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Plant Protection - Pacific Community Land Resources Division

BOGIA COCONUT SYNDROME: A LETHAL UNWANTED DISEASE OF COCONUT AND OTHER PALMS

Photo credit: Kokonas Indastri Koporesen, PNG

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ALERT

Bogia coconut syndrome (BCS) is a deadly disease of palm species currently found only in Madang Province of Papua New Guinea (PNG). Other non-palm plants also seem to be affected by the disease. BCS is suspected to be caused by a phytoplasma, an obligate intracellular parasite of plant phloem tissue and of the insect vectors that are involved in their plant-to-plant transmission.

BACKGROUND

BCS is named after the Bogia District in PNG's Madang Province, where the disease was earliest discovered to kill coconut palms. According to a Cocoa Coconut Institute Limited (CCIL) internal report, the disease was first reported in the inland area of Yoro in late 1980s and then spread down to the coastal areas of Bogia.

The occurrence of this unknown disease in Bogia was reported to the National Agriculture and Quarantine Inspection Authority (NAQIA), the national plant protection organization (NPPO) of PNG by CCIL in 2007.

The disease was further investigated by scientists from the North Australian Quarantine Strategy (NAQS), NAQIA and CCIL in 2008. Based on tests conducted in Australia, the team detected the presence of a phytoplasma in apical meristem samples collected from diseased palms. This finding was validated and confirmed by the Global Plant Clinic of the Centre for Agriculture and Bioscience International (CABI), in association with Tropical Virus Unit at Rothamsted Research and Central Science Laboratory, United Kingdom.

DESCRIPTION

The name "Candidatus Phytoplasma noviguineense" has been suggested for the causative agent of BCS (Miyazaki et al. 2018). Phytoplasmas are a group of pathogens that produce lethal yellowing-type diseases in a variety of plants. Lethal yellowing is another devastating disease of coconut palms and found in many countries worldwide.

While potential insect vectors of BCS have been identified (Lu et al, 2016), planting infected seedlings is possibly the main cause of spread. Disease development studies conducted in PNG by Ramu Agri-Industries Limited (RAIL), CCIL and NAQIA showed that it only takes a few months after the first onset of symptoms for the palms to die.

No treatment or cure exists for BCS. Unfortunately, knowledge of the causal agent and its transmission is also limited. Generally, sanitation and rouging out diseased palms have been used elsewhere to delay the spread and reduce impact from lethal yellowing-type or phytoplasma caused diseases.

BCS affects both newly planted and old palms. Since its discovery, thousands of palm trees have been killed and several plantations abandoned due to the disease.

The coconut tree is an integral part of life in the Pacific region and has multiple uses from food to household items to building materials. It is also cultivated as an important cash crop.

A disease like BCS can seriously impact food security and cash-earning potential of vulnerable island communities. Spread of the disease to other areas of PNG or to other countries in the region will greatly affect people's livelihoods as coconut is used for food and feed and remains a key trade commodity. For these reasons, BCS is a high priority biosecurity disease of concern.

BCS SYMPTOMS

The symptoms observed in BCS affected coconut palms closely resemble symptoms from coconut lethal yellowing disease. The following lists the progression of BCS symptoms on mature coconut trees.

- First visible sign is yellowing and necrosis of the tip of leaflets in lower whorl of leaves
- This is followed by nut fall of all sizes and age
- Where the palm is flowering, all inflorescence becomes empty
- Then, fronds begin to die and fall one by one
- Leaf fall and plant death continues until only the shoot remains
- Finally, the crown falls off with the trunk left standing

CURRENT STATUS

BCS is still confined to Bogia, Sumkar and Madang districts, all of which fall within Madang Province where the disease is responsible for rapidly causing loss of a very high number of coconut palms. The disease has also been detected in betel nut palms. Recent reports suggest BCS has spread to cover a larger area, but this is still within the boundaries of Madang Province.

Interestingly, a closely related strain of BCS has been confirmed to affect a few eating and cooking banana varieties. The infection in banana is called Banana Wilt Associated Phytoplasma (BWAP) disease. BWAP is confirmed to be present in many coastal provinces of PNG but not present in the highland provinces where the climate is a bit cooler.

PNG's coastal communities, including those on remote islands, depend on coconuts, betel nuts and bananas for their livelihood. BCS puts these groups of people at risk of losing one of their important sources of food supply and income generating activities.

RECOMMENDATIONS

National Plant Protection Organisations (NPPOs) are encouraged to review pathways via which BCS can potentially get to their countries and pro-actively establish control points to mitigate the risk of introduction.

Regular monitoring for symptoms, early detection and incineration or deep burial of infected plants are effective management techniques. From a biosecurity perspective, restriction on movement of BCS host plants and planting materials from infested areas to non-infested or "pest free" areas is critical. This practice is active in Madang Province.

For the above regulatory control, NPPOs can also activate an "emergency declaration" concerning BCS (or any disease), where this provision exists within the national biosecurity legislation. This provides a legal basis to implement movement restrictions and can be instrumental in curbing spread of pests and diseases.

Where international movement of BCS host (coconut palms) is to occur, it is advisable to follow "FAO/IBPGR Technical Guidelines for the Safe Movement of Coconut Germplasm" which recommends:

A. Moving coconut planting material as embryos growing in a tissue culture medium.

B. Holding and growing seed nuts in post entry quarantine and upon germination, testing individual plants for phytoplasmas, viroids and viruses.

C. Where such testing is not available, NPPOs can make arrangements for the seed nuts to be germinated in an intermediate (third country) quarantine facility and indexed for phytoplasmas, viroids and viruses.

The guideline is available at this link:

http://www.bioversityinternational.org/e-library/publications/detail/coconut/

REFERENCE LINKS

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Research to halt a deadly disease in coconut palms: https://www.aciar.gov.au/media-search/ blogs/research-halt-deadly-disease-coconut-palms

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