NEW ZEALAND PLANT PROTECTION SOCIETY RESEARCH SCHOLARSHIP

Identifying protein effectors in the organism causing camellia petal blight

The necrotrophic fungus *Ciborinia camelliae* Kohn causes a disease known as camellia petal blight that has been disfiguring camellia flowers (Fig. 1) since it was first found in New Zealand in 1993. This blight has severally impacted the camellia seed oil industry, floriculture industry, and has been a great frustration to keen camellia growers over the last 25 years but no viable control methods for camellia petal blight have been discovered so far. The Camellia Memorial Trust has helped fund a research team at Massey University to study the interaction between camellia plants and this pathogen. **Hannah McCarthy**, recipient of the 2017/2018 New Zealand Plant Protection Society Research Scholarship, is part of this team. *Ciborinia camellia* is host and tissue specific, which restricts its infection capability to flowers of the *Camellia* genus. This disease spreads by ascospores, which after landing on a susceptible *Camellia* spp. bloom, germinate to grow hyphae and cause necrosis and death of the petal tissues. The flower then falls prematurely to the ground, where the fungus survives as hardened sclerotium until the next flowering season.

Most plant pathogens utilise a range of proteins to promote infection using mechanisms that include the suppression of plant immunity, degradation of cell walls, or the manipulation of the host's immunity to their own advantage. These proteins are known as 'effectors' and identification of these complex molecules has led to a better understanding of disease and new disease-control strategies for other plants. The aim of Hannah's MSc research is to identify effectors in *Ciborinia camelliae*, and she has been focusing on a protein family that shares characteristics (such as high cysteine content and the size of protein sequences) with known effectors from other fungi. This protein family is called *Ciborinia camelliae*-like small secreted proteins (CCL-SSPs). There are 73 unique protein sequences in *Ciborinia camelliae* but of the ten tested for necrotic ability by recombinant expression and infiltration into camellia petals, none were found to induce cell death. However, a protein found in the closely related fungus *Sclerotinia sclerotiorum*, was found to induce very rapid cell death, which was visible just two hours after infiltration. This protein from *Sclerotinia sclerotiorum* has high sequence similarity to CCL-SSPs. To identify the function of this protein family, Hannah is performing region swaps between the *S. sclerotiorum* protein and a *Ciborinia camelliae* CCL-SSP. By the end of this project, the research team hopes to have: (a) identified the region of the *S. sclerotiorum* protein responsible for its necrotic activity; (b) compared this region with sequences of *Ciborinia camelliae* CCL-SSPs; and (c) deduced the likely function of this protein family, and its role in camellia petal blight.

Figure 1 Observed camellia petal blight on bloom of a highly susceptible *Camellia* species.