



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.

SUMMARY: 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 underside. 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.

KEY SIGNS

There are two types of fungi that cause leaf spots on groundnuts: early leaf spot and late leaf spot. They look very similar and need microscopic examination to differentiate them. They are often found together in the same crop and even on the same plant. There are slight differences in symptoms, explained below, but from a farmer's point of view they are the same disease and should be treated as such.

Both types of fungi produce dark spots, roughly circular and up to 10 mm diameter on the leaves. Those of early leaf spot are reddish-brown on the upper surface surrounded by a yellow halo and brown on the lower leaf surface. Spots of the late leaf spot are dark brown to black and they are not usually surrounded by a yellow halo; if a halo is present it is smaller. The other difference is that the spores of the late leaf spot are arranged in concentric circles and these are visible on spots on the lower leaf surface. Both fungi produce oval spots on stems, leaf stalks and pegs, and cause leaves to fall off.

The first sign of the diseases is usually at 45-60 days after sowing, as spots on the older leaves. Early leaf spot is more common at first. This is gradually overtaken by late leaf spot, which produces more spores and more loss of leaves as the crop matures. Masses of spores are produced on the spots, but a hand lens, or better still a microscope, is needed to see them.

MANAGEMENT

Management of early and late leaf spot of groundnut is the same for both diseases.

Prevention – what to do before signs are seen

Cultural approaches: The best way to manage the disease is by growing resistant varieties¹ and by selecting those that produce yields early. Check whether these varieties and others are available locally (ICGV-SM 86715, ICGV 91225, ICGV-SM 93535). Priority should be given to varieties that yield in the shortest time to avoid the diseases. Note that some of the releases are tolerant to early leaf spot, but still susceptible to late leaf spot.

Whilst the crop is growing, keep weeds under control, otherwise they are likely to increase humidity within groundnut crops, thus promoting infection. Temperatures of 25-30°C and 6-8 hours of high humidity are needed for infection and disease development.

After harvest, collect and burn or bury the remains of the crop, and leave at least one year between groundnut crops planted on the same land, so that the remains of the old crop decompose before another crop is planted.

Control – what to do after signs are seen

Cultural approaches: Before sowing, plan to plant the new crops as far away as possible from older ones, especially if they are infected by leaf spots. If it is not possible to avoid planting near old crops, do not plant downwind from them, otherwise spores will easily spread to the new crop in wind and rain.

Chemical approaches: Inspect the crop at least once a week, and if growing the crop for sale, and fungicides are affordable and available, spray with chlorothalonil as soon as leaf spots are seen, even if they appear only on one or a few plants. Spray every 10-14 days, continuing until 14 days before harvest. Chlorothalonil controls both leaf spots and rust disease. Mancozeb can also be used. Spray more often (7-10 days) if:

- The first treatment is late and there are many plants with spots. In most cases, spraying should begin no later than 30-35 days after planting.
- Rainfall is high and disease control is poor.

CAUSE

The fungus that causes early leaf spot is *Mycosphaerella arachidis* and late leaf spot, *M. berkeleyi*. These are the sexual stages of the fungi. However, these fungi exist mostly in their asexual states, *Cercospera arachidicola* and *Cercosporidium personatum*, respectively.

Wind, rain-splash and insects spread the spores. There is no evidence that they are seed-borne. The spores germinate in water on the leaf surface, where they infect and produce more spots and spores. The life cycle takes 10-14 days.

Survival of these fungi occurs on volunteer groundnut plants, and infected crop debris.

IMPACT

Infection leads to defoliation, and in many parts of the world where fungicides are rarely used, losses of over 50% are common. Rust, caused by the fungus *Puccinia arachidis*, is now widespread, and the combination of leaf spot diseases and rust means that 6-8 applications of fungicides are needed to produce healthy crops. For most smallholders this represents a considerable investment that is unlikely to be justified economically.

DISTRIBUTION

Both early and late leaf spots are present wherever groundnuts are grown, including all parts of Africa. In Burkina Faso, Malawi, Mali, Nigeria and Sudan the diseases are widespread.

FURTHER READING

Early leaf spot of groundnut (*Mycosphaerella arachidis*). Plantwise Knowledge Bank. (<http://www.plantwise.org/KnowledgeBank/Datasheet.aspx?dsid=35255>).

Managing leaf diseases in peanuts: Fact Sheet. (<http://www.pca.com.au/pdfs/GRDCfactsheet0210.pdf>).

Mycosphaerella arachidis. CABI Crop Protection Compendium. (<http://www.cabi.org.ezproxy.library.uq.edu.au/cpc/datasheet/35255>).

¹Note ICRISAT has developed varieties that have been selected in farmer-participatory trials in Mali, Niger and Nigeria. Improved varieties have also been released in Tanzania, Uganda and Malawi for Groundnut rosette virus resistance; nevertheless, varieties have also been screened for tolerance to leaf spot and rust. Selections have also been made in Cameroon.