

Aphid control through a naturally occurring fungus

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Aphids are the most economically important sap-sucking insect pests worldwide, causing yield and financial losses both from direct damage by feeding, as major vectors for plant viruses, and in insecticide resistance management. High levels of green peach aphid resistance across multiple insecticide types are widespread across Australia. This includes resistance to synthetic pyrethroids, organophosphates and carbamates. The last remaining effective chemistries are the Group 4 however, metabolic resistance to neonicotinoids has recently been identified. A lack of canola host resistance and rapid evolution of insecticide resistance necessitates alternate and viable aphid control solutions for WA growers. There is anecdotal evidence of a naturally occurring entomopathogenic fungus in the field that mummifies and as such kills aphids, and its presence has been identified by growers and agronomists as a vital tool for keeping aphid populations under control, reducing crop damage and reducing chemical insecticide costs. This project was a successful collaboration between CSIRO and Planfarm to survey entomopathogenic fungi towards aphids in WA broad acre cropping, and to gain knowledge and capability on the enhancement of these fungi for aphid control.

Candidate entomopathogenic fungi were identified across northern, mid and southern canola growing regions. Fungi were isolated from 60% of aphid samples, and 50% of these were positive for known or suggested entomopathogens. In general, aphid numbers were very low in the 2018 growing season, impacting the number of aphid samples collected. A dry start to the season also impacted on conditions favoring entomopathogenic fungi. The isolation and molecular validation of entomopathogenic fungi correlated with the presence of mummified aphids and the absence of insecticide and fungicide spraying in paddock management. Paddock fungicide treatment in the Northern growing region was associated with an inability to culture any fungi from aphid samples. The prevalence of mummified aphids was highest in samples obtained from mid and southern canola growing regions and paddocks that received neither insecticide or fungicide sprays, suggesting geographic location and chemical pest and disease management play a role in conditions favouring activity of entomopathogenic fungi. New entomopathogenic fungal candidates of two genera, *Fusarium* and *Alternaria*, were identified from green peach aphid in WA. A representative entomopathogenic fungus of the *Fusarium* genus was selected to determine conditions that enhance entomopathogenic fungal activity. Within controlled environments, foliar spore sprays were most effective with a clear deterrent effect (antixenosis). Similar effects were recorded against bluegreen and spotted alfalfa aphids. This scoping study lays the foundation for future research into the benefits and deployment of entomopathogenic fungi in WA cropping and aid to prolong the efficacy of the last remaining insecticide chemistry for green peach aphid control.