Yam dieback

Colletotrichum gloeosporiodies

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.

SUMMARY: 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.

KEY SIGNS

Anthracnose means 'coal disease'. It describes diseases caused by fungi that produce dark spots on leaves, petioles, stems and fruits. Yam anthracnose is a disease of water yam, also known as the greater yam, *Dioscorea alata*, although there are suggestions that it is widespread and severe on most cultivated yam species, including *D. rotundata*. This fact sheet describes the disease on water yam.

Symptoms vary according to the age of the leaf, the variety and the amount of rain. On young leaves, small dark brown spots occur with yellow margins (2-20 mm diameter) that expand rapidly as leaves approach full size. Sometimes the spots run together to form large irregular blotches, and 'shot-holes' occasionally develop as the centres fall out. Infected leaves usually fall off. On more resistant varieties, only the young leaf veins are infected; in this case the leaves become cup-shaped as they grow. On older leaves, pinpoint spots are present that do not expand.

Epidemics can occur when there are several days of heavy rains. Leaves and stems of newly emerged shoots are infected and killed, and dieback results; other shoots develop from the planting piece, and these too are killed. Small tubers from these shoots are seen at harvest. On older plants, young growth hanging down from the tops of supporting poles is similarly infected and dies back. During epidemics, mature leaves of susceptible varieties rapidly turn black, a host plant response to massive numbers of germinating spores and exposure to sunlight. Stems, too, develop similar symptoms of intense but superficial blackening on the sides facing the sun. The blackening is so uniform and sudden on susceptible varieties of yam that farmers in some regions say the yams have been struck by lightning.

MANAGEMENT

Prevention – what to do before signs are seen

Cultural approaches: Use of tolerant varieties is an important part of any management strategy for yam anthracnose, and this may mean the sharing of varieties between countries. However, the unrestricted movement of varieties of yam from one country to another could spread strains of yam anthracnose that are not uniformly distributed: only pathogen-tested plants growing as sterile tissue cultures and following the FAO/IBPGR (1989) *Technical Guidelines for the Safe Movement of Yam Germplasm*[1] should be moved.

[1] http://www.bioversityinternational.org/e-library/publications/detail/sweet-potato

Many cultural practices, such as planting maize around the crop, early staking, weeding, avoiding damage at harvest, and also use of fungicides have been suggested for the control of anthracnose but convincing evidence that they are useful is lacking. However, two measures are highly recommended: use of tolerant varieties and early planting.

No variety is totally resistant to anthracnose, but there are some with greater tolerance. Selections have been made and distributed by international and national research organisations in West Africa. Some performed well and have shown stable anthracnose response across different agroecological zones; for example TDa 87/01091, TDa 95/00197, TDa 95/ 00010, TDa289, TDa291, TDa 294, TDa297, TDa 95/ 00328 and TDa1425. The varieties Belep (New Caledonia), Kinabayo (Philippines), Oriental (Barbados) and Plimbite (Haiti) have shown tolerance to anthracnose in many countries. Farmers should check to see if any of these selections are available.

In all countries, early planting, so that vines reach the tops of their supporting poles ahead of the storm season, is strongly recommended as it improves the performance of all varieties against anthracnose.

It is essential to check each planting piece, whether whole tubers or sections, and discard or cut out parts with rots. This should be standard practice by all smallholders, not only to remove anthracnose infections, but also rots caused by nematodes.

During crop growth, remove weeds that may be alternative hosts, but avoid moving through the crop when the foliage is wet as this might spread spores of the anthracnose fungus.

After harvest, vines should be collected, buried or burnt. It is possible that the fungus can remain alive in the vines and produce spores for at least 4 months, so it could be a source of infection for new plantings.

Chemical approaches: Planting setts should be dusted with ash, or captan fungicide if this is affordable and available.

Foliar applications of fungicides are not recommended. They can delay but not prevent epidemics.

CAUSE

The fungus *Colletotrichum gloeosporioides* is the cause of yam anthracnose; this is the asexual state; the sexual state is known as *Glomerella cingulata*. There are many strains of *C. gloeosporioides* infecting a wide range of crops and weeds, some of which infect yam. In Nigeria, four strains have been described from yam, based on colour, spore characteristics, growth in culture, molecular analysis and aggressiveness, one of which may be a new species. Recent reports suggest that the fungus is also the cause of outbreaks of anthracnose on white yam (*D. Rotundata*), but this needs confirmation. It is possible that other fungi are present and are the main cause of anthracnose epidemics. Another unanswered question is whether more than one *Colletotrichum* species is involved; this is possible as symptoms are varied and it is known that this fungus has many strains.

Spread of the fungus between plants and nearby plantings is via spores in wind-driven rain. Over longer distances, it occurs as tuber infections, the potential of which have been recognised in recent years in the Caribbean, Pacific and West Africa. Survival of the fungus between seasons is not well understood, but sources of infection are likely from weeds, other crops (e.g. citrus and mango), yam tubers and possibly dead vines from the previous season's harvest.

IMPACT

Although *D. alata* is not the most important yam of West Africa, nevertheless, it is popular because of high yield potential, ease of propagation, early vigour and ability to store well. However, yam anthracnose is an economically damaging disease, with epidemics reducing the yield of early, high-quality varieties by up to 80% in West Africa, the Caribbean and the Pacific. Losses of this kind impact food security and also threaten genetic resources. Invariably, surveys have shown that farmers rank yam anthracnose as a limiting factor on production.

DISTRIBUTION

Anthracnose is found wherever *D. alata* is grown in the humid tropics. Across the yam belt of West Africa, the disease is reported from Benin, Cameroon, Cote d'Ivoire, Ghana and Nigeria. In Nigeria, where 75% of the world yam production occurs, the disease is particularly common in the humid forest agroecological zone.

FURTHER READING

Brunt, A.A., Jackson, G.V.H. and Frison, E.A. (eds.) (1989) FAO/IBPGR Technical Guidelines for the Safe Movement of Yam Germplasm.Food and Agriculture Organization of the United Nations, Rome/International Board for Plant Genetic Resources, Rome. (http://ecoport.org/Resources/Refs/IPGRI/yam.pdf).

Amusa NA, Adegbite A.A, Muhammed S, Baiyewu RA (2003) Yam diseases and its management in Nigeria. African Journal of Biotechnology 2(12):497-502. (http://www.ajol.info/index.php/ajb/article/viewFile/14878/58624).

Mathew MA, Winter S, Mignouna HD, Green KR, Asiedu R (2003) Molecular taxonomic, epidemiological and population genetic approaches to understanding yam anthracnose disease. African Journal of Biotechnology 2(12):486-496. (http://www.ajol.info/index.php/ajb/article/view/14877).

Jackson GVH, Newhook FJ, Winch J (revised Wright JG, Peters J (2000). Yam anthracnose. Pest Advisory Leaflet. Secretariat of the Pacific Community, Noumea, New Caledonia. (http://bit.ly/1HwveVr).

[1]http://www.bioversityinternational.org/e-library/publications/detail/yam

Material prepared by Grahame Jackson, November 2014