Bacterial diseases of bananas in the south-east Asian region and worldwide
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level to the highlands with elevation up to 2,200 meters above sea level in traditional or subsistence food gardens. The cooking bananas are the more important in PNG in terms of the quantities produced and consumed than the dessert bananas. In certain drier areas of the country such as in Central, Morobe, Milne Bay, Madang and East New Britain provinces, banana is the dominant staple crop.

Most diseases recorded in PNG were made between 1950s to late 1990s and the status of diseases has never changed much since then. PNG has never experienced any serious pest and disease outbreaks because banana continued to be cultivated in subsistence farming systems using traditional farming techniques. However, since early 2000 there appeared to be an increase in occurrence of pests and diseases in certain provinces. In terms of disease, the banana leaf yellowing disease was first report from Buka Island in Bougainville in 2006 The disease has now been reported in certain locations of Madang, Sandaun, mainland Bougainville and Morobe. Symptoms of the disease was seen recently in Port Moresby in the National Capital and need to be confirmed. Identification carried out in Australia and PNG showed a phytoplasma associated with discoloured stem tissues. The disease is a big threat to banana cultivation and food security in PNG.

PNG is free from blood disease, bumpy top and *Fusarium oxysporum* f.sp. *cubense* (race 4). All three diseases are present in West Papua Province of Indonesia. People at the PNG-Indonesian border provinces have been regularly informed of the risks to banana cultivation and biodiversity in PNG. The traditional annual pest and disease surveys by PNG and Australian quarantine will continue to monitor pests and disease outbreaks at the border provinces.

**Additional abstracts**

**The diversity of blood disease bacterium and *Ralstonia solanacearum* phylotype IV strains**

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Banana blood disease is one of the most important horticultural diseases in Indonesia and is a threat to Australia and surrounding countries. Previous studies have confirmed that the blood disease bacterium (BDB), the causal organism of blood disease of banana, is phylogenetically closely related to members of the *R. solanacearum* species complex (Taghavi et al., 1996). *R. solanacearum* is a heterogeneous species with considerable phenotypic and genotypic variation within the strains of the species *R. solanacearum* and its close relatives which comprise the species complex. Phylotype IV contains the most phenotypically diverse range of strains within the species complex and includes *Ralstonia syzygii*, the BDB, and *R. solanacearum* strains (Fegan and Prior, 2006).
This study aims to clarify the taxonomic relationship of the BDB with other members of the *R. solanacearum* species complex by employing phenotypic and genotypic methods, with a view to facilitating the unambiguous identification of the BDB and thereby aiding diagnosis and management of banana blood disease. Phenotypic characterisation of *R. solanacearum*, the BDB, and *R. syzygii* was accomplished using classical phenotypic tests (46 physiological and biochemical tests) and BIOLOG metabolic fingerprinting. Genotypically the diversity of strains of *R. solanacearum* phylotype IV, BDB, and *R. syzygii* was assessed by phylogenetic analysis of partial endoglucanase gene sequences, 16S-23S rRNA gene internal transcribed spacer (ITS) region sequences and the repetitive PCR using the BOX primer.

Our results showed that the BDB strains are genotypically coherent and closely related to *R. solanacearum* phylotype IV strains; however, phenotypically, *R. solanacearum* and BDB strains differ greatly from each other, with all BDB strains clustering separately from *R. solanacearum* phylotype IV strains and *R. syzygii* strains.


**Blood disease development of diploid bananas and the inhibition of disease development by endophytic bacteria and BDB filtrate treatments**

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Blood disease of banana caused by blood disease bacterium (BDB) was found with high frequency on cooking banana cv Kepok (ABB) in Indonesia, however most commercial triploid bananas were reported to be infected in artificial inoculation. Inoculation of BDB on diploid genomes of AA (cv Mas) and BB (cv. Klutuk) was conducted and the results suggested that diploid BB banana was more susceptible compared to diploid AA with higher disease incidence and disease intensity.

Practical techniques to control banana blood disease is urgently needed. The development of in vitro banana seedlings resistant to BDB infection was conducted by the inoculation of endophytic bacteria and induce resistance using BDB cultural filtrate. Exploration of endophytic bacteria was conducted from healthy banana stem in BDB endemic area selected by antagonistic assay. There were 2 isolates of endophyte bacteria found to be able to protect banana cv Kepok from BDB infection significantly on the inoculated banana seedlings. On the other hand induced resistance using BDB filtrate at the percentage of 5 - 15% were resulted on slightly improvement of resistance against BDB.