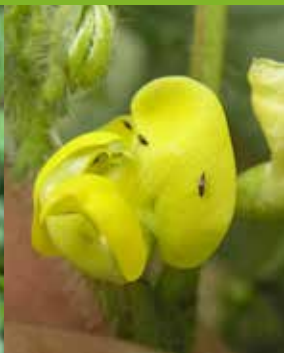
AFRICA soil health consortium

Crop pests and diseases

Legumes



Bean bruchid

Acanthoscelides obtectus

Photo: Clemson University – USDA Cooperative Extension Slide Series, CC BY 3.0 US, www.bugwood.org

Adult bean bruchid on bean with exit hole.

Photo: Pest and Diseases Image Library, CC BY-NC 3.0 US, www.bugwood.org

Adult, 3-4.5 mm long. Body grey, brown and reddish-brown, without any distinctive patterns.

The bean bruchid is a major post-harvest pest of most bean species. The infestation begins in the field, but becomes a major problem after harvest, when the holes left in the beans reduce the value of the crop.

To prevent a major infestation it is important to harvest the beans as soon as they reach maturity. Storing the beans in a clean facility is the most important measure. Remove old beans from the store and use a disinfectant to clean the storage room if necessary. Use an air-tight storage container if possible.

Legume pod borer

Maruca vitrata

Photo: gailhampshire, Flickr, CC BY 2.0, http://bitly/1FRL4tM

The adult moth has brown forewings with white markings.

Photo: Merle Shepard, Gerald R.Carner, and P.A.C Ooi, Insects and their Natural Enemies Associated with Vegetables and Soybean in Southeast Asia, CC BY 3.0 US, www.bugwood.org

Caterpillars are whitish to pale green in colour with irregular brown-black spots. The head is dark brown.

The legume pod borer, a moth, is a prominent pest of cowpeas and other beans throughout East and West Africa. The caterpillars feed on buds and flowers, and bore into the bean pods, eating the seeds and leaving a hole in the pod.

Preventive approaches include early planting, use of resistant/tolerant and early maturing varieties, removal of alternative legume hosts, intercropping and crop rotation.

Control options include handpicking and destroying eggs and larvae.

Pod-sucking bugs of cowpea

Hemiptera spp.

Photo: IITA, Flickr, CC BY-NC 2.0, http://bit.ly/1Ktfx0V

Pod sucking bugs.

Photo: IITA, Flickr, CC BY-NC 2.0, http://bit.ly/1LNR2MX

Pod sucking bugs feeding on cowpea.

The pod-sucking bugs are a group of major pests of cowpea in sub-Saharan Africa. They are difficult to control due to their mobility: a single control strategy is unlikely to succeed.

An integrated approach that combines cultural practices, such as early planting and fertiliser use, combined with carefully timed insecticide applications can manage the pest.

Bean flower thrips

Megalurothrips sjostedti

Photo: Stan Diffie, University of Georgia, CC BY-NC 3.0 US, www.bugwood.org

Adult bean flower thrips, greatly enlarged.

Photo: Ko Ko Maung, CC BY-NC 3.0 US, www.bugwood.org

The tiny adults on a bean flower.

Bean flower thrips are a major pest of cowpea and other leguminous crops throughout sub-Saharan Africa. The pest feeds on the buds and flowers of the crop, which can cause the flowers to be distorted and fall from the plant, resulting in crop losses.

Control of the pest can be achieved through a combination of cultural practices, such as ploughing to destroy pupae, intercropping and crop rotation with maize, planting early, and use of chemical pesticides, including home-made remedies based on black pepper.

Cotton bollworm

Helicoverpa armigera

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.

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.

Bean anthracnose

Colletotrichum lindemutheanum

Photo: Denis Persley, Department of Agriculture and Fisheries

Brown sunken spots with dark margins caused by bean anthracnose on the pods of French bean.

Photo: PABRA, Flickr, CC BY-NC-SA 2.0, http://bit.ly/1KQ3MBN

Red to black spots occur on the leaves.

Bean anthracnose is a fungal disease primarily of the common bean, *Phaseolus vulgaris*. It occurs worldwide, including many countries of Africa. Signs of infection occur on leaves, mostly limited to veins on the underside. Spots, oval to circular, tan with dark borders, develop on stems and pods, and also on seedling stems and leaves. Spores formed in the spots are spread in rain-splash or by wind and rain. Infected seeds are sources of the fungus and responsible for long-distance spread.

The disease is managed by using certified or approved seed. Seeds can also be treated with the fungicides captan or thiophanate-methyl. Intercropping with maize and use of 2-3 year rotations with non-legume crops are other preventive options reported to be effective.

Bean blight

Xanthomonas axonopodis pv. phaseoli

Photo: V.R. Wallen, Agriculture and Agri-Food Canada, CC BY 3.0 US, www.bugwood.org

Brown spots with wide yellow halos caused by bean blight.

Photo: Howard F. Schwartz, Colorado State University, CC BY 3.0 US, www.bugwood.org

Spots, some water-soaked, others brown, on the pods. Roughly circular and joining together.

Bean blight is caused by a bacteria, *Xanthomonas axonopodis pv. phaseoli*. Key signs of the disease are spots on leaves, stems and pods. Seeds become infected internally and on the outside. The bacteria are spread over short-distances in wind-blown rain, surface water run-off, and by people, machinery and insects moving through the crop. Long-distance spread is via infected seeds.

The bacteria survive in plant debris, volunteer bean plants, weeds and seeds. Priority measures for management involve use of disease-free (ideally certified or approved) seed, rotations (2-3 years) with maize, avoiding entry to fields when foliage is wet, and removing volunteer plants and weeds.

Common mosaic of bean

Bean common mosaic virus

Photo: Howard F. Schwartz, Colorado State University, CC BY 3.0 US, www.bugwood.org

Bubble-like appearance of leaf blades of Phaseolus*; also the plant is stunted.*

Photo: Grahame Jackson, CABI, CC BY 4.0

Mosaic patterns on the leaves of Vigna sp.*, yard long bean.*

Common mosaic of bean is caused by a virus that mainly affects *Phaseolus* and *Vigna* beans. It is spread in seed and by a number of aphid species. Plants are stunted, with leaves that show dark and light green patterns (mosaics), dark green areas along the main veins, and a bubble-like appearance. Pod yield losses range from 35% to near 100%.

In Africa, management options are limited by the lack of healthy seed programmes and access to commercial seed with resistance to the virus, and rely mainly on cultural controls. Insecticides do not offer solutions, even if affordable and available.

Halo blight of beans

Pseudomonas savastanoi pv. *phaseolicola*

Photo: Howard F. Schwartz, Colorado State University, CC BY 3.0 US, www.bugwood.org

Early leaf spots with yellow halo.

Photos: Howard F. Schwartz, Colorado State University, CC BY 3.0 US, www.bugwood.org

Water soaked lesions on pods (A) showing internal decay (B).

There are two serious bacterial diseases of bean: common blight, caused by *Xanthomonas* and halo blight, caused by *Pseudomonas*. Both diseases are spread in similar ways: in seeds, rain splash and by physical contact.

Bean halo blight has a distinct yellowing around the initial leaf spot, which spreads outwards, though the symptoms of common blight are similar.

Bean cultivars vary widely in their resistance to the two bacterial blights, and laboratory testing may be necessary to distinguish them. The use of clean seed is critical for both bacterial blights.

Early and late leaf spot of groundnut

Mycosphaerella arachidis & M. berkeleyi

Photo: Grahame Jackson, CABI, CC BY 4.0

Early leaf spot, showing spots on the top surface of the leaf and clear yellow halos.

Photo: Jill Lenne, ICRISAT

Late leaf spot: spots on the underside of the leaf, with smaller halos. Microscopic examination is needed to tell early from late leaf spot.

Early and late leaf spots, caused by the fungi *Mycosphaerella arachidis* and *M. berkeleyi*, are severe diseases of groundnuts worldwide. In Africa, they are reported to be major problems in Burkina Faso, Malawi, Mali, Nigeria and Sudan. These diseases cause spots on leaves, stems and petioles, resulting in leaf fall and high pod yield losses. Early leaf spots are brown with halos; late leaf spots are dark brown to black with dense spores forming ring patterns on the undersurface. Management of both diseases involves use of resistant, early yielding varieties and cultural controls, which include at least a 1-year rotation, removal of volunteer plants and weeds, isolating crops from those that are infected, and elimination of plant debris after harvest. Applications of fungicide, e.g. chlorothalonil, are beneficial for leaf spots and also against a rust disease (*Puccinia arachidis*) common on groundnuts.

Stem and pod rot of groundnut

Athelia rolfsii

Photo: Denis Persley, Department of Agriculture and Fisheries

Cottony growth on the stems of groundnut causing a wilt.

Photo: Grahame Jackson, CABI, CC BY 4.0

Sclerotia of the fungus Athelia rolfsii *on groundnut stem – at first white, later light brown.*

Stem and pod rot, also called southern blight, is a fungal disease that occurs wherever groundnuts are grown. It causes up to 10-25% reduction in pod yields worldwide. Losses in Africa are not well recorded but, as it is present in more than 45 countries, they are likely to be high. The fungus is soil-borne, attacking groundnut stems just below soil level and causing leaves to yellow and wilt. As the disease develops, the characteristic thick white cottony fungus grows above ground, and round to oval, 0.5-2 mm, tan to brown sclerotia develop in it. Sclerotia are bundles of fungus with thick protective outer cells, allowing the fungus to survive for months to years in the soil depending on the conditions.

The disease can be managed by crop rotation, early removal of affected plants, careful weeding and use of mulch.

Groundnut rosette disease

Groundnut rosette virus

Photo: Philip Taylor, CABI, CC BY 4.0

Groundnut with small distorted leaves and severe mosaic symptoms.

Groundnut rosette disease is the most important disease of groundnuts of sub-Saharan Africa. Epidemics occur without warning. It is caused by a virus complex – two viruses and a virus-like nucleic acid molecule called satellite RNA. The satellite RNA occurs in different forms and results in at least three types of field symptoms: chlorotic (yellowing), mosaic and green rosette. These diseases differ in the patterns of yellow and green on the leaves, but all cause stunting and severe loss of pod yield. The groundnut diseases are spread by the aphid, *Aphis craccivora*. Management is mainly dependent on use of tolerant varieties. Cultural measures can also be helpful, including removing volunteer and diseased groundnut and weeds, early planting, intercropping with other legumes and cereals, and crop rotation.

Groundnut rust

Puccinia arachidus

Photo: Mike Hughes, DAFF

Groundnut rust as it appears in the field; note that spots are mostly on the older leaves.

Photo: Mike Hughes, DAFF

Yellowing on the upper surface of leaflets (left), and pustules of rust on the underside (right).

Groundnut rust is a relatively new disease to Africa, becoming widespread only since the 1970s. It affects leaves, stems and pegs, producing many small red spots or pustules containing masses of spores. Foliage turns yellow, dries up and plants die early. Infection often occurs with early and late leaf spots. When epidemics occur, pod yield losses of 40% are common. Rust spores spread over long distances by wind and also on seed, and over short distances within crops by rain-splash, and possibly by insects. Spores need water to infect.

Management is primarily by removing volunteer (self-seeded) groundnut plants before planting, and by growing tolerant varieties, although keeping fields free from weeds, avoiding growing crops of different ages in the same area, site selection, rotations with cereals and possibly fungicide use are all measures to consider.

Anthracnose of cowpea

Colletotrichum destructivum

Anthracnose of cowpea is a fungal disease affecting stems, branches, and leaf and flower stalks. Previously, it was thought to be caused by the same fungus that attacks *Phaseolus* beans, but is now considered a separate species, *Colletotrichum destructivum*. Epidemics start when infected seed is planted. Brown spots appear on the foliage and produce large numbers of spores, which are then spread by rain-splash and in wind-driven rain.

The disease occurs in high rainfall parts of Latin America, Asia and Africa (especially the rainforest zone of southwest Nigeria). Important management measures involve the use of tolerant or resistant varieties, seed treated with fungicide and intercropping with cereals.

Cercospora leaf spot of cowpea

Mycosphaerella cruenta

Photo: Howard F. Schwartz, Colorado State University, Bugwood.org, CC BY 3.0 US, http://bit.ly/1DTSR4z

First symptoms with discrete spots, reddish, not restricted by veins.

Photo: Howard F. Schwartz, Colorado State University, Bugwood.org, CC BY 3.0 US, http://bit.ly/1JRVbBb

Leaf spots merge as leaves go yellow and die. Photos are of cercospora leaf spot on Phaseolus vulgaris*, common bean, which has similar symptoms to cowpea.*

Cercospora leaf spot is a fungal disease. It has a widespread distribution and occurs all over Africa. It causes leaves to fall off and serious yield losses of up to 40% in cowpea. There are many resistant varieties but also susceptible ones, so care is needed in identifying suitable varieties for farmers. The disease occurs on other legumes, including closely related plants such as mung bean, 'true' beans (*Phaseolus*) and soybean. The disease is not seed transmitted but carried over to the next growing season on alternative hosts, as well as crop remains. Fungicides can be used to dress (clean) seeds and manage outbreaks. The disease is important in countries where cowpeas are widely planted, such as Nigeria and Niger. Resistant varieties appear to have limited losses in many countries but vigilance is needed to prevent future outbreaks and limit the damaging effects of this disease.

Mosaic diseases of cowpea

Multiple viruses

Photo: Eric Boa, CABI, CC BY 4.0

Advanced, non-specific mosaic symptoms: this could be one of several different viruses.

Photo: Eric Boa, CABI, CC BY 4.0

Mosaic viruses can also reduce and distort growth – note the rough surface of smaller infected leaves.

There are several viruses associated with mosaic symptoms on cowpea. The two most important ones in Africa are blackeye cowpea mosaic virus (BlCMV) and cowpea aphid-borne mosaic virus (CABMV). There are at least seven other viruses which infect cowpea in Africa, including some that produce a mottling of leaves similar to a mosaic. More than one virus can be present and additive effects increase the damage to cowpea and subsequent yield losses.

The control of viruses in cowpea is fundamentally about prevention: use of resistant varieties and healthy seed. Both BlCMV and CABMV are seed-borne and transmitted by aphids. The opportunities for vector control are limited and only effective in the early stages of symptom development.

Striga or witchweed (multiple crops) *Striga species*

Photo: USDA APHIS PPQ Archive, CC BY 3.0 US, www.bugwood.org

Striga hermonthica *flowering on maize.*

Photo: Rob Williams, CABI

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

Striga gesnerioides *parasitizing roots of cowpea (left); flowers of* Striga hermonthica *(right).*

Striga, or witchweed, are parasitic weeds which infest millions of hectares of land planted to maize, sorghum, millets, upland rice, cowpea and sugarcane, reducing yields by 30-100%. There are many species in Africa, growing mostly in arid regions of low soil fertility, but four dominate: *S. hermonthica, S. asiatica, S. aspera* and *S. gesnerioides*. Witchweeds tap into the xylem of host plants causing yellowing, stunting and wilting. Seeds are tiny and can spread over long distances, probably in wind-blown soil and over shorter distances in rain run-off, on shoes and hooves of livestock.

Management depends on use of resistant varieties and cultural control measures, including crop rotations, weeding, raising the fertility of soils and the use of trap crops.

This cluster of summary cards is an output of the Africa Soil Health Consortium (ASHC), which is coordinated by CABI.

This cluster of summary cards was first published in 2015 by ASHC

CABI, Canary Bird, 673 Limuru Road, Muthaiga, PO Box 633-00621, Nairobi, Kenya
Tel: +254 (0)20 2271000/ 20 Fax: +254 (0)20 4042250 Email: Africa@cabi.org
www.cabi.org/ashc