PEST AND DISEASE CONTROL

FIGHTING VARROA WITH BIOLOGICAL CONTROL MITICIDES

Rae Butler, Bee Smart Breeding, VSH Specialist and Queen Breeder

With the results from the New Zealand Bee Research Priorities survey conducted by Landcare Research emphasising the 'treatment of varroa' as top priority, Artemio Mendoza's talk on 'Identification of Specific Biological Control Miticides to combat the Honey Bee Parasite *Varroa Destructor'* to the Canterbury Hub was aptly timed.

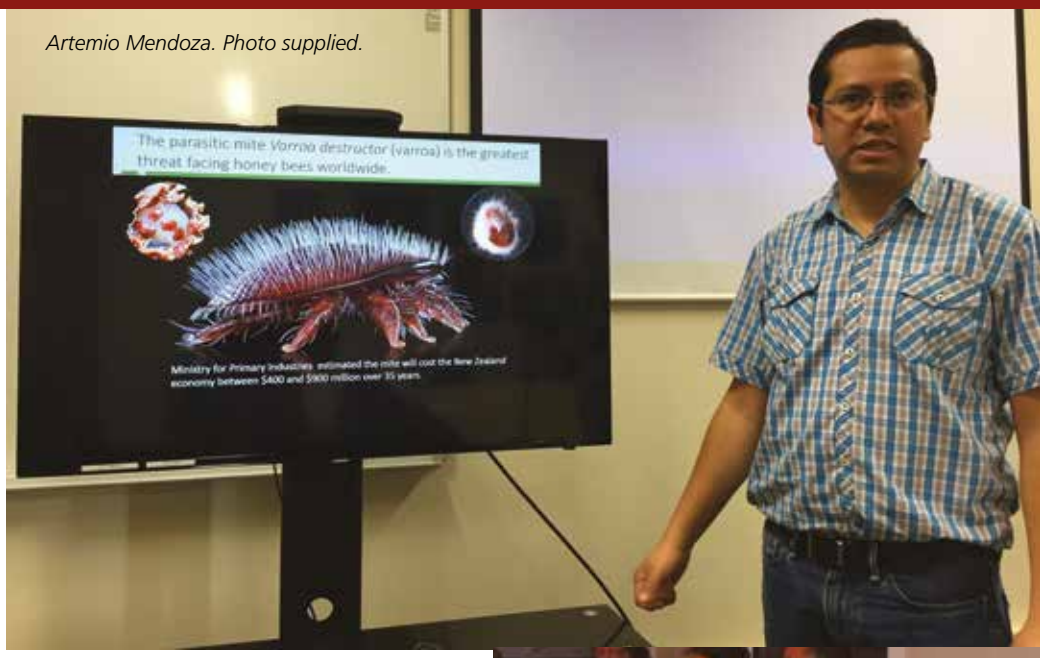
Artemio is a Senior Researcher at the Bio Protection Research Centre at Lincoln University. Together with Professor Travis Glare, Director of the Centre, his team is specialising in biological control (biocontrol) using insect pathogens. They find methods to utilise natural organisms as bio-pesticides or biological control agents to control pests.

Natural organisms such as virus, bacteria, fungi, nematodes, insects and plant extracts are being tested to reduce pest populations. They generally require active human management to be effective.

Fungus-based bio-miticides have been of interest since a farmer observed insects dying in the presence of mites covered in fungus. It was perceived that toxins produced by certain fungi kill insects. These observations paved the way for researchers to identify the active components in some fungi, such as *Beauveria bassiana, Metarhizium spp., Lecanicillum lecanii* and *Hirsutella thompsonii,* as an approach for controlling target pests.

There is research identifying one species of entomopathogenic fungus useful as a miticide. Beauveria bassiana is considered a natural enemy to the *Varroa destructor. Beauveria bassiana* can be found on brood cappings in beehives and occurring naturally on varroa (Meikle et al., 2006; García-Fernández et al., 2008; Steenberg et al., 2010).

Beauveria bassiana has been identified in New Zealand, but the practicality of using *Beauveria bassiana* in a natural state as a miticide has several drawbacks. It may take several days to kill the mite, the detrimental effect it may have on a beehive environment is unknown and the beehive temperature of 33-36^{0}C is higher than the 25-28^{0}C that is optimal for normal fungi development.



Artemio Mendoza. Photo supplied.

Professor Glare's team then looked at Peter Cheong's work at the Lincoln University Bio-Protection Centre in 2016, isolating metabolites from *Beauveria bassiana.* Peter identified and isolated active molecules (metabolites) from *B. bassiana* that are toxic and kill different pests such as aphids, mosquito larvae and brine shrimps.

This established the concept of applying metabolites extracted from entomopathogenic fungi, including *Beauveria bassiana* and *Metarhizium,* for control of varroa rather than using the live fungi. Live fungi that are not pathogenic on honey bees struggle to survive in the hive environment as the fastidiously cleaning bees try to rid the colony of any contaminants.

Ashburton beekeepers. Left: Martin Laas. Right: Matt McCully.

Listening intently to Artemio Mendoza. Left: Rae Butler, Ashburton. Right: Betty Murie, Huruinui. Sitting (left to right): Barry Donovan, Lincoln, Gary Glasson, West Coast and Nick Taylor, Orari. Standing: Ron van Toor, Lincoln. Photos: Maggie James.

The team at Lincoln University will use this intensive bioassay-guided extraction, separation and purification process to look for practical applications. This is similar to the process used by the makers of Apivar®, who managed to identify one molecule that inhibits the varroa receptors and put it in a convenient varroa treatment strip for easy application by the beekeeper.

Not all fungi are beneficial. Some are pathogenic against honey bees, such as Ascosphaera apis, that parasitise bee larvae causing 'chalkbrood'.

Biocontrol is an alternative but needs to be integrated into a pest management plan (IPM). There are 14 bio-fungicides and 14 bio-pesticides registered in New Zealand. They are considered less toxic than conventional pesticides, generally only affect the target pest and no other organisms, are effective in small quantities and break down quickly. For effective control of varroa, their application will need to be integrated into a strategy with biocontrol options.

With a combination of scientific research and practical knowledge, a best management practice of biocontrols for the *Varroa destructor* may have a place in a beekeeper's IPM plan.

References

García-Fernández, P., Santiago-Álvarez, C., & Quesada-Moraga, E. (2008). Pathogenicity and thermal biology of mitosporic fungi as potential microbial control agents of *Varroa destructor* (Acari: Mesostigmata), an ectoparasite mite of honey bee, *Apis mellifera* (Hymeoptera: Apidae). *Apidologie,* 39, 662–673. doi:10.1051/apido:2008049

Meikle W.G., Mercadier G., Girod V., Derouané F., Jones W.A. (2006) Evaluation of *Beauveria bassiana* (Balsamo) Vuillemin (Deuteromycota: Hyphomycetes) strains isolated from varroa mites in southern France. *Journal of Apiculture Research, 45,* 219–220. doi:10.1080/00218839.2006.11101352

Steenberg, T., Kryger, P., & and Holst, N. (2010). A scientific note on the fungus *Beauveria bassiana* infecting *Varroa destructor* in worker brood cells in honey bee hives. *Apidologie, 41*(1), 127–128. doi:10.1051/apido/2009057

MPI

HONEY BOXES MARKING REQUIREMENT IN FORCE FROM 11 DECEMBER

Ministry for Primary Industries

Are you an exporter of honey, or a beekeeper selling honey that will be exported? If so, there's one final provision that comes into force on 11 December.

All requirements in the Animal Products Notice: General Export Requirements for Bee Products (the GREX) are now in force, with the exception of clause 4.1(1)(a).

"Clause 4.1(1)(a) of the Notice requires beekeepers to mark all honey boxes presented for extraction with their allocated AFB code or equivalent code. The purpose of this requirement is to facilitate the identification of boxes at extraction facilities, especially where extraction facilities extract bee products for multiple beekeepers."

Please note that this provision is about being able to identify which honey boxes are owned by each beekeeper. The code does not have to be unique for each box—but the codes do have to be unique to the beekeeper. A beekeeper can use the same code for all their boxes.

For further guidance on this requirement, please refer to section 4.6.1 of the Guidance to the GREX for Bee Products. This can be found on the MPI website (www.mpi.govt.nz).