PEST ADVISORY LEAFLET NO. 12

Plant Protection Service
Secretariat of the Pacific Community

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Yam Anthracnose

Yam dieback, or anthracnose, is caused by the fungus *Colletotrichum gloeosporioides*. It is probably present in all the countries of the region and is often a major problem where yams *(Dioscorea* spp.) are grown intensively. However, water yam *(D. alata)* is thought to be more susceptible to anthracnose than other yams.

In some countries, yam dieback is thought to be caused by lightning. This is because after heavy rain, the disease on some varieties increases rapidly from occasional leaf spots to extensive blackening of leaves and stems, and plants may die.

SYMPTOMS

Above-ground symptoms

Symptoms vary according to the age of the leaf, the amount of rain and the variety of yam. Mild infection leads to very small brown spots on young leaves. These spots become larger as the leaves approach full size, and they may develop pale yellow margins (Figure 1). Sometimes the leaf spots run together to form large irregular blotches, the centres of which may fallout giving a 'shothole' effect. Infected leaves usually fall off. In some varieties, the veins on the underside of the leaf become black where they have been infected. If this occurs as the leaves are expanding, they may become cup-shaped and twisted. The 'wings' on the stems may also become infected.

Long periods of rain favour epidemics of the disease because the fungal spores (conidia) are spread by rain-splash. Young foliage is more susceptible to anthracnose. Therefore, if periods of high rainfall coincide with the stage in crop development where a lot of young leaves are present, the disease can quickly spread throughout the crop. In this case, rapidly expanding black lesions occur on the leaves and stems and the shoots die (Figure 2). This is particularly common when vines have reached the tops of their supporting poles, and the new growth droops near to older infected parts of the plant. Mature leaves, by contrast, develop numerous, brown, pin-point spots which do not usually expand nor penetrate to the other side of the leaf. Both large and pin-point spots can occur on the same leaf (Figure 1).

Figure 1: Yam Anthracnose lesions

Large numbers of spores on mature leaves of some varieties leads to a superficial blackening of the leaf surface. Occasionally, when a leaf has been disturbed from its normal orientation to expose the whole or part of its lower surface, the exposed part of that surface becomes blackened or bronzed instead of the upper surface (Figure 3).

Stems may develop similar symptoms of superficial but intense blackening.

Figure 2 : Rapidly expanding black lesions occur on leaves and stems and shoots die.

Below-ground symptoms and affect of disease on yield

When dieback occurs on young plants, a few of the lower leaves may survive, but usually the whole vine dies resulting in no, or poor, yields. New shoots sometimes grow from the planting piece and plants become multi-stemmed in contrast to uninfected plants which usually only have one or two sterns. Because each stem produces a tuber, affected plants may have several small tubers instead of the normal one or two (Figure 4).

Tuber symptoms in storage

In the Caribbean, the fungus causes orange-brown tuber rots known as 'dead skin'. The rots develop in the flesh of the tuber just under the corky layer or skin. Small blisters occur on the surface of the yam and the skin is easily removed from the layer beneath. Later, deeper rots develop, and eventually all that is left is a wrinkled shell surrounding a rotting core. It is not yet known if these rots occur in Pacific countries. It is likely that they do, but they may have been mistaken for rots caused by the nematode, *Pratylenchus coffeae.*

INFECTION AND SPREAD

Although the pathogen is not able to survive in soil for more than a few weeks, it is able to survive between growing seasons on crop debris. Therefore, survival from one season to the next may occur, but is unlikely to be important where growers practise crop rotation and plough-in crop debris. The fungus, *Colletotrichum gloeosporioides,* infects many crops and weeds. It is possible that spores from these plants also affect the yam crop.

If tuber rots occur in the Pacific as they do in the Caribbean, then infected planting material is likely to be the most important way that new crops become diseased. Small immature tubers (Figure 4), derived from early shoot death, may be a major source of infection of the shoots as they develop.

Once infection is established in a crop, subsequent development of yam anthracnose depends on rainfall and host variety. Severe outbreaks develop on susceptible varieties following rainstorms or cyclones. Spores are formed in large numbers on the leaf spots and are splashed in rain and or carried by dripping dew to adjacent and lower leaves and stems.

CONTROL

The two most important disease management strategies are to grow resistant varieties and to ensure that planting setts are pathogen-free.

Figure 3 : Exposed underside of leaf blacked by anthracnose.

Cultural methods

Cultural control measures such as the removal of weeds that may be alternative hosts, planting barrier crops of maize, avoiding damage to tubers at harvest, early staking, crop rotation, and ploughing-in plant residues immediately after harvest are likely to reduce disease development.

Resistant varieties

Varieties differ in their resistance to the disease. Some are highly resistant at all stages of growth. Others show good resistance only when leaves are mature and a full leaf canopy has formed. In some resistant varieties, infection does not occur until late in the life of the crop. In these, there may be dieback of young shoots, leaf curling with or without discolouration of veins on lower surfaces and infections of leaf stalks causing otherwise healthy mature leaves to fall off. Growers should be encouraged to select tubers from plants showing resistance and to use only these for propagation and increase of stock.

Resistant varieties have also been found in the Caribbean, e.g. Kinabayo, Plimbite, Belep and Oriental. These varieties are being introduced into Pacific islands through regional tissue culture laboratories to ensure they are free from virus (see quarantine below).

Preparation of planting setts

Tubers should be selected from uninfected plants and stored in a cool dry place during dormancy. Setts should be carefully inspected and any showing areas of rot rejected. The setts should be treated with a broad- spectrum fungicide to eliminate surface-borne fungi and cutting knives should be treated frequently with bleach.

Time of planting

Time of planting is important and should be planned so that plants reach maximum height on supporting poles before the main rainy season. Early planting cannot be used to avoid the disease entirely, but only to delay the onset of severe damage to the foliage.

Chemical control

Chemical control is difficult and costs are high. Weekly benomyl treatments alternating with applications of copper, dithiocarbamates or daconil have been tested. Resistance to benomyl is reported. Fungicides can delay the onset of epidemics, but cannot prevent them developing during the rainy season. If foliar sprays are used they should be applied before symptoms of anthracnose appear in the crop, and weekly during the growing season.

QUARANTINE PRECAUTIONS

The global distribution of yams is an important element of international crop improvement programmes. However, the movement of yam from one country to another can spread new and potentially devastating diseases. Introduction of new yam germplasm should be limited to small quantities for scientific purposes under the supervision of quarantine officials. Preferably, the material should be transferred as sterile, pathogen-tested plantlets growing on tissue culture medium (FAO/IPGRI, 1989). It is important that the plantlets have been tested to ensure that they are pathogen-free. This is done by growing the material in the country of origin or intermediate quarantine station for one crop cycle. Only plants that show no signs of virus (or other pathogen) infection should be released.

REFERENCE

PAO/IPPGR. 1989. *Safe Movement of Yam Germplasm: Food & Agriculture Organisation and International Board for Plant Genetic Resources Technical Guidelines.* (Eds. AA Brunt, GVH Jackson and EA Prison) pp 19.

Figure 4 : Small tubers produced by yam anthracnose infected plants

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