Hort Innovation media release

Monday July 25, 2022

Varroa-targeting pesticide under development

Amid Australia's first Varroa Destructor Mite outbreak, the grower-owned research and development corporation Hort Innovation has joined forces with the University of Sydney to develop a world-first hormone-based pesticide that is safe for honey bees but fatal to Varroa mite.

As part of the $1.2M initiative, scientists will create molecules that selectively bind to and interfere with the hormone receptors of Varroa mite and fellow honey bee pest, small hive beetle, interfering with reproduction, development, and behaviour. The target receptors are absent from vertebrates, making the pesticide safe for other beneficial animals in the environment.

Hort Innovation chief executive Brett Fifield said the project aims to help safeguard Australian honey bees and will have positive impacts to horticulture production.

"Thirty per cent of global agricultural production is reliant on pollination by honey bees," he said. "And across the board, this production is currently under threat from pests including the Varroa mite and the small hive beetle."

Mr Fifield said pesticides are a crucial aspect of sustainable agriculture and disease control. However, there is a pressing need for more environmentally-friendly pesticides that have selective action against 'bad' versus 'good' insects.

"The development of a commercial pesticide that is fatal to Varroa mite and small hive beetle, but not honey bees, will lead to a worldwide market opportunity to export Australian-based technology. It will also offer a significant step toward protecting global agricultural systems that are reliant on honey bee pollination."

Until recently, Australia was the last known inhabited continent in the world that was not permeated by Varroa mite. Varroa mites cause weakness in honey bee colonies by feeding on larvae and pupae. They can also live on adult honey bees, transmitting viruses. Chemical control methods exist but research shows Varroa mites globally are building up tolerances and some treatments aren't suitable for the Australian environment.

Small hive beetles are a major pest in the warm and humid regions of the east coast of Australia, South Australia and northern WA. The larval stage causes damage to honeycomb, destroying brood and stored honey and pollen, resulting in honey fermentation and colonies becoming 'slimed out'. Current control methods include traps based on broad-spectrum insecticides with potential side-effects to bees. The cases of small hive beetle have surged with the ongoing Australian El Nino events causing wet hot summers.

University of Sydney project lead Professor Joel Mackay said insecticides that target Varroa mite and small hive beetle receptors have not been successfully created before.

"There has been international recognition of the potential value of insect hormone receptors as targets for safer selective control agents," he said. "Several companies have tried and encountered technical difficulties largely because these proteins are challenging to express, purify and characterise.

"However, our team has had over a decade of experience tackling and overcoming these technical challenges. We have one of only two laboratories in the world that have determined atomic structures of the hormone proteins of the receptors we are targeting. We have also developed a unique receptor-based chemical library screen for discovery of new pesticide leads molecules."

La Trobe University and the Walter and Eliza Hall Institute are also contributing to the five-year project.

Currently, Hort Innovation is investing more than $61M into research and development projects that aim to enhance and protect pollination security in Australia – from work with flies and native bees that are not affected by Varroa mite to mechanical methods of pollination.

This project is being delivered through Hort Innovation's Hort Frontiers strategic partnership initiative. Hort Frontiers facilitates collaborative, transformation research and development to support horticulture to 2030, and beyond.

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