

The Chancellor of Ghent University has the honour of inviting you to attend the public defense of the doctoral dissertation of

Parichate Tangkanchanapas

Title of the doctoral dissertation:

Viroid-host interactions in Solanaceae

The public defence will take place on 26 April 2021 at 16:00 in meeting room A0.1 Azalea, Coupure links 653, 9000 Gent.

Due to the current COVID-19 regulations, it is not allowed to attend the defense on site.

The defense will be livestreamed and accessible at <https://www.fbw.ugent.be/doctorate/ParichateTangkanchanapas>

Dissertation supervisors

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Abstract of the doctoral research

Viroids are the smallest plant pathogens, consisting of naked single-stranded circular RNA without protein capsid, or even any protein coding sequence. Viroid symptoms and their yield losses can vary from symptomless to very severe, depending on the viroid species, type of viroid strain, plant host and cultivar, plant age, environmental and climatic conditions. In Thailand, two pospiviroids, *Columnnea* latent viroid (CLVd) and pepper chat fruit viroid (PCFVd) cause serious yield losses on both tomato fruit and hybrid seed production. Moreover, especially the exported tomato (*Solanum lycopersicum*) and chili (*Capsicum annum*) hybrid seeds need to comply the seed certification program before a phytosanitary certificate can be issued. However, these two viroids have been intercepted with traded tomato and chili seeds by quarantine of several countries. This causes concern about these diseases, especially CLVd, of which isolates (or variants) in Thailand (tomato isolate) cause more severe symptoms than the ornamental isolates (most US and European isolates) and may have different biology (host ranges, severity and yield losses) as well. For this reason, the main objective of this PhD study is to investigate these two pospiviroids, CLVd and PCFVd, and enhance the knowledge on their biology. In addition, a fast, reliable and sensitive point-of-care RT-LAMP detection tool was developed in support of PCFVd surveillance. Throughout several chapters, the epidemiological knowledge on CLVd is enhanced, by studying symptom severity in different hosts, assessing the progeny quasi-species population in relation to host plant pathogenicity and genomic variability. The pathogenicity and symptom severity of four different isolates of CLVd, known to induce mild, intermediate and severe symptoms on a range of host plants was described. Progeny populations of CLVd known as “quasi-species” were studied across a range of solanaceous hosts. A clear picture on these CLVd progeny populations was obtained by means of indexed amplicon sequencing. This methodology allowed to directly obtain a high number of full-length viroid genome sequences, and permitted to study CLVd population evolution in the plant, and define mutation profiles and the effects of the mutations on viroid secondary structure and host specific single-nucleotide polymorphisms (SNP). Furthermore, the CLVd progeny population was studied in different plant tissues (leaves, apical leaves, flowers, pollens, petals and fruits), and this at different time points. Finally, the CLVd taxonomy was re-evaluated based on sequence similarity and phylogenetic analysis of all known CLVd sequences to date, and the results of this work on disease severity, CLVd population and evolution.

Brief Curriculum Vitae

Parichate Tangkanchanapas was born on 23rd July 1974, in Bangkok, Thailand. He completed his bachelor's degree in Biotechnology at Silpakorn University (Sanam Chandra Palace Campus) in 1997. In 2003, he started working as an agricultural research officer at the Department of Agriculture, in the Plant Quarantine Research Group. From 2003 to 2005, he studied at Kasetsart University (Kamphaeng Saen Campus), where he obtained a Msc degree in Agricultural Biotechnology. In 2009, he changed position to Plant Pathologist (virologist) in the Plant Pathology Research Group, Department of Agriculture. As virologist, he loves researching and teaching on plant viruses, and especially viroids. Through this passion for viroid research, in 2016, he obtained a scholarship from the Royal Thai Government and became a PhD candidate in Applied Biological Sciences at Ghent University and ILVO. His PhD research focuses on interaction between viroid and their host in several Solanaceae plants in various aspects such as detection technique assay, symptom expression and severity, quasi-species population and taxonomic classification. During his PhD study, Parichate presented his research at international conferences as oral communication or poster. Part of his work has already been published in peer-reviewed scientific journals. Parichate will continue to work at the Department of Agriculture in Thailand as a Plant Pathologist.