Inspired by his previous work in agronomy, University of Melbourne PhD student Jose Palacios is currently undertaking a research project into biological measures to control anthracnose in lettuce. Jose spoke to *Vegetables Australia* about his project, the activities undertaken so far and what it aims to achieve.

CONTROL OF LETTUCE ANTHRACNOSE USING BIOLOGICAL AGENTS

Anthracnose is a group of diseases which can be caused by different fungal species. It is found commonly in vegetables such as celery, tomato, spinach and lettuce, and the diseases are characterised by the symptoms and damage inflicted on the crop. In lettuce, the symptoms of this disease are characteristic brown spots and holes in the leaves.

University of Melbourne PhD student Jose Palacios, who has a background in agricultural and soil science, is currently completing a research project on anthracnose in lettuce. Jose's research project objective is to evaluate 27 *Trichoderma* strains and their secondary metabolites – the biochemicals they actively produce as a defence mechanism to protect their space in the soil.

Jose is conducting this investigation at the Faculty of Veterinary and Agriculture Sciences at the University of Melbourne in collaboration with Dr Mary Cole from Agpath in Vervale, Victoria, and the University of Naples in Italy.

PROJECT BACKGROUND

Jose has worked with *Trichoderma* since 2001 in Cuba, South America (Peru, Colombia and other countries) and in Australia in organic crops. His research into lettuce anthracnose was inspired by his previous role as an agronomist with Victorian organic salad mix producer Coolibah Herbs.

"I found that lettuce anthracnose was a disease that was very

hard to control. Even on conventional farms, only one chemical can control it efficiently, but with reported high risks for human health," Jose said.

"I investigated and found reported uses of *Trichoderma* secondary metabolites to control soilborne diseases in crops, and one day I said, 'perhaps we might control foliar diseases as well.' I searched for help at the University of Melbourne and Agpath and, finally, the investigation project took off in June 2016."

The research spanned across several stages, starting with isolating as many strains as possible from Australian sources and some from commercial formulations; selecting cold-tolerant isolates (as anthracnose is a winter disease); identifying isolates through molecular (DNA) testing; brewing combinations of strains to achieve the production of a more diverse array of biochemicals; and testing in the field in 2017 and 2018.

"An additional aim of this investigation is to make it practical and applicable for almost all foliar diseases in crops by modifying the strains and brewing conditions, but that is a plan for the future," Jose said.

CURRENT PROGRESS

The isolation and identification of cold-tolerant *Trichoderma* strains has finished as well as the isolation of secondary metabolites and field trials. Jose said this had a significant effect in controlling lettuce anthracnose.

"Currently molecular techniques are being employed to identify strains and determine the relationships among them. Together, with the morphological data, it will help to nominate species/ strains that are able to control anthracnose," he said.

As a soil scientist, Jose is committed to finding economically feasible and environmentally responsible ways to produce food, particularly in the case of anthracnose disease in lettuce.

"Conventional farmers are dependent on synthetic chemicals to control this disease. I am not against the chemical industry, but I trust there are more sustainable ways to do it," Jose said.

"Even chemicals need conditions to work efficiently, such as water pH and hardness, droplet size, surfactants, air temperature, etc. Biologicals are living organisms and they also need minimal conditions to express all their goodness."

According to evidence in this research, not a single biological control agent can control every disease in all conditions all the time.

"The screening process is essential for success," Jose said.

Furthermore, using biochemicals instead of living spores for foliar applications could be a revolution in crop disease control.

"I understand the nature of the farming business – farmers need to protect their investment, but they should never forget that there are always alternatives to just spraying chemicals by the calendar," Jose explained.

"Integrated Pest Management and Integrated Disease Management both have the principle that the chemical control has to be the last resource, not the first."

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