Investigating RNA Interference as a Method of Varroa Mite Control

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PROJECT SUMMARY

Objectives:

Investigate the potential for using RNA interference (RNAi) gene silencing as a control strategy for Varroa mite.

- Determine the effect of injecting double stranded RNA of a few selected genes on Varroa mite survival and reproduction.
- Contingent upon the success of the above step, explore ways that dsRNA can be introduced to Varroa mite via the honey bee larvae.

Background and Discussion:

RNA interference (RNAi) is a new technology which interferes with gene transcription and the production of proteins needed to carry on normal biological processes. The technique involves introducing a piece of double stranded RNA (dsRNA, 450-550 base pairs) into the organism. The dsRNA is broken up into small pieces (about 20 base pairs). These small base pairs then bind to and disrupt the ability of messenger (mRNA) to act as a template for protein production. This is a break in the chain of events from gene to protein production. This disruption prevents or reduces the production of proteins or enzymes needed for normal biological functions. This disruption, also called "gene silencing" via RNA interference is being investigated as a new and novel means of control for several pests.

This project investigated Varroa mite control using RNAi technology. Briefly, we looked for 6 genes in the Varroa genome and constructed dsRNA in vitro for them. The constructed dsRNA had been effective in causing death or reduction of egg-laying in other insects (i.e., tick, mosquito, fruit fly). We then microinjected the dsRNA into Varroa mites and observed their survival or reproduction.

Results showed that our method of microinjection worked well because the survival of control injected mites was 85 %. After microinjection, we assessed the dsRNA effects on mite reproduction targeting four genes and effects on survival targeting two genes.

Through these studies, we have discovered four genes important for mite reproduction and two genes important for mite survival that could be targeted for RNA interference. Future goals are to find ways to introduce dsRNA associated with these genes into Varroa mites so that their survival or reproduction can be suppressed.

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For More Details, Visit

- 2011.2012 Annual Report CD (11.POLL10.Huang); or on the web (after January 2013) at www.almondboard.com/researchreports