

SOUTH PACIFIC COMMISSION

SWEET POTATO LITTLE LEAF

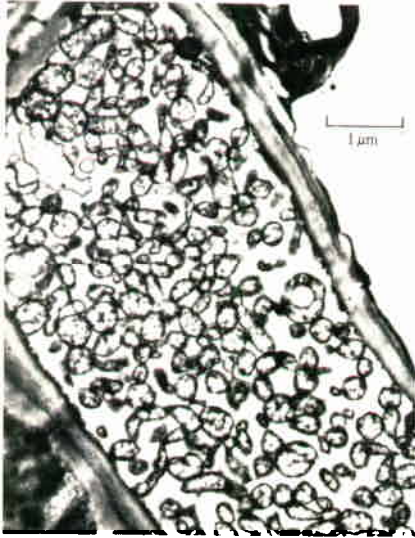


Left: *The sweet potato black-spotted leafhopper, Orosius lotophagorum ryukyuensis (x13).*



Right: *Sweet potato plants—little leaf infected (left) and uninfected (right).*

LITTLE LEAF or WITCHES' BROOM DISEASE of sweet potato was once thought to be caused by a virus, but now mycoplasma-like organisms (MLO) have been found in diseased plants (Fig. 1). The disease was first reported



Above—Fig. 1: *Mycoplasma-like organisms inside the cells of a sweet potato plant with little leaf disease.*

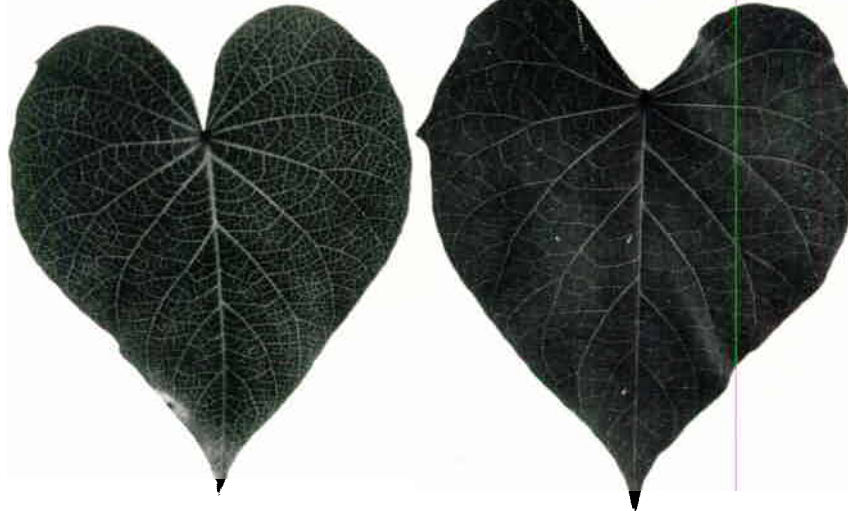
from the Ryukyu Islands of Japan in 1951. It also occurs in Taiwan and Korea and within the South Pacific Commission region is present in New Caledonia, Niue, Papua New Guinea, Republic of Palau, Solomon Islands, Tonga and Vanuatu.

In Papua New Guinea and Solomon Islands severe outbreaks of the disease occur in areas with low rainfall and a distinct dry season.

SYMPTOMS

The first sign of the disease is yellowing of the veins (vein clearing) on leaves which are otherwise normal in appearance (Fig. 2). Progressively smaller leaves are formed until they are about an eighth the size of those that are healthy. They are chlorotic, occasionally rolled upwards at the margins, puckered and in some cultivars more rounded than normal. The

Below—Fig. 2: *A sweet potato leaf with vein clearing (left) and a healthy leaf (right) (x1).*



vein clearing symptom is often less obvious on these severely dwarfed leaves. Diseased stems are short, conspicuously erect and multibranched due to the development of normally dormant axillary buds. This gives the plants a bushy appearance, which is further increased by a gradual shortening of the distance between the leaves, along the main stem, until it is 1 cm or less (see front cover).

Severely affected plants often become smothered by more vigorous, healthy plants, shed their leaves and die. Even when plants survive until harvest, only pencil-thin tubers are found amid a mass of short, thin, extensively branched roots.

INFECTION AND SPREAD

Insect transmission

The sweet potato black-spotted leafhopper, *Orosius lotophagorum ryukyuensis*, spreads the disease in Solomon Islands (see front cover). A similar leafhopper, *Nesophrosyne (Orosius) ryukyuensis*, spreads the disease in Japan. The leafhoppers suck in the MLO when they feed on the sap of diseased plants. But only after about 20 days are they able to transmit the MLO to healthy plants. Once infected, the insects remain so for life. Winged forms of the leafhopper migrate and are capable of spreading the MLO to new areas. Leafhopper eggs, laid in the sweet potato stems, do not carry MLO.

In Solomon Islands the leafhopper has been found only on the Guadalcanal Plains where there is a relatively long annual dry season which favours high insect populations. Because of this, disease is common.

Spread with planting material

Sweet potato plants may be infected by MLO even though they appear to be healthy. This is because there is a long time (50–100 days) between infection of plants and the development of symptoms of little leaf disease. The use of cuttings from such plants (which are said to have latent infections) as propagating material is probably the most important way the disease is spread, especially over long distances. Eggs present in the stems may hatch to establish a leafhopper population. After feeding on the infected planting material, these leafhoppers can then spread the disease in the new area.

EFFECT OF THE DISEASE

The effect of the disease on the yield of sweet potato is not easy to estimate. It depends on the time when plants become infected, the planting density (it is usual for planting points to contain a minimum of three cuttings), and the percentage of plants infected. For instance, the yield of plants that develop the vein clearing symptom near to maturity is probably not affected. In contrast, plants that are infected at the time of planting and develop symptoms early, may not produce any tubers. On the Guadalcanal Plains in Solomon Islands tuber yields were reduced by 32 per cent, 45 per cent and 95 per cent in planting points with three cuttings which contained at harvest one, two or three plants with little leaf disease respectively, compared to those with three healthy plants. In Papua New Guinea there are instances of 50 per cent yield losses when the disease reduces the

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- Banana bunchy top virus** (SPC Advisory Leaflet 2, 1977)
- Taro leaf blight** (SPC Advisory Leaflet 3, 1977)
- Coconut palm rhinoceros beetle** (SPC Advisory Leaflet 4, 1977)
- Banana burrowing nematode** (SPC Advisory Leaflet 5, 1977)
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- Queensland fruit fly** (SPC Advisory Leaflet 18, 1983)

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area covered by healthy foliage by 20 per cent.

It is common to find sweet potato crops with at least 25 per cent infection and in the dry season, between May and November, when leafhopper populations are at their highest, entire plantings become diseased. This causes the failure of the crops and a loss of propagating material for future plantings.

CONTROL

Exclusion of MLO-infected plants

Little leaf disease, because of its restricted distribution in the South Pacific Commission region, is a major quarantine hazard for countries where it is not present and where sweet potato is an important crop. In these countries the introduction of untreated vegetative propagating material should be avoided. Any transfers of material from countries where the disease is present should be as true seed or as plants which have been shoot-tip cultured and certified free of MLO.

Even in Papua New Guinea and Solomon Islands, where little leaf is confirmed, it may be worthwhile restricting the movement of planting material because the disease is not widespread in these countries. In Solomon Islands it most frequently occurs on the Guadalcanal Plains, and in Papua New Guinea it is a major problem only in the Central Province. In both countries the disease has spread to new localities by the introduction of planting material (vines and tubers) from these areas. Outbreaks of the disease have so far been eradicated in these new localities by destruction of the affected plants.

Destruction of diseased plants

The removal of diseased plants (roguing) offers a reliable and economical method of controlling little leaf disease. It is most important that the roguing is done often, so that plants are removed at the first sign of symptoms. This reduces the chance of them being sources of infection. The rogued plants should be taken out of the sweet potato field and burned.

Selection of planting material

Careful selection of planting material by growers to make sure that it is free of disease is an important practical control measure. Cuttings should be taken from plantings with the lowest incidence of disease, and from those that have been regularly rogued.

In times of exceptionally high incidence of disease there may not be disease-free stock available. Schemes to provide growers with healthy planting materials, of the popular cultivars, are now thought to be necessary in the localities in both Papua New Guinea and Solomon Islands where the disease is always present.

Alternative hosts

Several wild species of *Ipomoea* (Morning Glory) are hosts of the MLO. Diseased plants occur in areas where little leaf of sweet potato is common but also in the regions of high rainfall where the disease is rare or absent. It is not likely that these alternative hosts of the MLO are important in the spread of the disease to sweet potato. They should only be rogued in the areas where the disease in sweet potato is severe and near to nurseries where certified healthy stocks of sweet potato are maintained.

Chemical control

The use of insecticides to control little leaf disease has not been investigated as in most places sweet potato is grown at the subsistence level and growers can rarely afford the costs of the chemicals. But insecticides could be of use in sweet potato nurseries to maintain certified healthy stock free of leafhoppers. In this situation any of the following are likely to give good control: malathion 50 per cent e.c. (2 ml/l); acephate 75 per cent s.p. (0.75 gm/l); dimethoate 30 per cent e.c. (3 ml/l); carbaryl 80 per cent w.p. (3 gm/l). For chemical control to be effective it must be combined with intensive roguing of diseased plants.

Resistant cultivars

This aspect of control has been investigated both in Taiwan (Asian Vegetable Research and Development Center) and Solomon Islands, but with disap-

pointing results. In Taiwan one (PI-344129) of 365 cultivars was found to be immune to the disease, and in Solomon Islands one cultivar from 220 tested had moderate resistance. The immune Taiwan cultivar was susceptible to little leaf when tested in Solomon Islands.

LEGUME LITTLE LEAF DISEASE

Legume little leaf is another disease caused by a mycoplasma-like organism, but it is unrelated to sweet potato little leaf disease, and it is spread by a different leafhopper, *Orosius argentatus*. A large number of legume species are hosts of the disease, as well as members of other plant families, but not sweet potato. On the Guadalcanal Plains it is common to find plants of the long bean, *Vigna sesquipedalis*, and the common weeds, *Emilia sonchifolia* and *Vernonia cineria*, infected with legume little leaf disease within plantings of diseased sweet potato. □