Australian Government
Rural Industries Research and Development Corporation

# Progress in developing strategies for the insecticidal control of Small Hive Beetles

## Disinfestation of stored comb by phosphine fumigation

**NSW Department of Primary Industries (NSW DPI)** conducted trials which demonstrated 100% effectiveness of phosphine fumigation against all life-stages of the Small Hive Beetle. This information formed the basis of a permit application submitted by the **Australian Honey Bee Industry Council** to the **Australian Pesticides and Veterinary Medicines Authority (APVMA)** to extend the use of aluminium phosphide tablets to include the fumigation of stored comb etc. This permit application is currently being considered by APVMA and it is hoped that bee keepers will soon have access to this effective disinfestation method.

*Three stacks each of five boxes of stored comb undergoing phosphine fumigation.*

*Open stacks of boxes of stored comb ready for phosphine fumigation inside a shipping container.*

Phosphine fumigation is already registered for disinfesting wax moth from stored comb and the proposed use against Small Hive Beetle is identical to the existing use pattern.

*Note: combs containing honey must not be fumigated prior to extraction.*

## Traps for Small Hive Beetles

Several traps that do not rely on any insecticides have been designed and evaluated. Most rely on the beetles entering or falling through slots or holes in a horizontal screen or shallow box lid, into a reservoir of vegetable oil. These may be useful for hives that remain in one place for extended periods but they can be difficult and messy to move. One style of trap is being sold in the United States of America. You can inspect the trap on http://www.gabees.com/catalog/385.htm

## Soil treatment to control Small Hive Beetle larvae

Trials conducted by NSW DPI confirmed that permethrin was effective in killing Small Hive Beetle larvae in soil, or larvae entering permethrin-treated soil to pupate. In May 2004 Pesticide Permit **PER-7347** was renewed until 31st May 2006 in New South Wales to allow bee keepers to use ***Farmoz Permex EC Residual Insecticide*** or any other product containing 500 g $L^{-1}$ as the only active ingredient to treat soil in front of hives. The application rate recommended is 4 L $M^{-2}$ and re-treatment every 30 days may be required.

*Full size larva of the Small Hive Beetle (approx. 13 mm long).*


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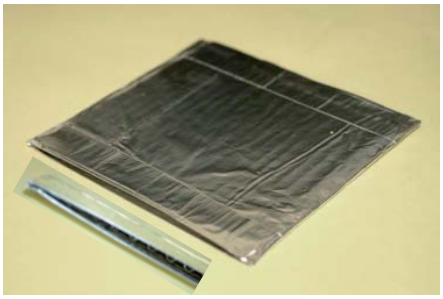
*Small Hive Beetle pupae in soil. (most burrow at least 10 cm in friable soil).*

## Progress towards the development of an 'in-hive' lethal harbourage for Small Hive Beetle adults

Laboratory tests of seven insecticides with potential for the control of adult beetles were completed by NSW DPI as part of RIRDC funded project **DAN-216A Insecticidal Control of Small Hive Beetle.** One insecticide was much more effective against adult beetles and was also less likely to cause unacceptable residues in honey or wax. The other compounds were rejected on the grounds of poor efficacy, unfavourable residue risk, or both. An innovative way of delivering the insecticide that took advantage of the shy habits of the beetle and its preference to rest in cracks and crevices away from the bees was also extensively tested. It comprised a piece of insecticide-treated corrugated cardboard covered with a layer of adhesive-backed aluminium foil. Results of laboratory tests with the artificial harbourage indicated that 98% of beetles contained within sealed boxes of stored comb were killed because they chose to hide inside the cardboard. Further work went into determining an appropriate concentration of insecticide that would be effective, provide adequate persistent activity against beetles and have a useful shelf-life prior to use.

*The prototype lethal harbourage (note the open ends of the corrugated cardboard*



*where beetles enter - see insert)*

Between October and December 2004 trials of this prototype insecticide treated harbourage for adult beetles were conducted in research hives owned by NSW DPI. These trials aimed to measure the risk to hives and potential contamination of honey as a result of the use of the lethal harbourages. Results of trials in which honey collected from hives containing the prototype lethal harbourages was analysed for contamination indicated that minimal residues could be expected unless bees damaged the harbourage. If damage occurred residues in honey were still low, but unacceptable. Perhaps even more importantly, hive death could result.

In February and March 2005 trials of a prototype insecticide treated harbourage were conducted by NSW DPI in strict accordance with APVMA Research Permit **PER-8167**. Permission was granted to treat only 20 infested commercial hives located in western Sydney. Results of these limited trials demonstrated that 87-93% reduction in the number of beetles inside hives was achieved. Damage caused by bees to the harbourage in one of the hives led to the death of that hive. Clearly, a more robust 'bee-proof' housing for the insecticide treated cardboard was required.

The current situation: Despite the encouraging results of the field trials the manufacturer of the insecticide of choice has decided that the company does not wish to co-operate with further development. They have stated that to use their insecticide in this situation doesn't fit with (the company's) product stewardship policy. This is a major blow to developing a product for bee keepers. While other options are explored, NSW DPI is currently seeking an alternative insecticide with the desired characteristics of low vapour and low water solubility.

Concurrently negotiations are underway with plastics design and manufacture companies to make a robust, rigid bee-proof and tamperproof housing for the insecticide treated cardboard. Not surprisingly, the small market size and small manufacturing runs make this project less economically attractive to companies. RIRDC is providing co-investment to facilitate product development.

Complementary research: The University of Western Sydney (Richmond) is hosting a study tour by a group of German scientists led by Dr. Peter Neumann. The group will also be working in the beetle's native South Africa. Dr. Neumann's group will be conducting research into the biology of Small Hive Beetle, particularly reproduction outside of the bee hive (eg. in fruit); the influence of hive status (eg. 'strong' vs 'weak/stressed' or 'queenless'); the role of Small Hive Beetle in the transmission of diseases such as AFB; the potential use of traps based on aggregation pheromone; and, the development of alternative hive design to reduce or even eliminate beetle entry.

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