Dry rot of yam

Scutellonema bradys

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Damage by the nematode Scutellonema bradys *on white yam tubers.*

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Dry rot beneath the skin of white yam tubers.

SUMMARY: Dry rot, common to all food yams, is caused by the microscopic nematode *Scutellonema bradys*. It attacks tubers in the field and in storage resulting in loss of edible parts, lower quality and reduced market value. Tuber infections are important for the survival and spread of the nematode. Management is by using nematode-free setts (achieved by carefully inspecting planting material or treating with hot water to kill the nematodes), by reducing soil populations using legume fallows or rotating yams with crops resistant to attack, and by removal of crop debris.

KEY SIGNS

The nematode causing dry rot of yam has a wide host range, infesting all edible and wild yam species, and many other crops including some legumes (e.g. cowpea), cereals, vegetables and weeds.

The feeding of the nematodes produces cavities. These become darker as the rot progresses, normally to a depth of less than 2 cm. Externally, cracks appear in the skin, which becomes crinkly, and parts flake off revealing the dark rot beneath. Rots continue in storage and can lead to complete decay of the tuber as other rot-causing organisms take over. There are no above ground symptoms.

Sometimes external symptoms are not obvious on the tubers. Extensive rots can develop without cracking and flaking of the skin, and are only seen when the skin is scraped away.

MANAGEMENT

Prevention – what to do before signs are seen

Cultural approaches: As there is evidence of different strains of *S. bradys* and the unrestricted movement of varieties of yam from one country to another could spread them, 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 Yam Germplasm*[1].

No varieties of either *D. cayenensis/rotundata* or *D. alata* are known to be resistant. The main methods of controlling dry rot are by cultural methods, the most important of which is the use of clean, nematode-free planting material.

Before planting, carefully check each planting piece for dry rot symptoms by scraping away the skin; it is easier to check if tuber cuttings or mini-setts are used rather than whole tubers. Wiping the knife used to cut the setts with a cloth containing bleach is recommended, especially if the knife has cut infested tubers.

Coating the setts in wood ash is a traditional method that should be followed, even though it will not significantly reduce nematode numbers, although it may add beneficial potassium. But be careful with fertilizer applications. Adding cow dung

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

into the mound reduces nematode populations, as do applications of NPK fertilizer and phosphorus alone, but nitrogen alone increases populations.

Ideally, plant yams after a fallow period, although this is often difficult as pressure on land is intense and increasing; nor is it always obvious to farmers what crops to use as *Scutellonema* has a wide host range. However, restorative fallows using legume cover crops reduce nematode populations and the following are recommended: *Aeschynomene histrix, Puerariaphas eoloides, Mucuna puriens* and *Centrosema* spp.

Crops that should be avoided prior to planting yams or as yam intercrops are cowpea, sesame, green gram, pigeon pea, kenaf, okra, tomato and melon. Preference should be given to maize, groundnut, chilli, Indian spinach or sorghum.

Weeds should be kept to a minimum, especially those that are hosts of yam nematode, e.g. *Eupatorium, Synedrella* and *Chromolaena*.

After harvest, all undersized and rotten tubers should be collected and buried deeply or burnt.

Chemical approaches: Chemical control is not appropriate for the control of this disease as most nematicides are dangerous to use without training. They are also expensive and mostly unavailable to smallholders. By contrast, hot water treatment is inexpensive and beneficial. Yams should be immersed in water at 51°C for 10 minutes. As a thermometer is needed to ensure the water is kept at the required temperature, this may not be a viable method for smallholders unless they are trained. If used, farmers should test it on a few setts first, as a method to produce nematode-free setts for the next season's crop. Treatment should be applied near the end of dormancy but before shoots develop, not immediately after harvest.

CAUSE

Dry rot disease is caused by *Scutellonema bradys*. Morphological and molecular characteristics of the nematode differ across the West African yam belt, and there are also differences in pathogenicity. Samples from Benin showed the greatest variability.

Nematodes enter the developing yam tubers at the growing point, at places on the tubers where the shoots and roots emerge and also through cracks and damaged areas in the skin. They inject a hollow needle-like mouthpart, called a spear, into cells of the tuber and feed on their contents. Both males and females live in the tubers and soil around them; eggs are laid and the young develop into adults after several moults.

Spread of *Scutellonema* over short distance is in water within and above ground, and in soil on tools and shoes. However, the main method of spread over long distances is in setts used for planting. Survival of the nematode occurs on the roots of other crops and weeds, and in stored tubers.

IMPACT

Scutellonema causes four main problems on yams: (i) a reduction in the weight of diseased tubers, up to 30% less than healthy ones at harvest; this is due to moisture loss, and is worse in late harvested tubers in dry soil; (ii) lower quality tubers with reduced market value; (iii) a loss of edible portions, which increases the longer the yams are stored; and (iv) a loss of planting material. Long-term losses are estimated to be 50%; when wet rots in storage follow dry rots, losses can be 80-100%.

DISTRIBUTION

Although of African origin, *S. bradys* is now present on several continents. It has restricted distribution in Asia, Central, North and South America, but is widely distributed in the Caribbean. In Africa, it is present in Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Gambia, Ghana, Mali, Nigeria, Senegal, Sudan and Togo.

S. bradys is common in West Africa. Surveys sampling tubers in markets across the yam belt have shown that highest populations occur in D. rotundata in the mid-altitude savannah, followed by the southern Guinea savannah. In Nigeria, these surveys have shown that approximately half the tubers at markets are infested with the nematode.

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).

Scutellonema bradys. CABI Crop Protection Compendium. (http://www.cabi.org.ezproxy.library.uq.edu.au/cpc/datasheetreport?dsid=49315).

Yam nematode (Scutellonema bradys).Plantwise Technical Factsheet. (http://www.plantwise.org/knowledgebank/datasheet.aspx?dsid=49315).

Bridge J, Coyne DL, Kwoseh CK (2005) Nematode parasites in tropical root and tuber crops (excluding potatoes). In: Luc M, Silora RA, Bridge J (eds) Plant parasitic nematodes in subtropical and tropical agriculture (second edition). CABI Publishing, Wallingford, UK, pp 221-258. (http://bit.ly/1LX3XvF).

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