Advisory Leaflet 8
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SOUTH PACIFIC COMMISSION

ALOMAE AND BOBONE DISEASES OF TARO

Left: Alomae symptom in the "male" taro caused by infection with small and large bacilliform virus.

Right: Bobone symptom in the "female" taro caused by infection with the large bacilliform virus.

ALOMAE AND BOBONE are diseases of taro caused by viruses. They are extremely serious but so far have only been reported from Solomon Islands and Papua New Guinea. It is likely that the diseases have been present in these countries for many years.

THE DISEASES, CULTIVAR DIFFERENCES AND VIRUS PARTICLES

Cultivars differ in their susceptibility to alomae and bobone. Taro in Solomon Islands are classified by growers according to their reaction to these diseases and also to size. Small taro ("female", 28 chromosomes) are susceptible to bobone whereas larger taro ("male", 42 chromosomes) are susceptible to a mild bobone attack and also to alomae (see back cover).

Two kinds of virus particles are associated with these diseases: both are bacilliform but one is larger than the other. Bobone results from infection by the large particle whereas alomae occurs when both particles are present. Distinctive symptoms also occur in "male" taro infected with the large particle and in both "male" and "female" taro infected by the small particle alone.

SYMPTOMS

Bobone (of "female" taro)

The petiole of the first affected leaf is shorter than normal with irregularly shaped outgrowth (enations or galls) especially at the base. The leaf-blade hangs downward, is thick, extremely puckered and the veins are enlarged; these too have enations. The next leaves to appear are more grossly deformed: petioles are very short (20-30 cm) and the distorted leaf-blades remain rolled and twisted. Leaves are brittle. Usually 4-7 leaves are affected before gradual recovery occurs beginning 5-8 weeks after the first appearance of symptoms. The recovery of plants and the fact that leaves remain green are two important symptoms of this disease.

Fig. 1: *Symptom caused by infection with the large bacilliform virus in the "male" taro.*

Alomae (of "male" taro)

Initial symptoms of plants with alomae infection are often similar to those with bobone. Petioles are short, enations are present and the contorted leaf-blade is green. Leaves formed subsequently, however, are invariably chlorotic with a conspicuous or sometimes indistinct chlorosis of the minor veins.

The main veins are often enlarged. These leaves are small, remain rolled and are slightly twisted. Leaf production then ceases and the plant rots and dies. Suckers are likewise affected in a similar manner.

Large particle symptom (of "male" taro)

Just as "female" taro are infected by the large particle (bobone symptom) so too are "male" taro. But symptoms are relatively mild. Usually only 2-3 leaves are affected. Petioles are only slightly shorter than normal although enations may be present. Dark green areas which are thickened and distorted occur on the leaf-blade, but these are not extensive (**Fig. 1**). Leaves are sometimes cupped but never severely rolled or twisted.

Small particle symptoms (of "male" and "female" taro)

Symptoms appear soon after planting. The minor veins become chlorotic but in contrast to alomae the chlorosis is most pronounced near the leaf margin and the interveinal tissue remains green (**Fig. 2**). The leaf-blade is slightly curled downwards at the margins but leaves are never puckered, thickened or twisted as occurs with large particle infection. Plants are stunted but eventually recover. Older, established plants show a more severe symptom: leaves are small, narrow, often extremely chlorotic with torn margins and petioles are short (**Fig. 3**). Sometimes, petioles develop without leaf-blades. Plants rarely die and usually slowly recover.

Taro infected with the small particle have been found in Fiji, the New Hebrides, Western Samoa, as well as Solomon Islands and Papua New Guinea.

INFECTION AND SPREAD

Insect transmission

The large virus particle present in plants with bobone and alomae is spread by the planthopper *Tarophagus proserpina*, which feeds exclusively on taro, and the small particle by the mealybug *Planoccoccus citri*. There is evidence that *Tarophagus* may transmit both particles simultaneously. New taro plantings become infected by long-winged forms of the planthopper which have migrated from infected gardens. The virus is acquired within 24-48 hours when *Tarophagus* feeds on a diseased plant. The insect then becomes infective 15-18 days later and remains so for life.

Our knowledge of infection and spread of the small particle by mealybugs is incomplete. It has been shown in laboratory tests that they only occasionally transmit the virus. This and the fact that mealybugs are seldom found on taro plants when alomae is epidemic may indicate that they do not play a major role in the transfer of the small particle at these times.

Spread with planting material

Although plants infected with either large or small particles recover to produce symptomless leaves, the viruses

Fig. 2: *Veinal chlorosis caused by infection of young plant with small bacilliform virus.*

may still be present in the parent plant and also in the suckers. When this occurs the virus is said to be latent. Multiplication of the virus with reappearance of symptoms is often triggered when these taro are replanted. This is perhaps the most frequent way that the diseases are spread to new areas, for there is no indication that virus particles are present from inspection of the planting material.

Spread with corms used as propagating material

In the same way that leaves can appear healthy yet contain virus particles so too can corms. When infected corms are planted diseased shoots develop.

EFFECT OF THE DISEASES

Plants that develop bobone symptoms during the first two months of growth yield 25 per cent less than those disease-free. The effect on yield from small particle infection is not known, except on the island of Santa Isabel in Solomon Islands where plants die from infection. Losses from alomae can be total and in areas of the Solomons where this disease is endemic taro cultivation is slowly being abandoned.

CONTROL

Destruction of diseased plants

For both bobone and alomae, removing (roguing) infected plants can give good control provided it is done as soon as symptoms appear. Plants should be pulled out and destroyed, preferably burnt or deeply buried. They should never be left in the garden, otherwise the planthoppers will migrate from them to healthy plants and spread the disease. Roguing is especially important during the first two months after planting when

Fig. 3: *Severe chlorosis and leaf deformation in mature plant caused by infection with small bacilliform virus.*

symptoms often appear following multiplication of latent virus. At this time the level of planthoppers is usually low.

Cultural methods

It is most important that new plantings are not situated next to those already infected, otherwise infestations of planthoppers will be too high for roguing to be effective. A reduction in the early population levels of the planthopper can be achieved by removal from the planting material of all except one of the petiole bases; these contain the eggs of *Tarophagus*.

Resistant cultivars

Only the lower yielding "female" taro are immune to alomae. Cultivars from Hawaii, Fiji, the New Hebrides, New

Zealand and the United States were all susceptible to alomae when tested in Solomon Islands. This aspect of control is still under investigation, with the recent introduction of taro from other Pacific territories.

Chemical control

There are no chemicals available that kill the virus in infected plants, but insecticides can be used against the insects that spread the diseases. However, the use of chemicals cannot be recommended because of the high costs involved if taro are grown at the subsistence level. For crops grown commercially Malathion 50% a.i. (2ml/1 water) or preferably a systemic insecticide, for example, Acephate (Orthene 75% S.P., 0.75g/1 water) can be used at intervals of 3-4 weeks, beginning when winged adults are first seen in the crop. To be effective chemical control must be combined with roguing.

Biological control

Cyrtorhinus fulvus, an egg-predator of *Tarophagus*, can be introduced to areas where alomae and bobone are endemic. Although efficient in substantially reducing populations of the planthopper, *Cyrtorhinus* may not give the high degree of control necessary to prevent virus spread.

Alternative hosts

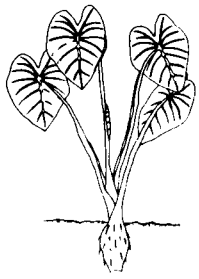
The small particle has been found in *Xanthosoma* in the Cook Islands and in laboratory tests *Philodendron selloum* has been found susceptible to infection by the large particle. Neither plant, however, is thought to be an important reservoir of these particles under field conditions.

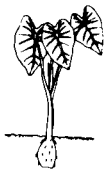
QUARANTINE PRECAUTIONS

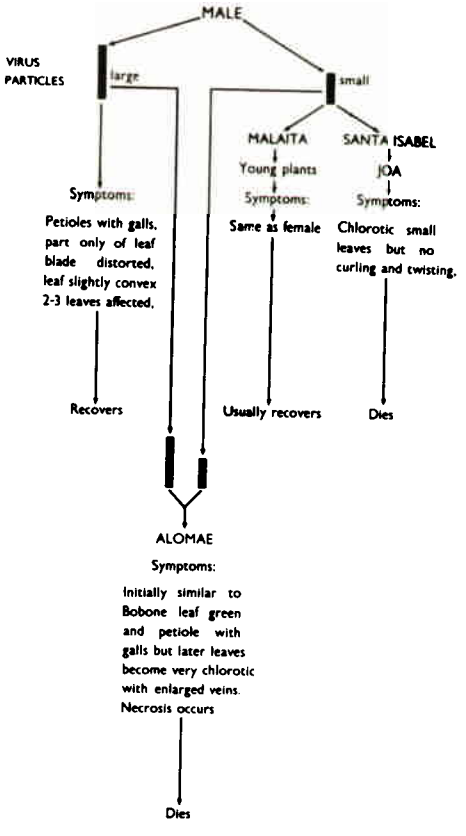
Taro throughout the SPC region has been tested and found extremely susceptible to alomae. To prevent further spread of this disease and bobone, a total ban on the movement of propagating material from Solomon Islands and Papua New Guinea to other countries should be observed. Because of virus and other problems, movement of propagating material between countries should, in any case, be limited to small quantities for scientific purposes under the supervision of specialist officers of the agricultural services.

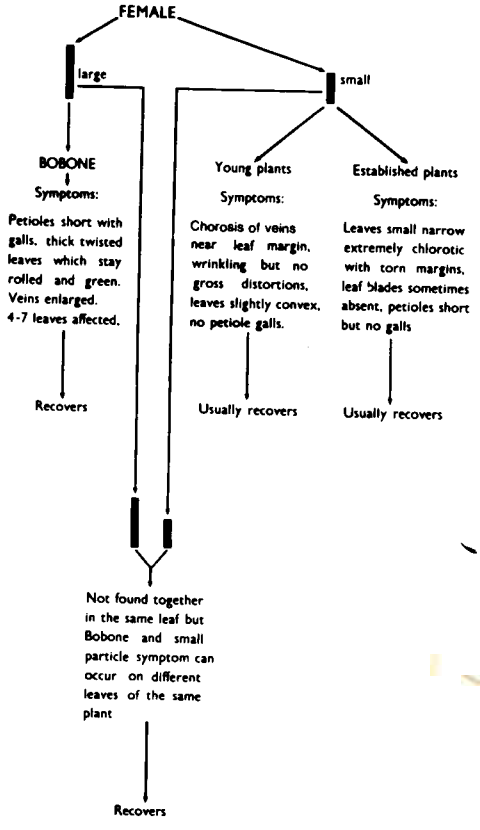
This leaflet was prepared by G. V. H. Jackson, Plant Pathologist, Solomon Islands. Further information can be obtained from the Plant Protection Officer, South Pacific Commission.

Commission publications may be obtained from the **South Pacific Commission, BP D5, Noumea Cedex, New Caledonia.**









THE VIRUS DISEASES OF TARO IN SOLOMON ISLANDS.