

## Masters Project

### Development of nanoparticle-loaded RNA vaccines for crop protection

**Group:** Xu

**Supervisor Names:** Prof. Zhi Ping (Gordon) Xu and Dr. Peng Li

**Supervisor Email:** p.li3@uq.edu.au

**Project duration:** 52 weeks (two semesters)

#### Project Summary

Global crop yields are estimated to be reduced by 30–40% per year because of plant pests and pathogens, constraining global food security. The current approaches to management of pests and diseases rely on plant genetic resistance and/or transgenes coupled with insecticide and fungicide sprays. The need for innovative approaches in managing crop health grows each year, driven by the need for greater production, climate-driven pest expansion, community and regulatory demands, toxicity issues and pesticide resistance. RNAi has emerged as a powerful strategy to engineer transgenic disease resistance against pests and pathogens in plants. Topical application of dsRNA for pest control is emerging as an appealing alternative to genetically modified crops. However, a major limitation in the practical application of dsRNA as a spray is a short virus protection window of 5–7 days post spray.

In a world's first, we have demonstrated the proof of concept of nanoclay-loaded RNA as a stable spray application for sustained crop protection for 30 days, negating conventional transgenic approaches. This project aims to contribute in taking the outcome to the stage of market-ready products.

Expected outcomes and deliverables

This project involves preparation and characterisation of synthetic nanoclay and formation of nanoclay-RNA platform. The student is expected to understand the mechanism of crystal growth, master various characterisation methods and cell analysis techniques, and approach contact with industry. It has the capacity to further promote to a PhD candidature and publication potential in topclass journals.

Required experience

This project is suitable for students with the background of chemistry, materials sciences, chemical engineering, biotechnology, biochemistry, and crop science. The student will be expected to conduct full-time research in AIBN.

#### Reference

Mitter et al., Clay nanosheets for topical delivery of RNAi for sustained protection against plant viruses, *Nature plants*, 2017, 3: 16207