

## Using co-culture to enhance fungal biocontrol activity and photostability

Jonathan Hadipurnomo, Lara Dalldorf, Jonty Mills and Laura Villamizar

*Microbial Solutions, AgResearch Ltd., Lincoln Research Centre, Christchurch 8140, New Zealand*

Corresponding author: [laura.villamizar@agresearch.co.nz](mailto:laura.villamizar@agresearch.co.nz)

Fungal co-culture is a method that has predominantly been used for the discovery and production of novel secondary metabolites not found in axenic culture. However, its potential to enhance fungal biomass fitness and to harness unique beneficial traits has received limited attention. In this study, two fungal isolates *Penicillium* sp. (F1) and *Trichoderma* sp. (F2), with beneficial attributes such as promoting plant growth and controlling plant pathogens, demonstrated compatibility when co-cultured on agar and on a semi-solid substrate based on oats. The combined biomass containing conidia from both fungi (Mix) and conidia from F2 alone were equally efficient at inhibiting the growth of four plant pathogens (*Fusarium oxysporum*, *Rhizoctonia solani*, *Botrytis cinerea*, and *Sclerotinia sclerotiorum*) in *in-vitro* competition assays. In an *in-planta* bioassay on tomato stems, the Mix caused a significantly higher reduction in disease severity (severity reduced by 60%) than the reduction caused by F2 (28%) and F1 (41%) individually. Biomass of the Mix also displayed better photostability when exposed to ultraviolet light UV-C, with no viability loss after 1 minute and 30% reduction after 5 minutes of irradiation. F2 and F1 significantly dropped viability by 4.7% and 7.5% after 1 minute and by 37% and 56% after 5 minutes of irradiation, respectively. This study demonstrates that the distinct traits of F1 and F2 can be exploited concomitantly when co-cultured, resulting in a combined biomass with greater abiotic stress tolerance and enhanced biocontrol activity. Further research is required to understand the mechanisms that underpinned the improved fitness of this fungal consortium.

## Agrichemical-Light Solutions for a sustainable future

Mark R. H. Hurst, Maureen O'Callaghan and David A. Wright

*Resilient Agriculture, AgResearch, Lincoln Research Centre, New Zealand*

Email: [mark.hurst@agresearch.co.nz](mailto:mark.hurst@agresearch.co.nz) and [david.wright@agresearch.co.nz](mailto:david.wright@agresearch.co.nz)

Reducing on-farm inputs such as agrichemicals and fertilisers is a key part of reducing the environmental footprint of primary production systems. Producers face restricted access to chemicals driven by regulations, market access, customer requirements and resistance. Climate change is also impacting the distribution and activity of pests and diseases and increasing the risk of further incursions affecting food security. Responding to these challenges requires multi-disciplinary science, close collaboration between researchers and those implementing the research, while at the same time planning for new solutions that will work seamlessly with emerging technologies, such as precision delivery systems.

A new AgResearch initiative, "AgriChem-Light (ACL) programme" aims to bring together AgResearch-wide capability and external collaborations to reduce inputs of synthetic pesticides and fertilisers in the primary sector. This will require a multidisciplinary and where possible a cross sectoral approach, spanning plant and animal genetics, biological solutions (including biopesticides, biofertilisers, endophytes, classical biocontrol), emerging digital and precision application technologies, farm systems research, and social science. The scope of the ACL programme is large and encompasses weeds, invertebrate pests and pathogens of plants and animals, and alternatives to synthetic fertilisers. A prioritisation process guided by grower need, regulatory insight and market direction has been established to ensure focus on the most pressing issues.

Key outcomes of the programme will be viable alternatives to synthetic pesticides enabling continued market access and increasing economic returns through low residue produce.