



Black sigatoka of banana

Mycosphaerella fijiensis



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Brown streaks with yellow areas between; the spots have joined together at the leaf margin causing a blight.

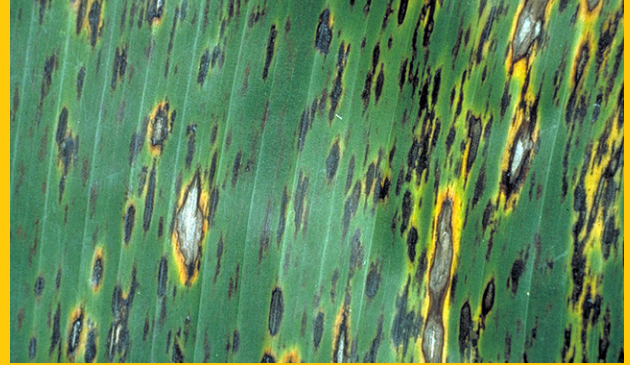


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Close-up of brown elongated spots, most with yellow margins, and some with grey centres.

SUMMARY: Black Sigatoka, caused by the fungus *Mycosphaerella fijiensis*, is a leaf disease of banana and plantain worldwide. Spores are spread in wind and rain, and leaves die rapidly after infection, reducing fruit weight by 30-40% – less for plantains. Management is by using tolerant or resistant varieties. Some plantains are little affected, and resistant dessert and/or cooking varieties with Cavendish characteristics have been bred. Fungicides – protectant and systemic – exist for commercial plantations, but expense, availability and strategies to prevent fungal resistance, complicate their use by smallholders.

KEY SIGNS

The first sign of the disease is red-brown streaks, parallel to the veins, about 1-5 mm long by 0.25 mm wide. They are most noticeable on the underside of the third or fourth youngest leaf, especially along the edge of the leaf blade, which is first exposed as the leaf emerges. The streaks expand and become noticeable on the upper surface, darkening and later developing grey, slightly sunken centres with black margins and bright yellow halos. As the streaks join together they form bands of dead areas several centimetres wide, on either side of the midrib, and the leaves collapse and die.

MANAGEMENT

Prevention – what to do before signs are seen

Cultural approaches: The control of this disease is extremely difficult and is best done through use of tolerant or resistant varieties, and attention to some cultural practices that reduce the length of time that leaves are wet and can be infected by spores.

For planting, choose areas that have good drainage, avoiding those with heavy clay soils where surface water remains for some time after rains. Avoid areas where there is shade from trees. If planting on hillsides, choose sites with morning sun to dry leaves rapidly and always plant so that the rows run in the direction of the prevailing wind, to allow air into the plantation to dry the leaf surface, to prevent infection, or to reduce the number of spores. Planting at wide spacing, about 2.5 m apart (1600 plants to the hectare), will also help.

Use tolerant or resistant varieties. Many plantains are either tolerant or resistant (e.g. Mysore, Saba and Pisang Awak). These are dessert or dessert/cooking bananas with resistance to black Sigatoka. Yangambi Km5, a dessert banana from West Africa, also has black sigatoka resistance. Check whether these varieties are available locally.

Control – what to do after signs are seen

Cultural approaches: Collect infected leaves from the mother plant after harvest of the fruit and take them out of the plantation and burn them.

Chemical approaches: Deleafing and fungicide applications are necessary if Cavendish varieties are grown for the market. Deleafing (the removal of infected leaves) is done before spraying. Remove infected leaves, or parts of leaves. If less than 30% infection, remove only part of the leaf; if more than 40% remove the entire leaf. Take the leaves out of the plantation and burn them.

- Protectant fungicides (these stay on the surface of leaves): mancozeb (in oil or oil/water emulsion) and chlorothalonil (in water) during times when the disease is relatively low.
- Systemic fungicides (these move inside plants): triazoles (e.g. propiconazole, fenbuconazole and tebuconazole) and strobilurins (e.g. azoxystrobin).

It is important to rotate the fungicides in the different groups to prevent the build up of resistant strains of the fungus. No more than two applications of the same systemic fungicide should be made before changing to another group. In drier times, mancozeb can be used alone.

CAUSE

Black Sigatoka is caused by the fungus, *Mycosphaerella fijiensis*. It produces two types of spores: ascospores and conidia. Ascospores are produced when different strains fuse together (a form of sexual reproduction); conidia are produced by all strains without a sexual process. Ascospores are thought to be the most important, discharging from the upper surface of the leaves, infecting the new leaves as they unfurl and spreading the fungus to new areas in wind-driven rain.

Spores are produced in the dead, grey areas on the upper leaf surface. They are released during rains or during periods of high humidity and spread in wind and rain to leaves nearby or even to those in plantations far away. They land on the underside of emerging leaves, infect them and so the cycle begins again.

The fungus is also spread on infected planting material and on old banana leaves.

Another, similar fungus, called yellow Sigatoka (*Mycosphaerella musicola*) also exists. This was the most important leaf disease before black Sigatoka was identified in the 1960s, although it had probably been present in parts of Asia and the Pacific long before. Today, black Sigatoka has replaced yellow Sigatoka in most regions of the world.

IMPACT

Black Sigatoka is the most serious leaf disease of banana and plantains, and is widespread throughout the tropics.

Leaves die early; instead of lasting 200 days as they should, they last only about 50 days. The result is fewer than 5-7 leaves at flowering, the minimum number needed to produce bunches of acceptable weight and quality.

The impact of black Sigatoka on banana production can be measured in different ways depending whether they are grown commercially or principally for household consumption, and whether bananas or plantains are the crop of concern. Estimates will vary in different regions of the world, but generally losses in Cavendish plantations due to black Sigatoka are 30-40% in terms of reduced yield and premature or uneven ripening of the fruit.

To overcome the potential losses, fungicides are applied which amount to about 30% of the costs of production, less if plantains are the commercial crop. Similar figures for smallholder production are hard to come by. However, it is known that worldwide black Sigatoka has caused growers to abandon the crop because they cannot afford fungicides. This in turn has resulted in loss of an important staple food, increased market prices because of reduced supply and loss of genetic resources as growers abandon the crop. The result is a threat to food security, of particular concern in Africa where 50% of the world's plantains are grown.

DISTRIBUTION

East, South and Southeast Asia, East and West Africa, Central and South America, the Caribbean and Pacific islands. It occurs on several islands in the Torres Strait, but not mainland Australia.

FURTHER READING

Black Sigatoka disease management (2012) Plantwise: Factsheets for farmers (ed Phillip Taylor) (<http://www.plantwise.org/FullTextPDF/2013/20137804482.pdf>).

Black Sigatoka. Fact sheet. Plant Health Australia. Queensland Government (<http://www.planthealthaustralia.com.au/wp-content/uploads/2013/01/Black-Sigatoka-FS.pdf>).

Mycosphaerella fijiensis. CABI Crop Protection Compendium. (<http://www.cabi.org.ezproxy.library.uq.edu.au/cpc/datasheetreport?dsid=35278>).

Ploetz, RC (2001) Black Sigatoka of Banana. The Plant Health Instructor. (<https://www.apsnet.org/publications/apsnetfeatures/Pages/blacksigatoka.aspx>).

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