

# Pacific Pests, Pathogens and Weeds - Online edition

## Coconut Borgia disease (229)

### Common Name

Borgia coconut syndrome

### Scientific Name

There is no scientific name of the disease; it is known by its common name. Analysis of diseased coconuts (and bananas) have found phytoplasmas associated with diseased plants. Analysis of ribosomal RNA of the phytoplasma has shown that they belong to a group code named 16SrIV.

### Distribution

The phytoplasma associated with Borgia coconut syndrome has only been found in the Madang Province, Papua New Guinea. The same phytoplasma occurs widely in banana; it has been recorded in the East Sepik, Madang, Morobe, and Western provinces.

### Hosts

Coconut, banana and betel nut.

### Symptoms & Life Cycle

The symptoms in coconut in Papua New Guinea are similar to those of coconut palms with lethal yellowing disease in many countries worldwide: the outer fronds become pale yellow and droop, nuts drop early, followed by the collapse of all but the spear leaf (Photos 1,2&3). From the time of the first symptoms to death is only 3 months (Photo 4). Although loss of nuts is an early sign of the disease, there is no associated death of the flower bunch (stalk and cluster of flowers) that is a common sign of lethal yellowing disease.

The symptoms in ABB banana varieties differ from those caused by *Fusarium* wilt (**see Fact Sheet no. 176**). Leaves turn yellow, but inside the stems there are short brown or black streaks in the vascular areas (water and food conducting tissues) associated with larger areas of wet rot (Photo 5). Bananas with these symptoms contain phytoplasmas that are identical to those found in coconuts. The disease has been given the name banana-wilt associated phytoplasma (BWAP).

Spread of the phytoplasmas in coconut, banana and betel nut is thought to be by insects. Sap-feeding insects that pierce and suck sap from leaves and soft tissues spread similar phytoplasma diseases in other countries. Although the insect that spreads the phytoplasma is not known, interest has centred on *Zophiuma pupillata* (Hemiptera: Lophopidae), which breeds on coconuts. This insect is common on coconuts and betel nuts, but less so on banana, and phytoplasmas are frequently detected in both adults and nymphs.

Several other insects from different families are also common on coconuts and found to contain phytoplasmas; one of them is a species of *Proustia*, an insect that is known to spread phytoplasma diseases of coconut (India) and sugarcane (Southeast Asia).

### Impact

The disease in coconuts was first reported in 2008 in the Borgia district of Madang Province, hence its common name. It occurs in both newly planted and old palms. To date, many hundreds of palms have been killed and plantations abandoned due to the disease, and the epidemic continues unchallenged. The concern is that it will impact food security and the economic wellbeing of the people in the area as coconut is an important food as well as a traded commodity. Export of copra and coconut oil in Papua New Guinea is worth approximately US\$30 million and US\$45 million per year, respectively; if the disease were to spread it would have major socio-economic consequences.

The disease threatens the Stewart Research Station of the Cocoa & Coconut Research Institute, Papua New Guinea. The Research Station hosts the International Coconut Genebank for the South Pacific under IPGRI/COGENT and FAO agreements.



Photo 1. Dying and dead coconut palms with Borgia coconut syndrome, Madang Province, Papua New Guinea.



Photo 2. Coconuts showing signs of Borgia coconut syndrome, whereas the betel nuts are mostly healthy.



Photo 3. Yellowing of fronds is an early symptom on palms with Borgia coconut syndrome, Madang Province, Papua New Guinea.



Photo 4. In many plantations in Madang Province, Papua New Guinea, coconut palms have been killed by Borgia coconut syndrome.

## Detection & inspection

Look for coconuts with yellowing, drooping outer leaves, early nutfall, and rapid death (within 3 months). Look for bananas with yellow leaves and vascular tissues with streaks and patches of brown or black rot. Note, that identification of phytoplasmas is based on molecular analysis of ribosomal RNA; the analyses done on banana in Papua New Guinea have found plants with symptoms typical of BWAP containing phytoplasmas closely related to those in coconuts with Bogia syndrome.

There is evidence that phytoplasmas from coconut and banana from Madang Province are separate from the phytoplasmas in banana isolated from Western Province, Bougainville and Solomon Islands. This might explain why coconuts are not affected by the Bogia disease apart from those in Madang Province.

## Management

### QUARANTINE

The FAO/IBPGR *Technical Guidelines for the Safe Movement of Coconut Germplasm*

([https://www.bioversityinternational.org/fileadmin/user\\_upload/Coconut\\_361.pdf](https://www.bioversityinternational.org/fileadmin/user_upload/Coconut_361.pdf)) recommend that coconuts should be moved as embryos growing in a tissue culture medium. As a special note, the Guidelines recommend that embryos, seedlings and palms from which pollen is collected should be tested for viroids and *Coconut foliar decay virus*. If that is not possible, seednuts may be transferred only if they are germinated in intermediate (third country) quarantine, and indexed for viroids and *Coconut foliar decay virus*. (<http://www.bioversityinternational.org/e-library/publications/detail/coconut/>.)

In an effort to contain the epidemic of Bogia coconut syndrome in the Madang area, there are restrictions on plant movements from the province.

There are no recommended methods of managing the disease, apart from the embargo on plant movement. The priority is to find out which insects spread the phytoplasma and whether there are coconut varieties that are tolerant or resistant to the disease.



Photo 5. Streaks and bands of rots in the vascular tissues of a banana with banana wilt associated Bogia phytoplasma disease.

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Information (and Photo 5) Kelly *et al.* (2011). First report of a phytoplasma identified in coconut palms (*Cocos nucifera*) with lethal yellowing-like symptoms in Papua New Guinea. *New Disease Reports* 23:9 (doi: 10.5197/j.2044-0588.2011.023.009); and Davis *et al.* (2012) A new wilt disease of banana plants associated with phytoplasma in Papua New Guinea (PNG). *Australasian Plant Disease Notes* 7: 91-97. (<https://www.researchgate.net/publication/257801469>); and from Pilotti *et al.* (2014) Putative vectors of a phytoplasma associated with coconut (*Cocos nucifera*) in Madang Province, Papua New Guinea. *International Journal of Agriculture and Forestry* 4: 365-372 (doi: 10.5923/j.ijaf.20140405.04); and from Lethal disease of coconut: Phytoplasma (2019) Department of Agriculture, Water and the Environment. ([https://www.agriculture.gov.au/biosecurity/australia/naqs/naqs-target-lists/lethal\\_diseases\\_of\\_coconut](https://www.agriculture.gov.au/biosecurity/australia/naqs/naqs-target-lists/lethal_diseases_of_coconut)). Photos 1&3 Luigi Guarino Global Crop Diversity Trust, Bonn. Photo 2 Richard Markham, ACIAR, Canberra. Photo 4 Geoff Gurr, Charles Sturt University, Orange, Australia.

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