



Yam mosaic disease

Yam mosaic potyvirus



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Plant with yam mosaic disease, showing narrow yellow leaves.



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Yellow and green patterns, distorted margin, and backward curling of a leaf infected with yam mosaic virus.

SUMMARY: There are at least four viruses infecting edible yams in West Africa, of which yam mosaic virus is the most important in distribution, incidence and effect on plant growth. Infected plants show mosaics, distortions and, in severe cases, strap-like leaves, poor growth and smaller tubers than those from healthy plants. Spread is by tubers used for propagation and also by aphids. The most important management techniques are use of new varieties from breeding programmes, controlling weeds and on-farm selection of healthy plants as 'seed'.

KEY SIGNS

Yam mosaic virus is the most important virus of yams infecting all the edible species, including the *Dioscorea cayenensis-rotundata* complex, *D. alata*, *D. esculenta* and *D. trifida*.

A variety of symptoms are produced depending on the species and variety. Commonly, plants show yellow and green patterns, called mosaics; these are mostly between the veins or in narrow green strips bordering them, in which case the symptom is called vein-banding. In more severe cases the foliage shows shoe-string symptoms, so called because the leaves are long, thin and strap-shaped, and the plants may also be stunted.

A common feature of the disease is the apparent recovery of some plants soon after infection when symptoms disappear. The virus is, however, still living in the plants; those infected may be slower to sprout and show poor vigour.

MANAGEMENT

Prevention – what to do before signs are seen

Cultural approaches: As there is evidence of different strains of yam mosaic virus, and the unrestricted movement of varieties of yam from one country to another could spread them, transfers of yams 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 Yam Germplasm*¹. There are ELISA-based methods for detection of the virus as well as PCR methods using specific primers.

No varieties of either *D. cayenensis-rotundata* or *D. alata* are known to be resistant, but varieties have been bred or selected at the International Institute of Tropical Agriculture, Ibadan, Nigeria, from the world's germplasm for good performance: these should be sought for testing in areas where viruses are of concern.

Growers can also make selections on farm. Yams for propagation should be from the healthiest plants, invariably those that produced the largest tubers. 'Seed' yam producers should always choose tubers this way, perhaps using the mini-sett technology to accelerate multiplication.

¹ <http://www.biodiversityinternational.org/e-library/publications/detail/yam/>

Control – what to do after signs are seen

Cultural approaches: Weeds should be kept to a minimum, as many species are hosts to aphids. Aphid populations build up on weeds and then the insects migrate, probing plants as they go for suitability as new hosts. Although the aphids may not remain on the yams, they can still spread the virus as they travel through the crop.

After harvest, all plant debris should be collected and destroyed. This includes undersized tubers, which should be eaten rather than kept for planting.

Chemical approaches: Chemical control is not appropriate for the management of this disease. Insecticides can kill the aphids that spread the virus, but that does not necessarily prevent virus infection. This is because the time between an aphid sucking up the virus when it feeds on a diseased plant, and spreading the virus as it feeds again on a healthy plant is short; by the time the insecticide has killed the aphid it has already spread the virus.

CAUSE

The virus was first isolated and characterised from *Dioscorea cayenensis* from Ivory Coast in 1979: from serological, molecular and epidemiological analysis it is now known to be a genetically diverse potyvirus. Several aphids spread the virus, including *Aphis fabae*, *A. craccivora*, *Rhopalosiphum maidis*, *Toxoptera citricidus*, *Myzuspersicae* and *A. gossypii*; however, the relative importance of each of these species is unknown. Spread by aphids is done in a non-persistent way; this means that they acquire the virus on their mouth parts after a short feed on an infected plant (less than a minute), infect a healthy plant after another short feed, but then lose the ability to infect.

Spread of the virus by aphids is important, but so too is spread by vegetative propagation. The virus passes from the planting sett to the developing plant and then to its tubers. Farmers may inadvertently help in the process by eating or selling the largest tubers and saving the smallest for 'seed' for next season's crop: the smallest may have not grown well because of virus.

IMPACT

Yam production is adversely affected by virus diseases. Infection reduces the number and size of tubers and also their starch content. Tests have shown that a 40% loss of yield is possible in susceptible varieties. Apart from affecting the growth of plants, the virus also restricts the international movement of germplasm.

The virus rarely occurs alone and is often associated with, for example, *yam mild mosaic virus*, *yam badnaviruses* and *cucumber mosaic virus*. All four viruses occur in Nigeria, Ghana, Benin and Togo; tests have shown that 100% of tubers and nearly 70% of leaves contained at least one of the four viruses and 30% of the tubers had mixed infections. The importance of *yam mosaic virus* among the four is supported by surveys in the Guinea savannah of Nigeria that found the virus to be more widespread than the others, occurred in more mixed infections and more often in *D. cayenensis-rotundata*, the most important species.

DISTRIBUTION

The virus spreads in *D. cayenensis-rotundata* and *D. esculenta* throughout West Africa – Nigeria, Benin, Ghana, Ivory Coast, Benin and Burkina Faso – and is occasionally found in *D. alata* in Nigeria. It is also reported from Guyana in South America and Jamaica, Barbados, Guadeloupe and Puerto Rico in the Caribbean. The report of the virus in the South Pacific needs confirmation.

FURTHER READING

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