 2-4 mm across eyes visible on younger specimens.
- Live in clusters on leaves, shoots and young berries (less common on underside of leaves).
- Develop an egg-filled hollow under the body as they age and become increasingly domed in shape.

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Black thread scale

Ischnaspis longirostris

Caribbean, Africa, S America

Photo: Lyle J. Buss, UF/IFAS

- Small, long, slender, shiny black insects (2-3.5 mm) the rear end is slightly wider than the head end.
- Leaves become mottled, develop necrotic (browning) patches and curl inward.
- Leaves, shoots and berries are all attacked.

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Black citrus aphid

Toxoptera aurantii

Worldwide

Photo: Peter A. C. Ooi, CABI

- Adults are 2-3 mm long, oval, shiny black, brownish-black or reddish-brown with black tail pipes, winged forms will develop when the colony is crowded.
- Leaves curl and shrivel and shoots show abnormal growth.
- The aphid colonies are found on underside of young leaves, shoots and sometimes flower buds.
- These are the only aphids which can emit high pitched sounds, and colonies can be heard when they are disturbed.

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Tea red spider mite

Oligoychus coffeae

Worldwide

Photo: NBAIR copyright

- Very small (0.3 x 0.4 mm) 8 legged, oval, red at the front and reddish-brown or purple at the rear.
- Colonies of browsing mites feed on the upper surface of leaves.
- Small silk webs, which protect tiny red, spherical mite eggs, (visible with a lens) on the underside of colonised leaves.
- Leaves become yellowish-brown, rust or purple coloured, initially along veins, and may fall.

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Red banded thrips and coffee thrips

Selenothrips rubrocinctus Red banded thrips
Diarthrothips coffeae Coffee thrips

Worldwide

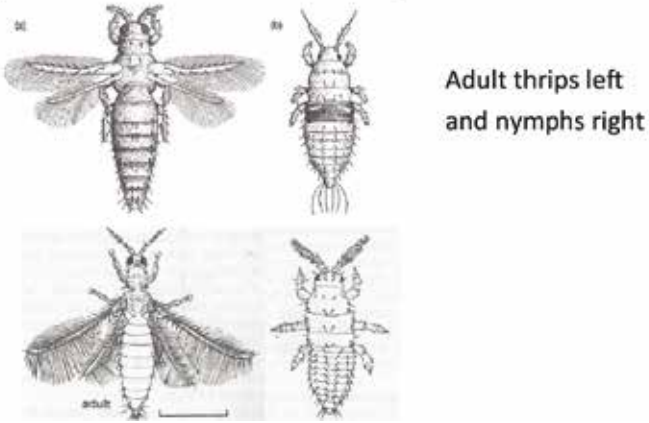

Photo: Denis Hill

- Adult thrips is 1.0 -1.5 mm long, greyish-brown with feather-like wings. Young thrips are similar but smaller, yellowish and wingless.
- Irregular silvery or grey patches on upper leaf surface caused by thrips feeding on underside. Patches covered with tiny black spots (frass).
- In severe cases leaves fall and the entire plant becomes defoliated.

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Citrus Whitefly

Dialeurodes citri

Worldwide

Photo: Lyle J Buss U of Florida Bugwood.org

- Small (1.3 mm) white triangular flies.
- Nymphal stages are flattened discs that are often mistaken for scale insects.
- Often live in dense colonies and will fly up in a cloud when leaves are shaken or disturbed.
- A common pests of many crops.

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Greenhouse orthezia

Insignorthezia insignis

Worldwide

Photo: Wikimedia commons Sam Fraser-Smith

- Often seen carrying a white waxy ovisac (1.5-3.5 mm) which curves upwards.
- Suck large quantities of sap and produce a lot of honey dew, leaves may drop prematurely.

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Stinging caterpillar

Parasa vivida

Africa and India

Photo: Steve Woodhall

- Young white caterpillars feed together on underside of leaves, causing small, irregular shaped pits.
- Older, green caterpillars have a double line of blue spots along their backs, they have finger-like projections with spiky hairs that irritate if touched.
- They are solitary and feed at the leaf edge.
- Pupation takes place in an oval, white tough silken coccoon (14 mm) stuck to a branch.

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Coffee leaf miner

Perileucoptera coffeella and other Leucoptera species

Caribbean, Central and S America

Photo: D. Nestel

- Irregular brown spots or patches visible on upper surface of leaves in which white, slightly translucent caterpillars are found.
- Larvae are 5-6 mm long and usually visible in the tunnels especially if the leaf is held up to the light.
- Several larvae per mine is common.

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Coffee leaf skeletoniser

Leucoplema dohertyi

Africa

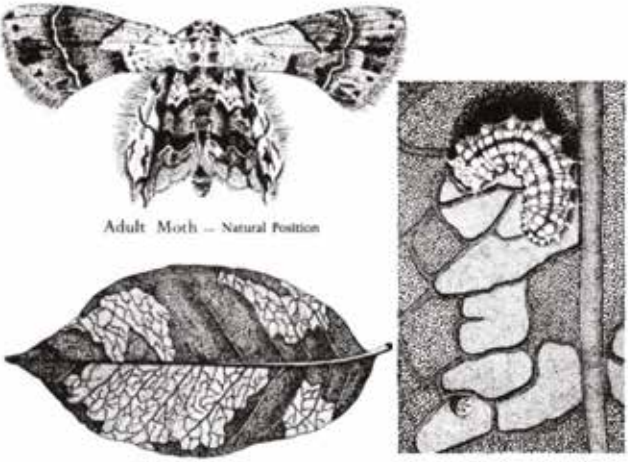

Photo: Dennis Hill

- Grey or white caterpillars up to 1 cm long with pimple-like projection on their body.
- Feed on underside of leaves, chewing everything except the midrib major veins and uppermost layer to leave irregular, transparent 'windows' in the leaves.
- The mature caterpillar (now red) lowers itself to the ground on a thread and pupates.
- Adult is a grey and brown moth, about 1.5 cm long, that lays yellowish-green eggs on the underside of leaves.

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Coffee berry moth

Prophantis smaragdina

Africa

Photo: Wikicommons

- Eggs laid near the stalk end of developing cherries.
- Reddish caterpillars about 14 mm long when fully grown.
- The caterpillar bores into a cherry and once it has eaten it will move to another linking the two together will silken threads and thus continues.
- It pupates on the ground between two leaves neatly stuck together.
- Small golden brown moth wingspan 14 mm.

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Stinging caterpillar

Parasa vivida (related moth shown)

Africa

Photo: Wikimedia commons

- Basal half of the forewing is jade green and the distal half chocholate brown with a brown patch on the leading edge of the wing.
- The hind wings are pale brown, the head and thorax are green with a brown central stripe.
- Greenish-yellow scale like eggs are laid in batches on the underside of the leaf.

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Coffee leaf miner

Leucoptera spp.

Caribbean, Central and S America

Photo: David Short, Flickr

- Small white, slender, moths with a wingspan 6-8 mm.
- Forewings have a brown fringe at their outer margin and dark spots at the end.

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Coffee berry borer

Hypothenemus hampei

Worldwide

Photo: Wikimedia commons

- Eggs are laid in batches of 8-12 in chambers eaten into the maturing coffee bean.
- The larvae are white with brown heads they have no legs and feed by tunneling through the developing bean.
- Often many different stages of the borer are found in the same berry.
- Adults are black with a brown head 2.5 mm long.

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Twig borers

Xylosandrus species

Worldwide

Photo: Pest and Diseases Image Library, Bugwood.org

- Adult black twig borers (*X. compactus*) and brown twig borers (*X. morigerus*) are black and brown respectively, cylindrical and 1-2 mm x 0.75 mm.
- Larvae are cream coloured with a brown head, curved, legless and about 2 mm long.
- Both the adults and larvae live within coffee twigs.

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White coffee borer

Monochamus leuconotus

Africa

Photo: Rory Hillocks, NRI

- Long grey beetle (30-35 mm) with black head and thorax and black at the tip of the wing cases.
- Long antennae; 20-30 mm.
- Eggs are laid under the bark on the bottom 0.5 m of the tree and are light cream coloured (4-5 mm x 1.5-2.0 mm).

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Black borer

Apate monachus and other species

Africa,
S America, Caribbean

Photo: Pest and Diseases Image Library, Bugwood.org

- Black or brown adult beetle, about 20 mm long, the head is held under the thorax.
- Chews a circular, 6 mm diameter hole into the wood and tunnels upwards into the main stem or branches.
- Wood shavings ('frass') visible at the base of the tree usually attacks dead trees and is generally considered not a serious pest however when they do attack they do more damage to younger plantations.

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Dusty brown beetle

Gonocephalum simplex

Africa

Photo: Georg Goergen/IITA Insect Museum, Cotonou, Benin

- The adult beetle is about 8 mm long, oval, flattened and dusty brown-back in colour. It has ridges running along the length of its hard forewings.
- Feeding removes patches of young brown bark from stems and branches and may ring-bark plants.
- Green berries with chewed off stalks are present on the ground.

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Dusty brown beetle (larvae)

(False wire worm Dusty brown beetle larvae) *Gonocephalum simplex* Africa

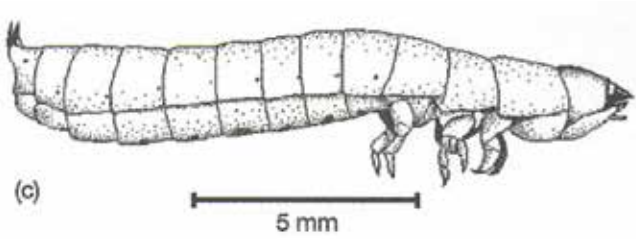

Photo: Dennis Hill

- Larvae are up to 30 mm long, shiny and cream, yellow or tan (especially at the head end) with three pairs of legs just behind the head. They are hard-bodied, cylindrical and segmented with a rounded head.
- Generalist feeders they are attracted to germinating seeds and roots, commonly eat out the growing tip of seedlings.

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Coffee lacewing bug

Habrochila sp.

Africa

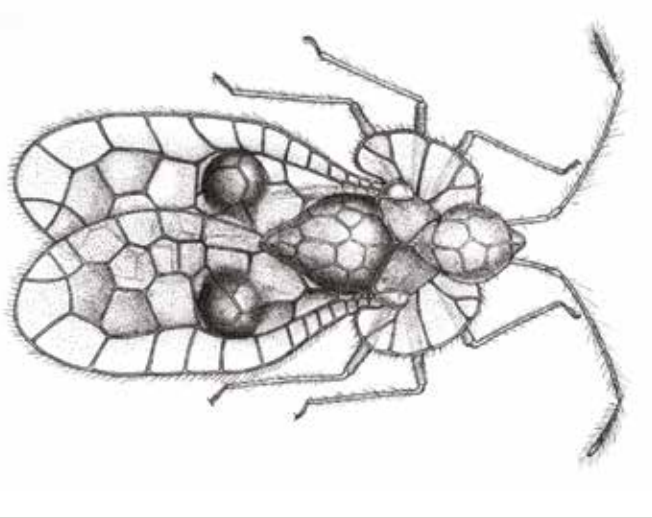

Photo: Smithsonian Institution, National Museum of Natural History, Department of Entomology

- Adult bug is black, about 4 mm long with lace-like wings, nymph similar but with poorly developed wings.
- White eggs are laid and embedded in underside of leaves, the tips protude from the leaf surface.

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Antestia bugs

Antestiopsis species (variegated coffee bug)

Africa

Photo: Bernard Bouyjou

- Shield-shaped adult bugs are dark brown, orange and white. Hatched young (nymphs) are similar in appearance but smaller, more rounded and lack wings.
- Bugs feed by sucking on plant parts, causing blackening of flower buds, excessive branch formation and shortening of internodes (witches' broom) may develop.

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Antestia bugs

Antestiopsis species (variegated coffee bug)

Africa

Photo: Bernard Bouyjou

- Creamy-white eggs are layed on the underside of leaves.
- The young emerge as tiny black beetles leaving an empty white papery egg case.

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Coffee lacewing bug

Habrochila sp.

Africa

Photo: CABI

- Yellow patches develop on underside of leaves. Spots of shiny, black bug excrement are commonly present. Leaves may yellow completely and die from the edge inwards.
- When feeding is severe brown patches may develop.

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Leaf miner

Leucoptera species usually *caffeella* and *meyricki*

Caribbean, Central and S America

Photo: E. Boa

- Leafminer larvae make white, pale yellow or brown mines in leaf tissue. Larvae are 5-6 mm long and usually visible in the tunnels.
- However they may not tunnel and leave irregular brown spots or patches visible on upper surface of leaves.
- Severely damaged leaves fall and the plant becomes weakened.

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Anthracnose

Colletotrichum spp.

Worldwide

Photo:

- Necrotic brown black lesions are usually produced on the leaf edges they may develop concentric rings within them and black dots (fruiting bodies) may be visible on the upper surface.
- Often not severe but leaves will fall if they become heavily infected.
- Spreads to shoots and berries.

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Coffee leaf rust

Hemileia vastatrix

Worldwide

Photo: CABI

- Yellow-orange powdery spots visible on underside of leaves. Corresponding yellow-white patches visible on upper leaf surface.
- Small, chlorotic young spots may be visible before becoming powdery.
- Leaves may fallduring spot development.
- Spots may develop on young green stems and berries.

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Powdery rust of coffee

Hemileia coffeicola

AgrEvo

Photo: AgrEvo

- Abundant orange powder coats the underside of leaf surfaces, but not as defined spots as in coffee leaf rust.
- After appearance of powder, leaves initially remain green before small chlorotic spots appear on lower leaf surface, leaves yellow slightly and then fall.
- Symptoms first appear on older leaves in the canopy of tree, and spread to rest of tree much faster than coffee leaf rust.

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American leaf spot

Mycena citricolor

Caribbean, Central and S America

Photo: Ing. Agr. María del Milagro Granados Montero

- Small reddish-brown spots appear on upper leaf surfaces and develop into circular lesions up to 10 mm in diameter with clear red edges and no yellow halo. Inner part of the leaf lesion may fall out to leave a hole.
- Similar circular spots develop on berries but are not necrotic. Tiny, pale pin-shaped structures of the fungus may be visible arising from berry spots.
- Characteristically spreads slowly even under ideal conditions.

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Coffee ringspot

Coffee ringspot virus (CoRSV)

S America

Photo: César M. Chagas

- Early leaf spot usually causes brown spots that are surrounded by a yellow ring.
- Late leaf spot causes dark brown to black spots that often don't have a yellow ring. Late leaf spots produce dark brown spores, usually on the underside of the leaf. The mass of spores can be seen without handlens and gives the spot a velvety appearance.

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Sooty mould

Various fungi (shown on *Sapodilla*)

Worldwide

Photo: Phil Taylor CABI

- Black dusty growth on the surface of the leaves which can easily be wiped off leaving a healthy leaf beneath.
- Can become crispy and crack off in dry weather especially when the cause (sap sucking insects leaving sweet honey dew on the leaves) has been controlled.
- Not especially damaging unless severe but is a symptom of an insect pest that will be causing damage.

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Brown eye spot

Cercospora coffeicola

Worldwide

Photo: N. Phiri, CABI

- Small yellow spots develop on the upper leaf surface that enlarge to 15 mm in diameter and become reddish-brown with an ash grey centre.
- Spots may have yellow halo and develop small olive green patch within the grey centre.
- Not generally too much of a problem in the foliar form but can reduce the vigour of seedlings and young plants.

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Potassium deficiency

Worldwide

Photo: Scot Nelson U of Hawaii, Flickr

- Necrosis from the edges of the leaf.
- In the advanced stages a yellow halo develops around the necrotic areas.

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Bacterial blight of endive

Pseudomonas cichorii

Worldwide

Photo: Florida Division of Plant Industry Bugwood.org

- Rapidly developing large water-soaked brown lesions cover much of the leaf surface often NOT limited by minor leaf veins; generally infects older leaves.
- Concentric rings may develop within the lesion.
- Unlike bacterial halo blight there is no yellow halo around the infected area and leaves will fall when badly infected.

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Bacterial halo blight

Pseudomonas syringae pv. *garcae*

S America and Africa

Photo: J. Minai, Coffee Research Foundation, Kenya

- Dark green, transparent lesions with a water-soaked appearance develop, later becoming necrotic with a yellow halo.
- Lesions may also develop on branches, the tips drying and collapsing, leaves and flowers may fall. Necrosis may also develop on branch tips, young berries and leaf rosettes.
- Leaves of older plants develop dark brown-black lesions and may become deformed (comma shaped) due to lesions near leaf edges.

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Thread blight

Corticium koleroga

Worldwide

Photo: H. Evans, CABI

- Greyish white thread like fungal growth on the underside of leaves and berries. This causes blackening and rotting of leaves, berries and young shoots.
- Leaves detached and hang down, but don't fall; they are held by slimy strands of fungus growing across the lower leaf surface.
- Berry blackening starts on one side and develops into a narrow band.

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American leaf spot

Mycena citricolor

Caribbean, Central and S America

Photo: Ing. Agr. María del Milagro Granados Montero

- Fallen leaves and berries can bear tiny pale pin-shaped structures of the fungus.
- These tiny (1-4 mm)mushrooms grow out of the leaves when on the ground or still on the tree.

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Twig borers

Xylosandrus compactus, X. morigerus

Worldwide

Photo: Scot Nelson, University of Hawaii, Flickr

- Borer tunneling creates tiny holes (1 mm diameter) in small branches of trees or the main stem of seedlings.
- Fine white sawdust may be visible near hole.
- Leaves of branches beyond the hole droop and branch blackens.

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FUNGUS

55 69 75 49

Fusaruim wilt

Gibberella xylarioides

Africa

Photo: M. Rutherford, CABI

- Initially generalised yellowing of the leaves which wilt and curl.
- Brown necrotic lesions on young leaves, initially along veins and edges.
- Leaves dry up become fragile and easily fall.
- Symptoms may develop on one side of the tree, which gradually dies before the whole tree dies.

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Antestia bugs

Antestiopsis species (variegated coffee bug)

Worldwide

Photo: Bernard Bouyjou

- Adult prefers to feed on green berries and flower buds but can feed on green twigs.
- They bore into side of beans which may rot or the inner tissues turns to a soft white paste.
- The marking on the exterior may vary from light spotting to complete rotting, immature berries fall.

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Coffee ringspot

Coffee ringspot virus (CoRSV)

S America

Photo: César M. Chagas

- White, round spots form on green berries, later becoming ringspots that may be sunken.
- Infected berries may fall.

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Coffee berry borer

Hypothenemus hampei

Worldwide

Photo: P. Baker, CABI

- Beans become blue-green, young berries may rot. Adults and larvae may be present in the berry. Small black beetle 1.5 mm and small white legless larvae respectively.
- The borer will survive in stored coffee beans and will continue to multiply in sealed storage vessels.

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Coffee berry disease

Colletotrichum kahawae

Africa

Photo: CABI

- White parts of flowers develop dark brown or black streaks or blotches and may die.
- Dark brown-black, slightly sunken lesions develop on attached berries and may have concentric black rings, young berries fall and others eventually rot.
- Pink powdery spores of the fungus may be visible on the berry lesions.

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Coffee berry moth

Prophantis smaragdina

Africa

Photo: CABI

- As larvae feed they weave a silk web across berry clusters, this webbing may hold the berries together.
- Affected berries become brown and hollow.

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FUNGUS

49 69 75 55

Fusaruim wilt

Gibberella xylarioides

Africa

Photo:

- Berries ripen prematurely often on sections of the plant initially.
- No obvious infection point or rot.

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Anthracnose

Colletotrichum spp.

Worldwide

Photo: Anna L. Snowdon

- On young twigs lesions start as depressed yellow elongated spots that become dark brown and may be surrounded by a yellow halo.
- As the lesion ages the outside splits and the fruiting bodies are visible within.
- Berries may fall from the plant.

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Brown eye spot

Cercospora coffeicola

Worldwide

Photo: N. Phiri, CABI

- Reddish-dark brown patchy lesions develop on berries ('berry blotch'), similar to those of coffee berry disease but with a yellow to red halo and not sunken.
- Small raised red spots ('red blister') appear on green or ripening berries (arrowed).

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Warty berry

Botrytis cinerea

Worldwide

Photo:

- Grey, wart-like growths present in clusters on the berries.
- Grey, spore-producing structures of the fungus may be visible on affected berries.
- Disease only occurs in cool, very damp conditions.

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Coffee berry borer

Hypothenemus hampei

Worldwide

Photo: B. Taylor, CABI

- Small round holes, about 1 mm in diameter, often close to the tip of green or ripened berries.
- Beans may develop a blue-green colour.
- Developing larvae and adults found inside.
- Young berries may rot.

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Botrytis flower blight

Botrytis species

Worldwide

Photo: Scot Nelson, University of Hawaii, Flickr

- Grey, fluffy fungal growth visible on coffee flowers and buds.
- Flowers become brown-black, shrivel and die.
- Disease more common and more damaging in cool, damp conditions.

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Armillaria root rot

Armillaria mellea

Africa, Central and S America

Photo: Chris Prior CABI

- Cracks in bark at the root collar, with white threads or radiating streaks of fungus beneath the bark or on roots that may extend upwards into the stem.
- Roots become brown and die.
- Affected plants usually in groups due to outward spread of disease from an old infected stump or log.

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Pink disease

Erythricium (Corticium) salmonicolor

Worldwide

Photo: Chris Prior CABI

- Tips of twigs and branches become yellow and leaves wilt and die, giving it appears burnt.
- A pink fungal layer forms on the underside of branches.
- Berries become brown and very dry, develop tiny pink spots on their surface and fall from the tree.
- In severe attacks a thick layer of plant tissue ('callous') looking ring may girdle the main stem and the plant may die.

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Coffee bark disease and collar rot

Fusarium stilboides

Africa, Oceania, Caribbean

Photo: J. Flood CABI

- Dark brown sunken lesion with a water-soaked edge at the base of young suckers that girdles and constricts the stem. Tiny pink dots of the fungus may be visible on the lesion. The bark remains intact.
- Bark rises up and becomes flaky (easily rubbed off) usually around a pruning scar. Sunken, cankerous lesions on the main stem that extend laterals and girdle the stem. When these symptoms are at ground level it is known as Collar rot.

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Armillaria root rot

Armillaria mellea

Africa, Central and S America

Photo: CABI

- Mushroom style fruiting structures growing at the base of trunk is a sign of the later stages of the disease.
- If this is seen the tree will be heavily infected and will die.

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White coffee borer

Monochamus leuconotus

Africa

Photo: N. Phiri, CABI

- White or cream larva 30-50 mm long within stems.
- Large long winding tunnels are created just below the surface of the bark.
- Wood shavings ('frass') present at base of tree.

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Twig borer

Xylosandrus species

Worldwide

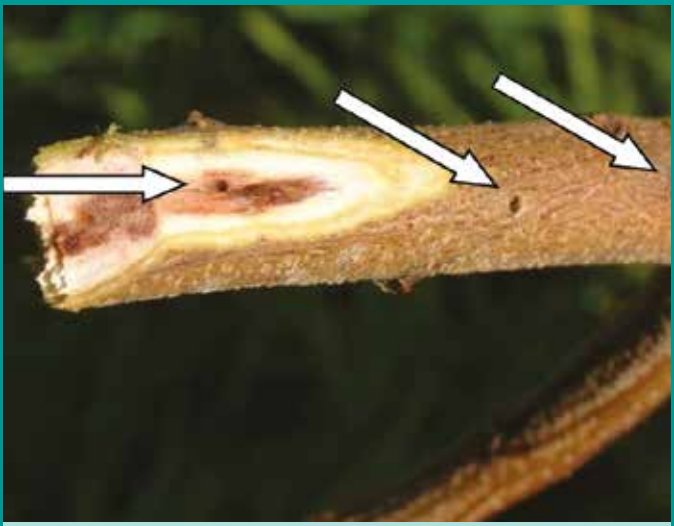

Photo: Scot Nelson, University of Hawaii, Flickr

- Tiny holes about 1 mm in diameter in small branches or main stem of young seedlings. Fine white sawdust near the hole. Branch beyond the hole blackens and leaves gradually droop.

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White coffee borer

Monochamus leuconotus

Africa

Photo: M. Rutherford, CABI

- Holes (10 mm diameter) in stem of tree. Wood shavings (‘frass’) present at base of tree.

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White coffee borer

Monochamus leuconotus

Africa

Photo: N. Phiri, CABI

- Bark on stem removed by feeding borer and visible as rings on stem.
- Ringbarking (the feeding goes completely around the tree) is common by younger larvae, often below the soil line the leaves yellow and die, younger trees may be killed.

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FUNGUS

49 55 75 69

Fusaruim wilt

Gibberella xylarioides

Africa

Photo: M. Rutherford, CABI

- Blue-black discoloration of wood visible beneath the bark.
- Brown necrotic lesions on young leaves, initially along veins and edges. Leaves yellow, dry, shrivel and fall.
- Symptoms may develop on all or only one portion of the tree, which gradually dies.

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Ceratocystis

Ceratocystis fimbriata

Worldwide

Photos: (Left) USDA Forest Service, Region 2 – Rocky Mountain Region Archive, USDA Forest Service, Bugwood.org (Right) Thomas C. Harrington

- Cankerous lesions develop at wounds which spread up and down, streaking ocurrs in the underlying wood.
- Lesions may girdle the stem at the root collar leading to gradual die-back.
- First symptoms are rapid yellowing wilting and drying of leaves, which remain attached for several weeks.

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Damping off

Rhizoctonia solani, Fusarium species, *Pythium* species

Worldwide

Photo: Scot Nelson, University of Hawaii, Flickr

- Disease of seeds and seedlings.
- Thread-like fungal strands may be found on the seeds if seedlings failed to emerge.
- Seedlings may develop brown necrosis at soil level which girdles and constricts the cotyledon and spreads upward. Seedlings will quickly wilt and die.

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Pink disease

Corticium salmonicolor

Worldwide

Photo: S. D. Sawant

- Tips of twigs and branches become yellow and leaves on the branches wilt and die giving a burnt appearance.
- Berries become brown and very dry, develop tiny pink fungal spots on their surface and fall from the tree.

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Burrowing nematode

Meloidogyne species

Worldwide

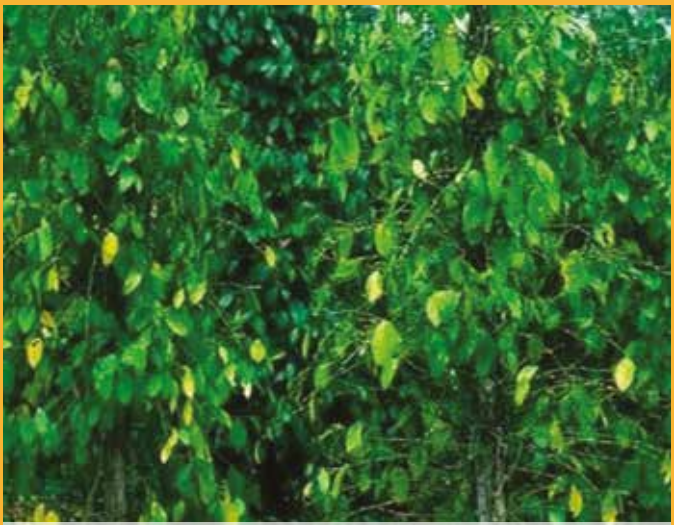

Photo: J. Bridge, CABI

- General reduction in rate and extent of plant growth.
- Yellowing of leaves and leaf fall is common.

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Root Knot nematode

Meloidogyne species

Worldwide

Photo: Scot Nelson, University of Hawaii, Flickr

- General reduction in rate and extent of plant growth.
- Yellowing of leaves and leaf fall is common.

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Fusarium wilt

Gibberella xylarioides

Africa

Photo: M. Rutherford, CABI

- Defoliation on one main branch of the tree is a characteristic symptom.

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Coffee bark disease

Fusarium stilboides

Africa, Oceania, Caribbean

Photo: J. M. Waller, CABI

- Several diseases all caused by the same fungus.
- In all cases the main stem is girdled by disease.
- There is general and gradual yellowing, decline and death of the plant.

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White coffee borer

Monochamus leuconotus

Africa

Photo: N. Phiri, CABI

- It is common for young trees (but not older ones) to be severely affected.
- Leaves yellow and die, the tree may be killed.

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Ceratocystis

Ceratocystis fimbriata

Worldwide

Photo: Thomas C. Harrington

- Chlorosis and wilting of leaves, a gradual die-back and ultimate death of part or all of the tree.

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Rosellinia

Rosellinia sp. (symptoms shown on apple)

Worldwide

Photo: Rosa MV Sanhueza Embrapa

- Cracks in bark at base of tree fill with masses of black fungal dots or threads in the underlying wood or white, radiating fungal streaks under the bark of roots.
- Causes leaf chlorosis, wilting, gradual dieback and death of trees.
- Affected plants usually in groups due to outward spread of disease from an old infected stump or log.

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Pratylenchus

Pratylenchus spp.

Worldwide

Photo: R.J. Reynolds, R. J. Reynolds Tobacco Company, Bugwood.org

- Dark patches develop on the roots which are not as deep into the tissue as other nematodes and not swollen like root-knot nematodes.
- General reduction in rate and extent of plant growth.
- Yellowing of leaves and defoliation (leaf fall).
- Plant may be killed.

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Burrowing nematode

Radopholus similis

Worldwide

Photo: Michael McClure, University of Arizona, Bugwood.org

- Nematodes tunnel deep into root interior, causing browning and death (necrosis) of roots.
- Root exterior may be wart-like and abnormally thickened.
- Leaves yellow and fall.
- General reduction in rate and extent of plant growth.
- Plants may be killed.

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Coffee corky root syndrome

Meloidogyne spp.

Worldwide

Photo: Scot Nelson, University of Hawaii, Flickr

- Roots have reduced growth and many galls develop which turn into corky tissue on the primary and secondary roots cracking of the outside of the root follows.
- General reduction in plant vigour and berry production.
- Leaf chlorosis, drop of flowers and berries.
- Ultimately plant death in 2-4 years.

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Root Knot nematode

Meloidogyne species

Worldwide

Photo: John Bridge, CABI

- Presence of galls along the roots, usually the same colour as the roots, browning and necrosis of the root may occur.
- Upper part (neck) of root may enlarge and become corky and cracked with many new, heavily branched roots.
- General reduction in rate and extent of plant growth.
- Plants may be killed.

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Contact us

Africa

Ghana
CABI, CSIR Campus, No. 6 Agostino Neto Road
Airport Residential Area, P. O. Box CT 8630, Cantonments
Accra, Ghana

T: +233 (0)302 797 202
E: westafrica@cabi.org

Kenya
CABI, Canary Bird, 673 Limuru Road, Muthaiga,
PO Box 633-00621, Nairobi, Kenya

T: +254 (0)20 2271000/20
E: africa@cabi.org

Zambia
CABI, 5834 Mwange Close, Kalundu,
P.O. Box 37589, Lusaka, Zambia

T: +26 (0) 967619665
E: southernafrica@cabi.org

Contact us

Americas

Brazil

CABI, UNESP-Fazenda Experimental
Lageado, FEPAF (Escritorio da CABI)
Rua Dr. Jose Barbosa de Barros 1780
Fazenda Experimental Lageado
CEP:18.610-307
Botucatu, San Paulo, Brazil

T: +5514 38117670
E: y.colmenarez@cabi.org

Trinidad & Tobago

CABI, Gordon Street, Curepe
Trinidad and Tobago

T: +1 868 6457628
E: caribbeanLA@cabi.org

USA

CABI, 745 Atlantic Avenue
8th Floor, Boston,
MA 02111, USA

T: +1 (617) 682-9015
E: cabi-nao@cabi.org

Contact us

Asia

China

CABI, Beijing Representative Office, Internal Post Box 56
Chinese Academy of Agricultural Sciences
12 Zhongguancun Nandajie, Beijing 100081, China

T: +86 (0)10 82105692
E: china@cabi.org

India

CABI, 2nd Floor, CG Block, NASC Complex, DP Shastri Marg
Opp. Todapur Village, PUSA, New Delhi – 110012, India

T: +91 (0)11 25841906
E: cabi-india@cabi.org

Malaysia

CABI, PO Box 210, 43400 UPM Serdang, Selangor, Malaysia

T: +60 (0)3 89432921
E: cabisea@cabi.org

Pakistan

CABI, Opposite 1-A, Data Gunj Baksh Road
Satellite Town, PO Box 8, Rawalpindi, Pakistan

T: +92 (0)51 929 2064/2063
E: sasia@cabi.org

Contact us

Europe

Switzerland
CABI, Rue des Grillons 1
CH-2800 Delémont,
Switzerland

T: +41 (0)32 4214870
E: europe-CH@cabi.org

UK
CABI, Nosworthy Way
Wallingford, Oxfordshire
OX10 8DE, UK

T: +44 (0)1491 832111
E: corporate@cabi.org

UK
CABI, Bakeham Lane
Egham, Surrey
TW20 9TY, UK

T: +44 (0)1491 829080
E: microbiologicalservices@cabi.org
E: cabieurope-uk@cabi.org