AFRICA soil health consortium

plantwise

Sweet potato virus disease

Sweet potato chlorotic stunt virus & sweet potato feathery mottle virus

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).

SUMMARY: 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.

KEY SIGNS

Infection by sweet potato chlorotic stunt virus (SPCSV) can result in a mild yellowing or reddening of older leaves and stunting, as its name suggests. Infection by sweet potato feathery mottle virus (SPFMV) can result in yellow spots or purple ringspots and, occasionally, feather-like patterns bordering the major leaf veins. On the storage roots, some strains, on certain varieties, cause networks of small cracks in the skin, or longitudinal fissures, in circular bands one or more centimetres wide. Inside, the storage roots may show black spots. These symptoms are known as russet crack and internal cork, respectively.

Often, however, either virus on its own does not produce any symptoms in sweet potato, or the symptoms occur only when plants are under stress and growing slowly; for instance, when there is not enough rain. If growing conditions improve, the rapidly growing vines often appear healthy.

By contrast, when the two viruses occur together in susceptible sweet potatoes they cause SPVD. Infected plants have yellow, narrow leaves, often with deformed edges, and vines are severely stunted. Yields of storage roots are generally low, but it depends when infection occurs; if it is early, storage roots fail to develop.

MANAGEMENT

Prevention – what to do before signs are seen

Cultural approaches: Because of the severity of this disease, unrestricted international movement of sweet potato plants should be avoided. Transfers should only be made as pathogen-tested plants growing as sterile tissue cultures, following the FAO/IBPGR (1989) Technical Guidelines for the Safe Movement of Sweet Potato Germplasm[1].

In Uganda, where the disease is particularly severe, varieties occur with resistance to SPVD. These include New Kawogo, Nderera and Munyeera. These are rarely affected by the disease, although yields are poor in comparison to the potential yields of susceptible varieties. New Kawogo is particularly popular because of its tolerance to SPVD. Varieties with moderate field resistance from the Namulonge breeding programme are NASPOT 1 to 6, released in 1999, and NASPOT 11, released in 2010, with improved resistance to SPVD. Check to see if these varieties are available locally.

Farmers should be encouraged to use these varieties, not only for their tolerance to disease, but also because growing

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

large amounts will reduce infection of susceptible varieties if grown nearby. However, in the absence of SPVD, they are lower yielding than susceptible varieties.

Farmers should also be encouraged to grow tip cuttings in nurseries, for later planting in the field after checking for the disease, rather than taking cuttings from the last crop, which may have unseen SPVD infections. After harvest, collect vines and burn, bury or compost them. Do not allow discarded storage roots to sprout; collect and feed to livestock or bury them.

Control – what to do after signs are seen

Cultural approaches: During crop growth, remove plants with SPVD, especially during the first month after planting. The early removal of infected plants can significantly reduce the likelihood of the remaining crop developing the disease. In addition, new plantings should be at least 15 metres away from existing plantings where diseased plants might be present; this gap will stop the whiteflies (which transmit SPCSV but do not travel far from their host plant) from spreading the virus to new plants.

CAUSE

Sweet potato virus disease (SPVD) is caused by two different viruses infecting plants at the same time. On their own these viruses do relatively little damage. Although SPVD was first reported in the scientific literature in the 1940s, it was not until 30 years later that the cause was known.

The two viruses involved, SPCSV and SPFMV, belong to different virus groups. Both exist as different strains in East Africa, and there are also differences between East African strains and those elsewhere. As a result of these differences, varieties resistant to SPVD in West Africa became severely diseased when grown in Uganda.

Severe SPVD symptoms occur because the presence of SPCSV allows SPFMV to reach much higher concentrations (up to 600 times) than if it were alone. Symptoms may become even worse if a third virus infects the plants: there are over 30 different types of virus that infect sweet potato.

Spread of SPCSV and SPFMV occurs in three ways. First, they are spread between plants by insects: SPCSV by the whitefly *Bemisia tabaci* and SPFMV by aphids. The viruses are picked up as the insects feed on plant sap. Once aphids have the virus in their mouthparts, they can then infect healthy plants immediately, but this ability to infect is lost quickly. By contrast, whiteflies take a few hours before they are ready to spread SPCSV, but they can continue to infect for a few hours. Secondly, the viruses are spread in cuttings used for planting. Thirdly, the viruses are spread in storage roots sent to markets; buyers often take the roots and grow sprouts from them for planting; this is a way of introducing a new variety of virus. Survival of the viruses between crops or cropping seasons occurs in vines left in the field after harvest, in storage roots discarded in the field or kept as a source of planting material, or in wild *Ipomoea* species such as morning glory.

IMPACT

SPVD is the most serious disease of sweet potato in Africa and perhaps the world. It is particularly severe in East Africa, with losses of 50-90% in the yield of susceptible plants. However, because of the disease, farmers now mostly plant resistant varieties, and in most districts of Uganda and Kenya virus symptoms only occur in 10-20% of plants, with about a fifth to a third of those infected with both SPFMV and SPCSV. Therefore, the real impact of the disease may not be a direct loss due to SPVD, but an indirect one because farmers are forced to grow low-yielding varieties that are resistant to SPVD.

DISTRIBUTION

The disease occurs throughout sub-Saharan Africa; it is particularly common in the Great Lakes region. Both SPCSV and SPFMV occur worldwide in all the sweet potato regions of Asia, North and South America and Oceania.

FURTHER READING

Clark CA, Davis JA, Abad JA, Cuellar WJ, Fuentes S, Kreuze JF, Gibson RW, Mukasa SB, Tugume AK, Tairo FD, Valkonen JPT (2012) Sweet potato viruses: 15 years of progress on understanding and managing complex diseases. Plant Disease 96(2):168-185. (http://apsjournals.apsnet.org/doi/pdfplus/10.1094/PDIS-07-11-0550).

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