Pacific Pests, Pathogens & Weeds - Fact Sheets

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Taro alomae & bobone (001)

Photo 1. First signs of *alomae* on the mother plant and suckers (Malaita, Solomon Islands). Note the stunted, tightly rolled, yellow leaves.

Photo 2. Stunting on the mother plant and suckers probably caused by *alomae* (Madang, Papua New Guinea). In this case the plant has stayed green.

Photo 3. Mother plant and suckers with *alomae*, starting to die (Madang, Papua New Guinea).

Photo 4. Plant destroyed by *alomae*: one live shoot and many dead leaves remaining (Madang, Papua New Guinea).

Photo 5. An outbreak of alomae. Note the collapse of the older leaves, and the young ones stay rolled. It is similar to a wilt. These symptoms are typical of an *alomae* epidemic on plants that had been growing rapidly.

Photo 6. Possibly *bobone* disease (the plant seems to be recovering) on a sucker (Madang, Papua New Guinea). Note the galls on the petiole, or leaf stalk.

Photo 7. *Bobone* on the "female" taro variety Oga showing stunted distorted leaves (Malaita, Solomon Islands).

Photo 8. Typical symptoms of *bobone* with stunted, twisted green leaves (Madang, Papua New Guinea). The plant will recover from these symptoms producing leaves that look healthy, but the plant will remain infected by the virus.

Photo 9. Galls on the leaf stalk, petiole, of a plant that is probably in the early stages of *alomae* (Madang, Papua New Guinea). Early stages of *alomae* and *bobone* can be similar, and unless the variety is known it is not possible to tell which disease is present.

Photo 10. *Taro vein chlorosis virus* in taro from (Tanafoli, Vanuatu). It is common to find leaves with infections on part of the leaf with edges rolled down. The symptom is very similar to that of *Taro badnavirus*, except that the colour of the veins is brighter.

Photo 11. Taro badnavirus showing a vein chlorosis symptom on a plant in (Safaatoa, Samoa). Compare with the symptoms of *Taro vein chlorosis virus* (Photo 10).

Photo 12. Symptom of *Dasheen mosaic virus* in taro; notice the pale green feather-like pattern between the leaf veins. Often these patterns show along the main veins.

Photo 13. *Dasheen mosaic virus* symptoms on *Alocasia.*

Photo 14. Philippine egg-sucking bug, *Cyrtorhinus fulvus.*

Photo 15. Nymphs, winged and wingless adults of *Tarophagus* sp., the planthopper that spreads *Colocasia bobone disease rhabdovirus,* and most probably *Taro vein chlorosis virus*, another rhabdovirus.

Photo 16. Adult *Tarophagus* sp. on leaf of taro.

Common Name

Alomae and *bobone*

Scientific Name

Several viruses have been identified in plants with these diseases, but it is not yet certain which ones are the cause. The viruses associated with these diseases are: *Colocasia bobone disease rhabdovirus* (CBDV); *Taro vein chlorosis rhabdovirus* (TaVCV); *Taro badnvirus* (TaBV); *Dasheen mosaic potyvirusvirus* (DsMV). It recent years a tenuivirus has been detected, as well as genome sequences of *Colocasia bobone disease-associated virus* (CBDaV), but it is not yet clear if this is the same as CBDV.

Distribution

Narrow. *Alomae* and *bobone* occur in Papua New Guinea and Solomon Islands. The distribution of the viruses is as follows:
i) *Colocasia bobone disease rhabdovirus* occurs only in Solomon Islands and Papua New Guinea; ii) *Taro vein chlorosis virus* is recorded in Fiji, Federated States of Micronesia, New Caledonia, Palau, the Philippines, Samoa, Solomon Islands, and Vanuatu; and Taro *badnavirus* and *Dasheen mosaic virus* are present worldwide. The undescribed tenuivirus has been recorded from Papua New Guinea and Solomon Islands.

Note, *Taro vein chlorosis virus* in Vanuatu is similar to that of Samoa, but differs from that recorded in Fiji. The relationship of *Taro vein chlorosis virus* elsewhere to these two strains in not known.

Hosts

Colocasia bobone disease virus and *Taro vein chlorosis virus* have only been recorded from taro (*Colocasia esculenta*); *Taro badnavirus* has been recorded from taro, *Xanthosoma sagittifolium* (tannier) and *Alocasia macrorrhizos* (giant taro). *Dasheen mosaic virus occurs* in all the edible aroids (taro, giant taro, giant swamp taro, *Xanthosoma*), and in many ornamental aroids.

Symptoms & Life Cycle

Plants with *alomae* show a variety of symptoms. (Photos 1-5&9). The leaves are shorter than normal with distorted leaf blades, but remain green, or they can show stunted young leaves which remain rolled, twisted and pale yellow. Galls may be present on the petioles of the distorted leaves. Soon after the initial symptoms, plants stop producing leaves and gradually die as the plants rot.

Plants with *bobone* are similar to *alomae* at first: the leaves remain green, but are stunted, thickened, curled or partly curled, and there are galls, but plants gradually recover (Photos 6-8).

Plants that die from *aloma*e are called 'male' on Malaita, Solomon Islands, and those that are resistant, but show *bobone* are called 'female' (perhaps 5 or 6 varieties).

Insects spread the viruses that are found in *alomae* and *bobone*:

- Taro rhabdoviruses are spread by *Tarophagus* species, planthoppers.
- The tenuivirus may be spread by planthoppers.
- Taro badnavirus is spread by *Planococcus* and *Pseudococcus* mealybugs.
- Dasheen mosaic is spread by aphids.

The insects suck up the viruses as they feed on diseased plants, and spread the viruses as they move to healthy plants and feed.

The viruses are also spread in planting material. Often, the viruses do not show symptoms; in this case they are said to be 'latent'. For instance, most plants examined contain *Taro badnavirus* and *Dasheen mosaic virus* without showing symptoms, or only rarely showing symptoms. However, the viruses inside the plant pass from mother plants to their suckers.

In the same way, it is likely that all 'female' taro are infected with the *Colocasia bobone disease rhabdovirus.* Sometimes *bobone* occurs after planting, when plant hoppers are absent. Possibility, stress at planting causes the virus to multiply and then symptoms occur.

Alomae is also spread in planting material. If infection occurs near harvest, plants may be used for planting the next crop as they still look healthy.

Impact

Alomae is a lethal disease that affects nearly all varieties of taro. On Malaita, Solomon Islands, it is very difficult to grow "male" taro in the lowlands. In recent years, the disease has spread to other islands in Solomon Islands with devastating results, such as the Weather Coasts of Guadalcanal and Makira. It is not unusual for entire gardens to be destroyed by *alomae*. Farmers want to grow "male" taro for their size and also there are many varieties so they have a choice of tastes and textures.

Bobone does not kill taro; it reduces the yield by about 25 per cent. Plants usually start to produce healthy leaves after 4-6 weeks, and then appear normal. The disease only occurs in a few varieties of taro. So where alomae exists, farmers have to grow "female" taro which are lower yielding.

Symptoms of other taro viruses on their own are often mild, and do little damage: see, (i) *Taro vein chlorosis virus* (Photo 10), (ii) *Taro badnavirus* (Photo 11), and (iii) *Dasheen mosaic virus* (Photos 12&13).

Detection & inspection

It is important to inspect taro gardens regularly. Look at the youngest leaves. If a plant has *alomae* or *bobone*, the youngest leaf will be stunted, slightly curled under, and crinkled. Sometimes, the young leaves with *alomae* are paler than older leaves, but not always so. Usually, the young leaves with *bobone* are green, thickened and distorted, perhaps with prominent galls on the petioles. However, it is difficult to tell *alomae* and *bobone* apart at an early stage.

Later, if plants have *alomae*, they will stopped producing leaves and start to die, whereas plants with *bobone* will produce 4-6 distorted leaves, and then leaves which look healthy.

Management

QUARANTINE

Note, that there are many countries in the Pacific vulnerable to these diseases, so where they are not yet present (everywhere except Papua New Guinea and Solomon Islands), biosecurity authorities should be alert to potential pathways for their introduction. If countries want to introduce germplasm for testing, they should follow the FAO/IBPGR *Technical Guidelines for the Safe Movement of Edible Aroid Germplasm* (http://www.bioversityinternational.org/e-library/publications/detail/edible-aroid/). This stipulates that introductions should be as virus-tested plants growing in tissue culture.

BIOLOGICAL CONTROL

Cyrtorhinus fulvus, a bug that feeds on the eggs of *Tarophagus* species (Photo 14), reduces the population of the plant hopper, but experience shows that it is not enough to stop the spread of *alomae* when *Tarophagus* populations are high (Photos 15&16).

CULTURAL CONTROL

Alomae is best controlled by cultural methods. It is very important that farmers:

- Know that insects spread *alomae*; they spread the disease between plants and between gardens.
- Form a village group of taro growers, which meets regularly, exchanges ideas, and where members help each other.
- Agree to apply control measures over a wide area, with each farmer doing the same in his or her garden.

Farmers should do the following:

Before planting:

- Make new gardens as far away from previous gardens as possible.
- Avoid taking planting material from diseased to new gardens.
- Plant resistant varieties: "female" taro are resistant to *alomae*, and they can be used where the disease is severe, especially in the lowlands.
- Do not plant "male" and "female" taro together.

During growth:

- Pull out *alomae* plants carefully, making sure that any planthoppers are trapped in the leaves or between the stalks; alternatively, put a (e.g., rice) bag over the diseased plants before pulling them out and burning them.
- Do not pull out plants and leave them in the garden or throw them into the bush - the insects will fly or jump back again.

After harvest:

- Collect all debris after harvest and burn or bury it.

CHEMICAL CONTROL

Regular spraying with a synthetic pyrethroid insecticides will kill *Tarophagus* and reduce *alomae*. It will not prevent *bobone* as plants are already infected.

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