

Crop pests and diseases

Roots and tubers





Photo: Eric Boa, CABI, CC BY 4.0

Cassava green mite adult and egg.

Cassava green mite

Mononychellus tanajoa

The cassava green mite is an important pest of cassava in Africa that can cause significant losses in yield.

The mite can easily be spread from one place to another on leaves and cuttings of the plant, and by wind.

An integrated approach is required to control the pest and reduce the damage. Cultural practices, such as using clean planting material, planting early in the rain season and intercropping with pigeon pea, can reduce populations of the pest.





Photo: Edwin M Escobar, Flickr, CC BY-NC 2.0,
<http://bit.ly/1yY5kTM>

*Adult sweet potato weevil (body length
6-8 mm).*



Photo: Scot Nelson, Flickr, CC BY-NC-SA 2.0,
<http://bit.ly/1HUq1j>

*A cut sweet potato showing larvae in
tunnels.*

Sweet potato weevil

Cylas spp.

Sweet potato weevils are insect pests that can cause severe damage to sweet potatoes. The larvae cause the most damage by feeding on the stems and storage roots.

When weevil populations are high, more than one preventive method should be used such as: use of clean planting material, planting early in season and/or using early maturing varieties, selecting deep rooting varieties or earthing up the soil around the base of the plant, removal of crop residues and volunteer plants, and crop rotation.





Photo: G. Georgen, IITA

An example of Heteroligus meles.



Photo: Dr Stephen Kwaku Asante, CSIR-Savanna Agricultural Research Institute.

Tuber damage caused by the yam beetle.

Greater and lesser yam beetle

Heteroligus meles and *Heteroligus appius*

Greater and lesser yam beetles are both important pests of yams in West Africa. The adult beetles burrow into the soil and feed on the tubers.

Preventive methods, such as planting as late in the season as possible and treating planting material with an insecticide before planting, are the best ways to control yam beetles and reduce the damage they cause.



Yam moths

Dasyses rugosella, *Euzopherodes vapidella*
and *Erechthias minuscula*



Caterpillars of several different species of moth are major post-harvest pests of yams in Africa.

Cleaning the storage facility and avoiding storing damaged tubers helps reduce damage.

There are also botanical and synthetic pesticides that can be applied to stored yams to control the eggs, caterpillars and adult moths.



Photo: Donald Hobern, Wikimedia Commons, CC-BY-2.0,
<http://bit.ly/1a8PJuf>

Adult moth of cotton bollworm.



Photos: Gyorgy Csoka, Hungary Forest Research Institute,
CC BY 3.0 US, www.bugwood.org

Cotton bollworm caterpillars in two different colours.

Cotton bollworm

Helicoverpa armigera

The cotton bollworm is a major pest of many important food, oil and cash crops worldwide, including cereals, legumes, fruits and vegetables. A severe infestation of caterpillars of this moth can cause a complete loss in yield.

Chemical control needs to be carefully timed as the caterpillars bore into the grains or fruit of the plant and are then protected. Resistance to pesticides, such as pyrethroids, has been reported in many countries. *Bacillus thuringiensis* (Bt) and neem extracts provide effective control against the caterpillars while minimising damage to natural enemies. Important cultural controls include removal and destruction of post-harvest crop residues, ploughing the soil to expose the pupae and uniform planting times.





Photo: Paul van Mele, Agro-Insight

Cassava showing bunches of leaves, typical of witches' broom symptoms, in Thailand.



Photo: Paul van Mele, Agro-Insight

Brown vascular tissues are seen on witches' broom infected plants in Thailand when the stems are cut.

Phytoplasma diseases of cassava

Various phytoplasma

Several severe diseases of cassava are associated with a number of different bacteria-like phytoplasmas in South America, the Caribbean, Asia, Africa, and the South Pacific. In some, shoots are bunched with small yellow leaves; in others, symptoms are seen only on roots at harvest.

Management of these diseases is difficult: methods of spread are unknown and commercial growers and smallholders lack access to clean planting material. Careful selection of cuttings is recommended and also early removal of plants if disease symptoms occur.





Photo: Eric Boa, CABI, CC BY 4.0

Typical dry brown rot is only evident when tubers are cut open.



Photo: Eric Boa, CABI, CC BY 4.0

Leaf symptoms are seen clearly here against the light, but are easy to miss when walking through fields.

Cassava brown streak disease

Cassava brown streak viruses



Cassava brown streak disease (CBSD) has been known since the 1930s but has only recently become a major problem. Originally restricted mostly to the coastal regions of Tanzania and neighbours, an outbreak of this virus disease in the Great Lakes region in 2003 has since spread, particularly at higher altitudes (>1000 masl), to other countries in East and Central Africa. CBSD is not present in West Africa. CBSD is a serious threat to a key food crop. The leaf symptoms appear mild by comparison with the huge losses in tuber production: a dry brownish rot makes tubers unfit for eating and sale. CBSD occurs alongside cassava mosaic disease (CMD), another major threat to production caused by a different type of virus. Both diseases are spread by whiteflies and in infected planting material. Effective management depends on developing resistant varieties and making clean planting material available to farmers.



Photo: Fen Beed

Yellow patches spread outwards from the leaf spots as the leaf withers.



Photo: Fen Beed

Bacteria block movement of water and nutrients in the woody stem; the leaves above the blockage wilt without developing any leaf spots.

Cassava bacterial blight

Xanthomonas axonopodis pv. *manihotis*



Cassava bacterial blight is perhaps less well known in Africa than cassava mosaic disease and cassava brown streak. It deserves more attention, however, given the continuing risk of major outbreaks and the large losses due to the disease in the past, particularly in DR Congo.

The disease is introduced in symptomless cuttings which fail to grow. The bacteria are then spread by rain splash and physical contact. Varieties with good tolerance to the disease are available though they may not be widely known.



Photo: Eric Boa, CABI, CC BY 4.0

Advanced mosaic and distortion of leaves on an infected cutting.



Photo: Eric Boa, CABI, CC BY 4.0

Although chlorotic (yellow) areas are well developed the limited leaf distortion suggests infection via whiteflies after planting.

Cassava mosaic disease

Cassava mosaic geminiviruses



Cassava mosaic disease (CMD) is widespread, occurring in all countries in Africa where cassava is grown. This viral disease has been present in Africa for over a hundred years yet caused relatively little concern until the 1980s, when an outbreak of a damaging epidemic began in Uganda and now affects all neighbouring countries.

The disease is spread in cuttings, which may be symptomless, and by whiteflies. Disease management has concentrated on the use of resistant cultivars. While this is an important strategy to reduce yield losses, more attention should be paid to the use of clean planting material, early detection of CMD in fields and removal of plants.



Photo: Carlos Lopes, EMBRAPA

Black sunken spots with grey centres on stems.



Photo: Carlos Lopes, EMBRAPA

Damage to leaves and stems causing a blight.

Leaf petiole and stem blight disease of sweet potato

Alternaria bataticola

Leaf petiole and stem blight disease of sweet potato (also called sweet potato Alternaria blight), is caused by the fungus *Alternaria bataticola*, and results in spots on leaves, petioles (the leaf stalks) and stems, causing leaves to fall and vines to die. It is present in several African countries but is especially serious in the cool, moist environments of central and southwestern Uganda.

Management is through the use of varieties selected or bred for resistance or tolerance, careful choice of planting material, and hygiene measures, principally the destruction of vines after harvest.





Photo: Dr Richard Gibson

Two plants (in the foreground) affected by sweet potato virus disease, with a healthy plant behind.



Photo: (Top) Grahame Jackson, CABI, CC BY 4.0.

(Bottom) Gerald Holmes, California Polytechnic State University at San Luis Obispo, CC BY-NC 3.0 US, www.bugwood.org

Narrow bands around the storage root, symptomatic of sweet potato feathery mottle virus (top). Feathery mottle virus symptoms (russet crack strain) on storage roots causing fissures (bottom).

Sweet potato virus disease

Sweet potato chlorotic stunt virus & sweet potato feathery mottle virus

Two virus species, one spread by aphids, the other by whiteflies, cause sweet potato virus disease when they occur together. When just one virus is present, often no symptoms are seen. The disease is especially severe in East Africa: plants become stunted, with vines bearing narrow yellow leaves and a lack of storage roots.

The most important control measures are the use of tolerant varieties, careful selection of cuttings, removal of infected plants in the first month from planting and leaving at least 15 metres between plantings.





Photo: Grahame Jackson, CABI, CC BY 4.0

Brown irregular leaf spots with yellow margins, expanding or joining together to cause a blight or early leaf fall.



Photo: Grahame Jackson, CABI, CC BY 4.0

Mature leaves blackened during heavy rains followed by sunny days.

Yam dieback

Colletotrichum gloeosporioides



Yam dieback (*Dioscorea alata*), also known as anthracnose of water yam, is caused by the fungus *Colletotrichum gloeosporioides*. It results in dark leaf spots, blotches, defoliation and stem dieback of young shoots, blackening of older foliage and reduced tuber yields.

Sources of infection are spores from other crops, weeds and infected tubers. Spread is via wind and rain, and diseased tubers.

The disease is managed by using tolerant varieties and by planting early, ahead of the heaviest seasonal rains.



Photo: IITA, Flickr, CC BY-NC 2.0, <http://bit.ly/1LKoMgW>

*Damage by the nematode *Scutellonema bradys* on white yam tubers.*



Photo: IITA, Flickr, CC BY-NC 2.0, <http://bit.ly/1FV6y4g>

Dry rot beneath the skin of white yam tubers.

Dry rot of yam

Scutellonema bradys

Dry rot, common to all food yams, is caused by the microscopic nematode *Scutellonema bradys*. It attacks tubers in the field and in storage, resulting in loss of edible parts, lower quality and reduced market value. Tuber infections are important for the survival and spread of the nematode.

Management is by using nematode-free setts (achieved by carefully inspecting planting material or treating with hot water to kill the nematodes), by reducing soil populations using legume fallows or rotating yams with crops resistant to attack, and by removal of crop debris.





Photo: IITA, Flickr, CC BY-NC 2.0, <http://bit.ly/1L09rc5>

Plant with yam mosaic disease, showing narrow yellow leaves.



Photo: IITA, Flickr, CC BY-NC 2.0, <http://bit.ly/1TunWXa>

Yellow and green patterns, distorted margin, and backward curling of a leaf infected with yam mosaic virus.

Yam mosaic disease

Yam mosaic potyvirus

There are at least four viruses infecting edible yams in West Africa, of which yam mosaic virus is the most important in distribution, incidence and effect on plant growth. Infected plants show mosaics, distortions and, in severe cases, strap-like leaves, poor growth and smaller tubers than those from healthy plants. Spread is by tubers used for propagation and also by aphids.

The most important management techniques are use of new varieties from breeding programmes, controlling weeds and on-farm selection of healthy plants as 'seed'.





Illustration: Margaret Senior, NSW Department of Primary industries, <http://bit.ly/11MAEdo>

Composite of early lesions on leaves and further development of larger, dark brown patches as foliage withers. Note darkening of stem and rotting of tuber.



Photo: Eric Boa, CABI, CC BY 4.0

The disease develops rapidly once spores infect leaves and late blight takes hold, eventually killing the whole plant.

Late blight of Irish potato

Phytophthora infestans

Late blight of potato, caused by a fungus-like organism, is a constant threat wherever potatoes are grown. Whole fields can be wiped out in a short time. Selection of clean, healthy and preferably certified tubers is essential, as is removing left-over tubers from previous potato crops.

It is difficult to avoid the use of fungicides given the risk of losing whole crops. Most fungicides are used as protectants: some act systemically and others on contact with foliage, with the common aim of preventing disease establishment.

Resistant varieties are an important part of an integrated disease management strategy but the risk of disease outbreaks is too high to rely only on this approach.





Photo: William T. Stanley, Negaunee Collection Manager, Mammals, The Field Museum of Natural History

Natal multimammate rat, Mastomys natalensis.



Photo: Jonathan Beilby

Grass rat, Arvicanthis species.

Rats and mole rats of sweet potato

Mastomys, Arvicanthis & Tachyoryctes species

Rats and burrowing mole rats both attack sweet potato, but rats are the more serious pests.

Although 12 species of rat are crop pests, only the multimammate and grass rat are distributed widely. Rapid population outbreaks, in East Africa at least, may be related to rainfall in December and January that encourages early breeding.

Control relies on community action and early intervention, mostly using cultural methods. Chemicals are a potential danger to human health and the environment, as well as being costly and mostly unavailable to smallholders.



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