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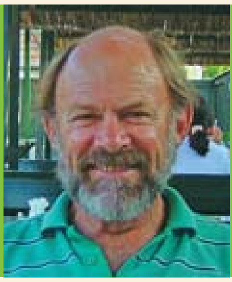
Rural Industries Research and Development Corporation

Honeybee R&D News



Chairman's Foreword

Des Cannon, Chairman, HBRDC (RIRDC)

The Research Program would appear to have been quiet over the past three months but in reality a lot of work has been going on, with continuing projects being advanced and the new projects announced in the last issue of Honeybee R&D News having been contracted.

There has been one Research Project completed, a study on existing and prospective markets for Australian honey (see new Publications in this News), and there has also been a workshop held to promote minimal use of chemicals, and to evaluate alternative methods of treatment, in the event that Varroa ever becomes established in Australia (see article below)

Coming up in the next two months are Committee Meetings for both the Honeybee R&D Program, and for the Pollination R&D Programme. At these two meetings, preliminary proposals for R&D Projects will be evaluated. Projects that each Committee deem to be suitable will be re-evaluated as Full Research Proposals at the respective meetings in March next year, at which funding will be allocated for new Projects to commence from July 2011 and onwards.

Hopefully the task before the Committees will have been made a little easier this year in that RIRDC published some months ago a list of Research Priorities for the coming years of funding, and many of the Preliminary Proposals received have been targeted at these agreed Research priorities.

For further information about the RIRDC Honeybee Research and Development Program, feel free to browse the RIRDC website (www.rirdc.gov.au) or contact the Program Co-ordinator, Helen Moffett, on 02 6271 4145, or email Helen.Moffett@rirdc.gov.au

Current R&D Committee

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Workshop on Chemical and Non-Chemical Treatments for Varroa

A two-day workshop on this topic was hosted by the Pollination R&D Programme in Canberra on 20/21 August 2010. The first day focussed on R&D needs in the event that Varroa ever becomes established in Australia, and presentations were made by Drs Medhat Nasr (Canada) and Mark Goodwin (New Zealand) on the Canadian and New Zealand experiences with Varroa. The second day focussed on beekeeper needs in the event of Varroa entering our country.

About 45 people attended the two days, with researchers, beekeepers, pollinators, horticulturalists and Government departments being represented.

Some of the most important points made at the workshop included:

- The possibility that by the time we get Varroa, the Varroa that we get may already be resistant to many of the chemicals employed for its control.
- Use of 'hard' synthetic chemicals, whilst giving a high rate of control (depending on whether resistance is present), also results in contamination of beeswax, which may in turn affect the development and viability (reproductive function) of the queens and drones.
- The need to test immediately on entry of Varroa, for the presence of any resistance to chemicals.
- The need to have a wide range of chemicals registered for use, so that beekeepers can rotate chemicals to slow development of resistance.

Varroa on bee larvae

- The need for beekeepers to accurately measure the level of Varroa present, so that they know WHEN to treat, and also whether the treatment was effective
- The need to educate beekeepers on use of both synthetic and organic chemicals
- The need to effectively reduce Varroa levels prior to the onset of winter, and at the same time ensure bees have good nutrition levels entering winter. Without both these occurring, hives are unlikely to survive the winter.
- The need to evaluate our own honeybee stock for Varroa resistance/ tolerance, rather than rely upon imported honeybee stock which may not be effective in the Australian climate/environment
- The expected effects upon horticulturists and growers as feral honeybees decline, resulting in a diminishing of pollination services in the environment. This will lead to a shortfall in production, and the necessity for the honeybee industry to expand to make up the loss in pollination service, in order that production can continue at the desired level. This will inevitably lead to an increase in the prices received by beekeepers for pollination services. Whether the industry can meet this demand is unknown.

Non-chemical means of control discussed included

- Varroa-sensitive hygienic behaviour
- Breeding for resistance to Varroa
- Drone brood control
- Screen bottom boards
- Temperature control
- Organic acids
- Biological control
- Pathogen control and integrated pest management (IPM)

To model a system used in New Zealand, A workable Varroa control strategy used in NZ consists of:

1. Start with a standard chemical control program
2. Use only single, not double, brood boxes
3. Remove honey from hives early
4. Use mesh floor boards in hives
5. Practice drone trapping
6. Resistance management through chemical rotation
7. Use only low resistance treatments
8. Sampling to monitor Varroa levels
9. Understand and practice threshold treatments
10. Plan for organics

Some of the issues raised are already being addressed. A number of new Honeybee and Pollination R&D projects are tackling problems such as evaluation of our stock overseas for its ability to tolerate/resist Varroa; registration of the chemicals needed for treatment of Varroa; strengthening the effectiveness of surveillance in our seaports; evaluating the effects of the new strain of *Varroa jacobsonii* in Papua New Guinea; evaluation of tube bottom boards used as a adjunct to IPM for Varroa for their effect upon honey production; a DAFF Committee (Commonwealth Dept of Agriculture, Fisheries and Forestry) is looking at ways to ensure continuity of supply of pollination services in the event of a Varroa incursion.

Honeybee R&D In Australia

Cold Bees Seek Warm Nectar

www.monash.edu.au August 13, 2010

When we venture out on a cool morning, nothing energises our body like a nice warm drink, and new research reveals that bees also use the same idea when they're feeling cold. A study by Drs Melanie Norgate and Adrian Dyer shows that bees also like to keep winter at bay with a warm drink.

The Monash University research, published in the prestigious journal PLoS One, has shown that important pollinators of many of our flowers, native Australian stingless bees, warm up their bodies by having a 'hot' drink on a cool day -- or a 'cool' drink in warmer weather. Working with collaborators from Monash University and the CSIRO, the researchers showed that at a range of ambient temperatures (23-30°C) bees displayed a significant preference for feeding from artificial flowers that presented nectar-like solution that was warmer than the ambient temperature.

"The bees perceived warmth as an important reward in addition to the nutritious nectar that they collect from flowers. However, surprisingly for the research team, when the ambient temperature reached 34°C, the bees began preferring a cooler feeder," Dr Dyer said. 'The study showed that just as a person might choose which type of drink to have depending on the weather, the bees also made a decision on their drink, based on what flowers might offer nectar at the ideal temperature for the particular climatic conditions.'

The researchers then measured the body temperature of bees after they had ingested warm liquid nectar.

'The bees' preference for warm liquid was then examined by using special infrared cameras that recorded the body temperature of bees whilst resting, flying or drinking nectar of different temperatures. The thermal images revealed an interesting pattern as the warm nectar helped bees maintain a body temperature (30-34°C) that is likely to be required by insects to maintain active flight," said Dr Dyer. 'Choosing nectar of various temperatures appears to be a novel behavioural mechanism bees use to maintain the most suitable body temperature for flight,' Dr Norgate said.

Future work will concentrate on understanding what flower features enable plants to modulate the temperature of their flowers to present rewards to pollinating insects, and how this may be important for the distribution of flowers in different regions where climatic conditions like temperature are variable or changing.

Honeybee R&D Overseas

The jump of Varroa from the Asian bee *Apis cerana* across to the European honeybee *Apis mellifera* is without doubt the single biggest issue facing beekeeping across the world. Along with Varroa we have the influence of the bee viruses, which by themselves often do not exhibit as a problem for bees, but which in the presence of Varroa have drastic effects upon hive health.

This being the case, there is a huge body of research being done across the world on Varroa, and also on the bee viruses, and on hive health in general. In the US, media attention has focussed on Colony Collapse Disorder (CCD), but most of the rest of the beekeeping world has focussed on Varroa.

In Europe, a lot of work is being done in BEE DOC (Bees in EuropE and the Decline Of honeybee Colonies). The BEE DOC comprises a network of eleven partners from honeybee pathology, chemistry, genetics and apicultural extension aiming to improve colony health of honeybees. The BEE DOC will empirically and experimentally fill knowledge gaps in honeybee pests and diseases, including the 'colony collapse disorder' and quantify the impact of interactions between parasites, pathogens and pesticides on honeybee mortality. Specifically BEE DOC will show for two model parasites (Nosema and Varroa mites), three model viruses (Deformed Wing Virus, Black Queen Cell Virus, Israel Acute Paralysis Virus) and two model pesticides (thiacloprid, t-fluvalinate) how interactions affect individual bees and colonies in different European areas.

BEE DOC has 11 partners from universities, Science Academies, Research Centres and Institutes in Germany, Sweden, France, Ireland, Switzerland, Bulgaria, Slovakia and Spain.The BEE DOC is linked to various national and international ongoing European, North- and South-American colony health monitoring and research programs, which will not only ensure pan-European but also global visibility and the transfer of results to apicultural practice in the world community of beekeepers.

One of the principal reasons for the decline in managed honeybee colonies, and of beekeepers, is extensive and unpredictable colony death. Moderate and predictable losses can be accommodated and planned for. However, extensive and uncontrollable losses make beekeeping as a profession, with heavy investment in material and equipment, an enterprise at permanent risk of bankruptcy. It is these colony losses that the BEE DOC aims to address.

Typically, the apiculturist identifies symptoms at the colony level, and then starts diagnostic procedures to identify the disease and initiate a treatment. Yet, when clinical symptoms appear at the colony level, diagnosis often comes too late to save or cure the colony. Consequently, there is a clear need for fast, reliable, sensitive and cheap diagnostic tools that alert the beekeeper to potential problems before colony level symptoms appear. Treatments typically rely on chemicals, which are administered into the colony to target pathogens before colony collapse is inescapable. The development of such treatments is based on searching for chemicals that are toxic to the pathogen, but harmless to the honeybee.

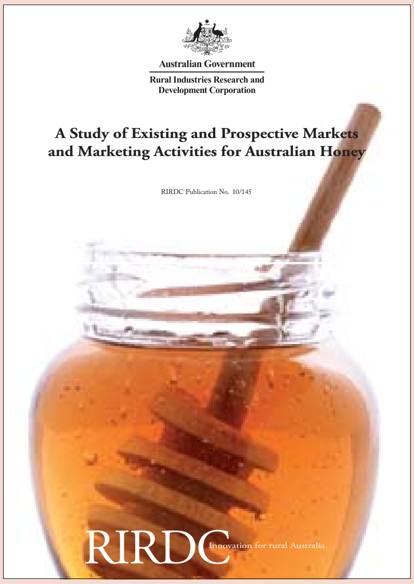
However, so far, any chemical treatment of a honeybee disease, even if successful at the colony level in the short term, has not eradicated diseases at the population level, particularly if the pathogen has a high transmission rate and a high infectivity. As illustrated by present apicultural reality, any chemotherapy of honeybee colonies immediately leads to an obligate contamination of honey and, ultimately more worrying, to resistant pathogens. Moreover, the dramatic colony losses of the past decade suggest that treatments aiming at a single pathogen only, may in principle fall short in curing colonies altogether if the interactions between various pathogens are the main drivers of colony death.

Despite the enormous research efforts invested in the USA, no single agent or factor emerged as the definitive cause of the phenomenon. Instead, the best hypothesis to emerge from the data is that particular virulent combinations of parasites and pathogens, rather than a classical monocausal disease, is the most likely explanation. Moreover, chronic exposures to pesticides that cause no problems for healthy colonies are suspected to interact with pathogens to produce lethal consequences for colonies already weakened by disease.

The classic example of such interactions among pathogens is the case of the ectoparasite *Varroa destructor*, whose lethal effect on colonies is in large part due to its ability to activate and transmit a number of viral diseases. The combination of pests, parasites and pesticides results in an inadvertent "meltdown" with one negative factor enhancing the negative impacts on honeybee health of the others. The BEE DOC will therefore focus on the interactions of these parasites with closely associated viruses and selected pesticides.

New RIRDC Honeybee-related Publications

All RIRDC publications can be purchased in hard copy, online from www.rirdc.gov.au , or may be downloaded for free from the same site.



A Study of Existing and Prospective Markets and Marketing Activities for Australian Honey

$25.00
Martin Kneebone
Publication Number: 10-145 (53 pages)

This RIRDC study aims to find ways to improve producer returns by assessing the effectiveness of the current supply chain arrangements and exploring the scope for the distribution of new and enhanced honey products. In particular, the study assessed the potential to deliver products specific attributes such as low Glycaemic Index (GI) and benefits derived from products that can enable antimicrobial and prebiotic activities.

Research in Progress – Honeybee 2009-10

$0.00
RIRDC
Publication Number: 10-090 (32 pages)

Honeybee Research in Progress June 2010 contains short summaries of continuing projects as well as those that were completed during 2009–2010. The Honeybee Program aims to improve the productivity and profitability of the Australian beekeeping industry through the organisation, funding and management of a research, development and extension program that is both stakeholder and marked focused.

The objectives of the Honeybee Program are:

- Pest and disease protection
- Productivity and profitability enhancement to lift beekeeper income
- Resource access security and knowledge
- Pollination research
- Income diversification including new product development
- Extension, communication and capacity building.