Volume 16 No. 5
Supplement 2003

Hive Lights

www.honeycouncil.ca

Canadian Honey Council

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Section I

Officers of the Canadian Honey Council

Canadian Beekeepers Association 1940-1972

	President				Secretary		
1940-41	William R. Agar*	Brooklyn	ON	1940	W.T Patterson*	Winnipeg	MB
1942	Sam M. Deschenes*	Montreal	QC	1941-48	Roy M. Pugh*	Tisdale	SK
1943	J.W. Braithwaite*	Brandon	MB				
1944	P.C. Colquhoun*	Maple Creek	SK				
1945	Allan T. Brown	Peterborough	ON				
1946	W.E. Phillips*	Dauphin	MB				
1947-49	Frank Garland*	Winnipeg	MB				
1949-51	J.N. Dyment*	Smithville	ON	1949	W.G.LeMaistre*	Edmonton	AB
1952	Peter Kowalski*	Edmonton	AB	1950-59	Roy M.Pugh*	Tisdale	SK
1953-54	W.H.Turnbull*	Vernon	BC				
1955-56	H.C. Allen*	Toronto	ON				
1957-58	Sid J. Lye*	Oakville	MB				
1959-65	Victor Mesley	Kemptville	ON	1960-62	R.M.McKay	Ottawa	ON
1966-67	Earl J. Burnett*	Roland	MB	1962-69	John E. King*	Ottawa	ON
1968-69	Robert Asher	Brooks	AB				
1969-71	Lou Truscott	Creston	BC	1969-72	Hank R. Taylor	Ottawa	ON

Canadian Honey Council 1972-2003

	President				Secretary		
1971-72	Don F. Peer*	Nipawin	SK				
1972-74	Robert Bird*	NewWestminster	BC	1972-75	Frank R. Garland*	Winnipeg	MB
1974-76	Jack M. Smith*	Beaverlodge	AB	1975-82	Fred Rathje*	Bassano	AB
1976-78	Gerry Paradis*	Falher	AB				
1978-80	Tom Taylor	Nipawin	SK				
1980-82	Howard Bryans	Alvinston	ON				
1982-84	Merv Abrahamson	Pelley	SK	1982-85	Bob Douglas	MacGregor	MB
1984-86	Jerry Awram	Hines Creek	AB	1985-98	Linda Gane	Nipawin	SK
1986-88	Dale Hansen	Farmington	BC				
1988-93	Roger Congdon	Cottam	ON				
1993-95	Barrie Termeer	Rollyview	AB		**National Coordinator**		
1995-99	Wink Howland	Yorkton	SK	1998-	Heather Clay	Calgary	AB
1999-01	Merv Malyon	Brandon	MB				
2001-02	Dave MacMillan	Thornloe	ON				
2002-03	Wink Howland	Yorkton	SK				

* Deceased

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Minutes of the 62nd Annual Meeting of the Canadian Honey Council

4-7 December, 2002, Niagara Falls, ON

The 62nd annual meeting of the Canadian Honey Council opened at 9:00 AM, Saturday 7 December, 2002 at the Sheraton Fallsview Hotel, Niagara Falls ON.

President David MacMillan opened the meeting and welcomed members and guests. Reports of the research symposium that was held December 5th and 6th are found in Section II.

Business Meeting

Saturday 7 December 2002

Present: David Macmillan, Wink Howland, Phil Veldhuis, Stan Reist, Grant Hicks, John Pedersen, Alain Moyen, Paul Vautour, and the National Coordinator Heather Clay

Minutes of the 2002 meeting

Motion: Moved by Paul Vautour, seconded by Wink Howland. To accept the minutes of the January 2002 Banff AB meeting as printed in the proceedings

CARRIED.

There was no business arising from minutes.

2002 Financial Statement

Wink Howland

The financial statements Appendices I, II and III were presented to the delegates.

Motion: Moved by Wink Howland /John Pedersen to accept the 2002 financial statement as presented.

CARRIED

Motion: Moved by Wink Howland/ Stan Reist that Jack MacKay be appointed auditor for the year 2003

CARRIED

President's Report

Dave MacMillan

This is the second meeting in 2002 as we met in Banff in February. It was clear from that meeting and the number of people attending the business session at this meeting that the scheduling of the business session should be earlier in the program. We will endeavour to address this problem when setting the agenda for the next meeting in 2004.

2002 was good year overall for beekeepers in Canada. The price of bulk honey doubled and production per colony was good. There is cautious optimism in the industry as we proceed into 2003.

The CHC has agreed to develop a national standard for On Farm Food Safety. We are finishing Phase 1 of the program and will commence Phase 2 in 2003. We have identified the requirements, strategy and approach. Now we will work on producing a generic model and a web based system for presenting the national standards. Beekeeper participation in the COFFS program will be voluntary.

Doug McRory, Heather Clay and I attended meetings in Ottawa. We have yet to meet with the minister of Agriculture but we did meet with his assistant Bryan Kirk and advised him of our concerns. We met with representatives of the Pest Management Regulatory Agency regarding formic acid registration. NOD apiary products is close to submitting a formal application for the registration of their product Mite Away II. Coumaphos registration is futher off. We requested a compensation fund to be set up using the 3% that PMRA holds back on sales. The PMRA advised that this is all for administration and cannot be reassigned.

Also on the list for Ottawa was the Veterinary Drug Directorate of Health Canada for discussions regarding the registration of Tylosin and Lincomycin. If we can get these two products registered in Canada we could alternate them with Oxy-tetracyclyine to prevent American Foulbrood from becoming resistant as they have become in Alberta and BC.

The CFIA is conducting a risk assessment on importation of bees from continental USA. The report is due out any time. New legislation in the USA may prevent bees on comb being moved. It awaits to be seen what will come of the border issue.

Motion: Moved by Stan Reist/ Phil Veldhuis to accept the President's report as presented.

CARRIED

National Coordinator's report

Heather Clay

Maximum Residue Level for Oxytetracycline and Tylosin

Oxytetracycline hydrochloride (OTC) has been in use as an antibiotic for more than 40 years. When it was first registered for use there was no federal requirement to set a maximum residue limit (MRL) in honey. The food inspectors operated on an unofficial "administrative tolerance" of 0.1ppm (100 ppb). In the past this has not been a concern because residues below 0.1 ppm were not detectable. However advances in technology now mean that the scientific equipment for checking residues can detect levels as low as 0.006 ppm (6 ppb). Without an official MRL the Canadian Food Inspection Agency enforces a zero tolerance for oxytetracycline in honey. The CHC is actively pressuring Health Canada to set an MRL and we expect a resolution to this situation within the next few weeks

Coumaphos Emergency Registration

Fluvalinate (Apistan) resistance has spread in Canada. New Brunswick, Ontario, Manitoba, British Columbia and Alberta have received permission an emergency permit for the conditional sale and use of coumaphos in the problem areas. The availability of coumaphos should help beekeepers deal with the situation while they work on improving their varroa mite management. The CHC is working with various authorities to have the drug registered and legally available to beekeepers who need an alternative to fluvalinate.

Honey House Grading Regulations

The new Honey House Grading Regulations were discussed with CFIA personnel in Ottawa. Some producer packers have been part of a pilot programme to test the workability of the new inspection system. There are a few problem areas but generally most were happy with new inspection practices. It requires more paperwork than most are used to and the CHC is working with the CFIA to ensure that the rules are kept "beekeeper" friendly.

Chloramphenicol in Chinese honey

In March 2002, chloramphenicol was detected in imported Chinese honey. The CFIA responded to a directive from Health Canada to recall all products that contained the offending Chinese honey. A list of recall products appeared on the CFIA website and the story received media attention for some time. It is surprising how many products contained blended honey. The unfortunate part is that blended honey can be labeled Canada No 1. We have requested CFIA require that only 100% Canadian honey can be labeled No 1. Honey sales in the east were affected by the recalls.

Imidacloprid problems

The summary of the imidacloprid workshop in Calgary, January 2002 reported that imidacloprid when used correctly is not a threat to honeybees. A number of beekeepers disagree claiming that the reviewers only looked at short term studies and that the study in 2001 on PEI did not check the colonies that had experienced problems of decline. As a result, researchers Dr.Jim Kemp and Dick Rogers have sought funding to conduct a more detailed study on PEI during the summer of 2002 and 2003. The CHC is very supportive of this initiative as it should investigate the many factors that contributed to the decline of colonies.

Organic honey

The Canadian General Standards Board is currently reviewing the standards for the production of organic honey. Our association has not been included in the process and we found out during our meetings in Ottawa that there was a chance of getting involved before the end of the review process. We sent a representative, Terry McEvoy to the organic working group meetings in Ottawa. He was able to present our position on the problem of buffer zones and organic certification. Beekeepers can control what goes into the hive and what crops they place the bees on but they cannot control the land use in a zone of 3.5 km radius or 60,000 acres. We want to see the Canadian standards made realistic and brought into line with international requirements.

Small Hive Beetle in Australia

In October 2002 we received news from Australia that Small Hive Beetle had been detected. The NSW and Queensland government websites kept beekeepers informed with maps and inspection information. It is a tribute to their inspection system that they can deal with a breach in biosecurity so promptly and effectively. Within a month authorities decided not to eradicate colonies and to declare the SHB endemic.

Canada imports several thousand packages and queen bees from Australia each year. The trade is very important

and Phillip Corrigan, Australian Trade Commission, Washington DC presented the most recent information on the status of SHB. After discussions with their associations the CHC directors held a phone conference December 13th and voted unanimously to recommend to the importation regulators at the Canadian Food Inspection Agency that they allow imports of Australian package bees and queens from areas that do not have small hive beetle.

Canadian On Farm Food Safety

The CHC has moved into Phase 2 of the COFFS program. The team leader is Wink Howland and he will be developing a generic model for beekeeping operations. As well the CHC will be giving beekeepers across the country an opportunity to learn more about HACCP and risk assessment via an interactive website. The feedback received from beekeepers will assist the technical team to modify the generic model. In summer we will be testing the model on real-world basis for both large and small operations in several regions of Canada. Other commodities have developed their models using hired HACCP specialists but we hope that our consultative approach will provide beekeepers with more information and better acceptance of the program

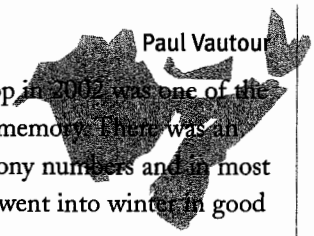
Motion: Moved by Dave MacMillan / Wink Howland to accept the National Coordinator's report as presented.

CARRIED

Delegates Reports

Maritimes

Paul Vautour



The honey crop in 2002 was one of the best in recent memory. There was an increase in colony numbers and in most cases colonies went into winter in good condition.

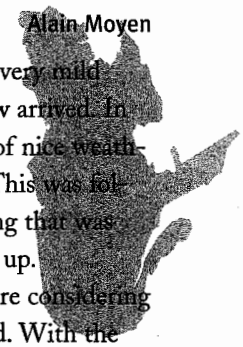
Prince Edward Island had 35 beekeepers and 3187 colonies compared to last year's 40 and 2848 respectively. The increase was the result of splits, imported colonies from Nova Scotia, and packages from New Zealand. The increases would have been greater but there were 30% winter losses. All operations were inspected on PEI. Only 6 cases of scattered AFB were found. No tracheal mites were detected in the province. Bee Health Regulations were amended to allow importation of queen bees from Hawaii.

The N.B. Department of Agriculture, Fisheries and Aquaculture launched a "bee recovery program" to help replace the previous years heavy losses. New Brunswick Beekeepers Association is concentrating on the treatment of resistant Varroa in partnership with Agriculture and Agrifood's CARD fund. Coumaphos was made available to treat colonies and the beekeepers who return strip are eligible for a rebate. A significant number of AFB findings were reported in three areas of New Brunswick.

Nova Scotia reports that no tracheal mites have been found in the province. Varroa mites are under control and testing will be done for fluvalinate resistance in spring. It is expected that 17,500 colonies will be sent to pollination next spring.

Québec

Alain Moyen



The winter months were very mild until April when the snow arrived. In April we had two weeks of nice weather to work on the hives. This was followed by a cool, wet spring that was not good for spring build up.

Québec beekeepers were considering treating with Formic Acid. With the weather being cool a few treated and the results were very hit and miss. Pollination went well in May and June. The first honey production started early June and ended in July. A second honey flow started in August and lasted until early September.

Serious questions are being raised about varroa mites with fluvalinate resistance. Our next step is getting emergency use of Coumaphos hopefully for next spring.

In the Montréal area honey production was average if not slightly above average. For the rest of the province the production was reported to be slightly under the hundred pound average.

Now for the good news... the price... where do we stop or do we want it to stop? Honey sales ranged from $1.50 /lb and up to $2.35/lb.

Speakers at the North American Apicultural Research Symposium were talking about major changes and important attitude adjustments we might have to make. The choice is ours: Do we pay now or do we pay later? I can't help thinking that as beekeepers we are faced with serious challenges.

Ontario

David MacMillan

I've been waiting 25 years to be able to combine an excellent crop with unheard of prices. This year mother nature smiled on us in this northern region of Ontario. Production was over 230 lb per colony which is a record for this area.

Some of the credit for our good fortune has to go to the O.B.A's. breeding program. We have been using Buckfast stock for a number of years now and have seen a steady rise in our average yields. We have also seen a dramatic decrease in the number of swarms.

Most of Southern Ontario has seen little rain this summer and yet many beekeepers report yields around the hundred pound mark. The goldenrod flow has not materialized in many areas and this can be blamed on the drought finally having its effect.

Testing for fluvalinate resistant varroa has been conducted in the high risk areas. So far the results have been negative with the exception of the Cornwall district. We are still free of the small hive beetle even though it is present across the river in New York State.

The high prices seem wonderful at the moment, but I am concerned about the damage it may do to the marketplace. We have experienced some consumer resistance. If industrial users switch to other sweeteners will they switch back and once customers are gone will they ever come back?

Manitoba

Phil Veldhuis

Manitoba had an eventful annual meeting in November. A special interest group scooped the elections and threw out all the previous resolutions. The thrust was to open the border with continental USA for importation of bees with no conditions attached. Most members were caught by surprise and there is a move to have the meeting annulled because the voting procedure was not according to the rules of the constitution. In the meantime it is unclear as the status of the Manitoba position on importation.

A beekeeper survey was conducted earlier in the year. The survey returns were collected and tabulated by a neutral party. The results of the survey did tell us some important things. For instance, there is very little support for complete deregulation. It also tells us that a majority of beekeepers would like to see restrictions on U.S. bees eased, but that they take the risks associated with bee diseases and pests very seriously.

Small Hive Beetle was found in Manitoba, associated with the importation of cappings wax to a beeswax rendering plant located near MacGregor. The operators of the wax plant alerted Manitoba Agriculture and Food that they suspected the small hive beetle after they learned that Texas was no longer free of the pest. Since they had recently imported raw cappings wax from that state, they feared the worst. The owners of the rendering plant have been very co-operative and pro-active about this problem. They imported this raw wax legally, and they have voluntarily accepted other restrictions to prevent the spread of diseases and pests. Furthermore, they have taken some trouble to try and eradicate the pest by drenching and removing soil from close to their building, and have taken themselves out of production until we learn more about how to proceed.

We started the summer worrying about spray damage associated with forest tent caterpillars. Cold weather in May dealt with that issue. However, a much more serious situation developed as the West Nile Virus spread into Manitoba. Two circumstances have put beehives throughout Manitoba at significant risk of pesticide damage. Requests from beekeepers with hives registered in city limits, and residents who had asked for their properties to be exempted from nighttime fogging were ignored. The Provincial Government announced that they would fund 70% of anti-mosquito fogging by any municipality. This is likely the most important issue for our industry this winter. Provinces and Municipalities will be under strong political pressure to spray mosquitoes next summer.

The MBA was founded in 1903. We will be hosting the annual CHC meeting during our celebration and convention in 2004.

Saskatchewan

Wink Howland

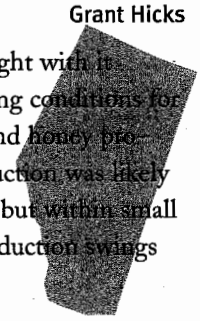
We experienced a very different fall season this year. Due to the drought conditions that most of the province experienced during June and July, much of the seeded canola failed to germinate. The resulting crops were thin and poor, and the honey flow suffered. August rains produced a second growth of canola. Some beekeepers were still putting out boxes on the 10th of September and being repaid within a week, with full boxes of white canola honey. In some cases that flow amounted to an additional 75 lb of honey or better. Concerns regarding getting a crop at all, switched to worrying about being able to properly prepare the colonies for winter, and how the bees might winter on the fast granulating canola that they were busily storing in the brood nests, rather than their regular diet of sugar syrup. That combination of late honey at record prices, combined with reduced feeding costs, has created a new worry for many of our beekeepers - taxes!

October came in hard and cold, but without snow. The lack of snow assisted in getting the bees wrapped, and then along came November and December with above average temperatures, and still little snow.

Honey prices seem to have flattened a bit, but still remain in the $2.30 range. There are a few loads of honey around the province, but the bulk of the crop has been sold, and that amount remaining has more to do with speculation that the price may go higher yet, that it has to do with lack of buyers. This outlook has led to beekeepers looking at trying to put extra bees into production next year, to take advantage of the record prices. This effort has dried up the availability of nucs and will put pressure on the package suppliers and queen producers, to fill the demand. This would not be a good year to delay your ordering.

Alberta

Grant Hicks



The 2002 season brought with it diverse and confounding conditions for colony development and honey production. Overall production was likely quite close to average, but within small geographical areas production swings were quite wild.

Goals

The Alberta government has set a goal of changing the annual value of agriculture from ten to twenty billion dollars by 2010. The Board of the Alberta Beekeepers Association has bought into this concept and feels that the challenge to double the production of the industry is one, which we can attain. There are 230,000 hives in the province and our Board has taken on the goal of having drastically increasing that number in the next few years. The flowers are out there. Nearly four million acres of canola are grown in our province and as many acres of hay and forage seed. The flowers are there; the weather comes and goes. Serious efforts are being made to gain greater access to financing, training for young beekeepers, the continued development of queen production, residue free methods for maintaining colony health, etc. Many of these issues we are currently addressing, while others are at the proposal stage. A solid floor price for honey would be useful.

Tylosin

The Government of Alberta, the Alberta Beekeepers Association, the Alberta Veterinary Medical Association, Agriculture and Agri-Food Canada and the Canadian Honey Council through the Canadian Bee Research Fund (CFRB) have developed a protocol whereby hives, which have been confirmed to have oxytetracycline resistant AFB, can be treated with Tylosin. The Tylosin is attained from a local veterinarian on a prescription basis. We think that we are on the right track with this process, as it is apparent that with full registration of this product in the U.S., will be on a prescription basis. Prophylactic treatment of AFB is a thing of the past. Beaverlodge Research Station is doing some exciting work in the area of AFB detection. A reliable method of predicting problematic levels of AFB would be a useful tool as we change our management techniques around this disease. A rotational model for antibiotic use to control AFB is needed. The western provinces all need to develop this process, as there are many concerns around the resistant AFB issue.

Coumaphos

Fluvalinate resistant Varroa mites have been found around Alberta, in and around operations that winter their colonies near the U.S. Border. The ABA board requested our province make Coumaphos available to producers across the province. The thinking was that if all our producers change to Coumaphos use before resistance to fluvalinate is homogenous, then the treatment era for Coumaphos use, would be reduced. Europe and the U.S. have shown that persisting with fluvalinate until resistance is universal results in a 5-6 year cycle before full potency returns. We would like to cut that time frame by two-thirds. Alberta supports a Bayer initiative to go for full registration of Coumaphos, as we see a continuing role for this product, on a rotational basis. We will be joining the U.S. and New Zealand initiative in lobbying Bayer to push for the registration of Amitraz. The ABA is requesting from, and cooperating with the government in establishing a resistant Varroa mite monitoring program, formic and oxalic acid trials, as well as trials of other food grade solutions. Our 2002 Convention keynote speaker, Richard Adee, who operates 50,000 hives in the U.S., suggests that mites are no reason to leave the honey industry, but that low prices are!

Queen Production

Queen production in Alberta was one of the spin-offs of Dr. Tibor Szabo's work in queen production with Agriculture and Agri-Food Canada, through provincial funding, at Beaverlodge Research Station. Training in queen production was part of the program at Fairview College, for students at the College, and through 'On-Farm' training sessions for commercial producers across the prairies. Further, most Alberta beekeepers spent time working in California operations at some time or another. Bee stock in California was selected to a large degree, from Western Canada. Seventy cent honey, several below average crops, seventeen to twenty dollar queens and eighty dollar packages of bee stock

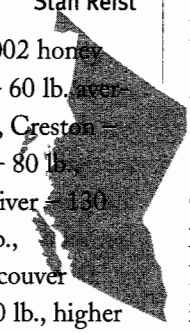
unsuited for life in Western Canada have helped to drive the movement to self-sufficiency in bee stock. I am not sure about the entire province, but in the Peace Country where we have 50,000 hives, as many as 30,000 queens may be produced. Self-sufficiency in the Peace River district has evolved to the point where we eliminate more hives in the fall than are operated in some provinces.

Bee Importation

The Alberta Beekeepers Association, Importation Committee, has hired a consulting team whose background is Animal Health and Economics, and who are familiar with bureaucratic process, to address this issue with Ottawa. Alberta beekeepers have no qualms with other provinces keeping your borders closed as you endeavor to get queen rearing and nuc development off the ground, or increase the number of pollination colonies in your jurisdictions. Our members do feel that access to stock from the continental U.S. would broaden the number of management tools available to them, in any given situation. The Alberta Beekeepers Association has sent NO resolutions to Council this year. The membership of the ABA has had discussions over the last couple of years as to the viability of maintaining membership in Council. The Motion to withdraw was tabled last year. This year saw quite an animated discussion around this issue. Our membership feels that Council needs to become a more productive body, but that we should work from within the organization to affect this change, rather than from without. We are willing to support and work within Council, we ask only that the primary focus be to facilitate the ability of our producers to make a reasonable living and to grow their businesses.

British Columbia

Stan Reist



This is a synopsis of the 2002 honey crop in BC: Grand Forks – 60 lb. average due to hot dry weather, Creston – 45 lb., Castlegar / Nelson – 80 lb., Quesnel – 125 lb., Peace River – 130 lb., Fraser Valley – 40-50 lb., Armstrong 70 lb. and Vancouver Island – low areas – 70-100 lb., higher areas – 150-250 lb.

June was warm and dry followed by cool, wet weather into early July. When the weather warmed up the flow started. One Vancouver Island beekeeper says that he has never seen it so good in his 57 years of beekeeping. He had some supers that he did not want to lose to the wax moth, so he thought he would put them on the hives and let the bees look after them. The bees kept filling everything he put on.

This is the first year that I know of on Vancouver Island, that a dead out gave you a 150 lb. crop. I almost think that if you put an old shoebox out they would have filled it. A beekeeper from Qualicum Bay averaged 180 lb. per hive from 4 hives in his back yard and said it reminded him of being in the Peace River.

So, with a good crop and the prices as they are, it should be a good year. At $2.00 a pound wholesale, where's it stopping?

BeeMaid

John Pedersen

The weather over the past season caused generally lower yields for honey crops across all of BeeMaid's area of operation. As a result BeeMaid will have lower than average honey deliveries at the two plants, but more especially the AHPC plant at Spruce Grove. Despite the lowered intake of honey for the 2002 – 03 crop, the BeeMaid management team has promised a return to members of about $2.00/lb for this crop year.

At the meeting of Alberta Honey Coop in early November, and the Manitoba Honey Coop in late November, interest was keen on the idea of BeeMaid setting aside some money each year to foster bee and honey related research. Also discussed was BeeMaid's participation in the COFFS program. Most members recognize the fact that sooner or later consumers, through retail stores, will demand more guarantees on food safety. BeeMaid will continue to be involved with the efforts of the CHC COFFS committee.

Under management agreements between the two Coops', and BeeMaid, the two plants are operating under one management team. By rationalizing plant utilization money can be saved in the processing of honey.

The finding of Small Hive Beetle in Australia, and the presence of Varroa mites in New Zealand will, no doubt, reduce the supply of package bees into Canada this coming season. Beekeepers will have to rely more than ever on their own resources to keep hive numbers up. One should also not ignore internal Canadian supplies of nucs and package bees.

Motion to accept the delegate reports moved by John Pedersen/Grant Hicks. CARRIED

Fred Rathje Award

Wink Howland

Fred Rathje was an enthusiastic supporter of the beekeeping industry and secretary of the CHC for many years. When he died in 1984 a fund was set up in his honor. It is awarded annually to a candidate who has made a significant, positive contribution of innovative, creative and effective effort for the betterment of the bee industry of Canada during the past year.

The recipient this year was Doug McRory, Provincial Apiarist Ontario.

Doug graduated from the University of Guelph in 1968 with a B.Agr. specializing in apiculture and entomology. He went on to become the Provincial Apiarist of Manitoba 1967-1971. After deciding that he could make more money beekeeping he operated a commercial beekeeping operation with 4200 hives at Benito Manitoba from 1971-1983. Fortunately for beekeepers he was enticed back to the world of government extension work when the office of provincial apiarist became vacant in 1985. The Canadian Honey Council is pleased to award this well deserved honour to Doug McRory.

Motion to accept the Rathje report moved by Wink Howland/ John Pedersen.
CARRIED

Resolutions

1 Whereas Chinese honey is currently under an import alert because of antibiotic contamination; and Whereas China has already attempted to circumvent this by shipping Chinese honey from other countries:
Be it resolved that the CHC requests that the CFIA continue to carefully monitor imports of honey.

M/S Wink Howland / Phil Veldhuis.
Carried Unanimously

2 Whereas the CHC has a policy calling for the word "Canada" to be only used for honey that is 100% Canadian in origin:
Be it resolved that the CHC petitions the CFIA to enforce the rule that any blend of Canadian and imported honey be clearly labelled as such.

M/S Stan Reist / Paul Vautour
Carried Unanimously

3 Whereas the Electronic Commerce Council of Canada, as of 1997, has been charging food producer-packers a yearly maintenance fee for UPC; and Whereas food producer-packers need UPC's to access their markets; and Whereas food retailers are the major financial beneficiaries of UPC's:
Be it resolved that the CHC develops alliances with any other concerned groups with the goal of petitioning the ECCC to remove these yearly fees for anyone with gross retail sales of less than $100,000.00 per year.

M/S Stan Reist / Paul Vautour.
Carried Unanimously

4 Whereas the federal government is encouraging the Canadian beekeepers to participate in the COFFS program and Whereas currently there are no advantages attached to this participation:
Be it resolved that the CHC seeks rights and privileges for those participating that are equivalent to a Federally Registered Producer Grader; be it further resolved that the COFFS standards be consistent with international standards.

M/S Dave MacMillan / Stan Reist.
Carried Unanimously

5 Whereas Beekeepers will need access to Coumaphos to treat Apistan™ resistant Varroa mites; and Whereas the current emergency registration of Coumaphos is a temporary measure which expires in 2002:
Be it resolved that the CHC lobbies to ensure the availability of Coumaphos for beekeepers in the 2003 beekeeping season, including petitioning Bayer Crop Science to pursue full registration for Checkmite™ (Coumaphos).

M/S Phil Veldhuis / Stan Reist.
Carried Unanimously

6 Whereas the danger of pesticide damage to bees is a perennial concern:
Be it resolved that the CHC requests that PMRA establishes a formal working group to provide recommendations related to preventing pesticide damage to bees;

and which may include, but not be limited to, labelling of pesticides and conditions under which pesticides may be applied.

M/S Phil Veldhuis / Dave MacMillan.
Carried Unanimously

7 Be it resolved that the CHC continues to support closure of the Canada-USA border to the importation of queens and/or honeybees in packages or on comb.

M/S Wink Howland / Alain Moyen.
Carried with 2 opposed (Grant Hicks, Stan Reist) and 2 abstentions (Phil Veldhuis, John Pedersen).

8 Whereas the Canada-USA border may be open to importation of bees at some future time; and Whereas we have been told by the CFIA that opening the border will probably mean that US bees on comb will be allowed into Canada:
Be it resolved that the CHC asks the Government of Canada to clarify the tax and labour implications for US beekeepers operating their colonies in Canada.

M/S Wink Howland / Paul Vautour.
Carried, opposed Grant Hicks.

9 Whereas importing honeybees from the mainland U.S. could lead to Africanized bees and/or genetics coming to Canada:
Be it therefore resolved that the CHC requests Health Canada to conduct a risk assessment on this eventuality and the effects on human health and safety.

M/S Dave MacMillan / Alain Moyen.
Carried, with 1 opposed, Grant Hicks and 1 abstention, Stan Reist.

10 Whereas it has recently been discovered that the small hive beetle (*Aethina tumida*) exists in Australia; and whereas this could affect the availability of package bees for Canadian Beekeepers:
Be it resolved that the CHC works with the CFIA to determine whether packages and queens can be safely imported from Australia without any possibility of importing small hive beetle;
Be it further resolved that packages and queens not be imported unless reasonable assurances can be made.

M/S Wink Howland / Paul Vautour
Withdrawn and represented during telephone conference December 13, 2002 Carried Unanimously.

11 Whereas the small hive beetle (*Aethina tumida*) was accidentally imported into Canada in a raw wax shipment:
Be it resolved that the CHC asks the CFIA to set up import protocols that will reduce the probability of a future importation of this pest.

M/S Wink Howland / Stan Reist.
Carried Unanimously.

12A Whereas Russian bee stock imported and developed by the U.S. is showing great promise, and whereas there are new lines that have not been imported to Canada:
Be it resolved that the CHC supports the importation of Russian eggs and semen of these new lines through the OBA Tech Transfer /Applied Research Program as they come available.

M/S Dave MacMillan / Phil Veldhuis.
Carried Unanimously.

12B Whereas there may be requests for imports of genetic stock throughout the year that cannot be considered at CHC annual meetings without undue delay:
Be it resolved that the CHC considers the recommendation of the CAPA importation committee upon receipt.

M/S Stan Reist / Grant Hicks.
Carried Unanimously.

13 Whereas a large number of beekeepers have French as their language of communication:
Be it resolved that simultaneous translation be available at the CHC/CAPA meetings when meetings are held in Eastern North America;
And be it further resolved that simultaneous translation be provided at other meetings when members request it, where economically feasible and cost shared.

M/S Paul Vautour / Dave MacMillan.
Carried Unanimously.

14 Whereas the salary paid to the National Co-ordinator is not reviewed regularly, and therefore tends to remain unchanged from year to year; and Whereas a simple mechanism for ensuring that the salary can be automatically adjusted each year to keep pace with inflation by using the "Maximum Pensionable Earnings" figure set annually by Canada Customs and Revenue Agency; and Whereas adjustment of the current annual salary to this amount involves only a minor increase of less than $1000.00 for the coming fiscal year:

Be it resolved that the salary paid to the National Co-ordinator be adjusted effective January 1st, of each fiscal year, to the "Maximum Pensionable Earnings" as determined by CCRA, commencing January 1, 2003.

M/S Wink Howland / Dave MacMillan.
Carried Unanimously.

15 Whereas at present the CHC is structured so that the only voting delegates are those that are described in the Bylaws under section I (1c) and Section VI (1a to 1f), and whereas the CHC has another class of members under section VI (2) who have speaking privileges, but do not have voting rights at meetings of the CHC, and whereas there have been suggestions that CHC broaden its scope to allow the above class of members to have voting privileges, and whereas any such change should be discussed at meetings of members of the various provincial beekeepers organizations and would require a Bylaw Amendment at the CHC level:
Be it resolved that the CHC strike a committee to investigate the feasibility and mechanism of expanding voting privileges to such members, and that this committee produce a draft plan, including proposed bylaw amendments, by October 1, 2003, and that this draft be presented to the various provincial organizations for consideration at their annual or semi-annual meetings;
And be it further resolved that after such meetings that any recommendations from the provincial organizations be incorporated into the final draft of the committee which, with proposed bylaw amendments, be prepared by the committee for presentation at the CHC annual meeting in 2004.

M/S John Pedersen / Wink Howland.
Carried unanimously.

16 Whereas the Saskatchewan centennial celebrations planned for 2005 will present an excellent opportunity to host the CHC annual meeting; and whereas Quebec would be the location for 2005 under the normal rotation of CHC annual meetings:
Be it resolved that the SBA host the 2005 annual meeting of CHC in Saskatchewan and that the FAQ host the 2006 CHC annual meeting in Quebec.

M/S Wink Howland / Alain Moyen.
Carried Unanimously

17 Whereas these recent joint meetings have been outstandingly successful in bringing together researchers and beekeepers; and whereas much effort and care was required to bring this about:
Be it resolved that the CHC thanks the following people:
Pat Westlake, OBA;
Bill Minnick, OBA;
Cynthia Scott-Dupree, U of G;
Doug McRory, OMAF;
Heather Clay, CHC;
Jeff Pettis, AAPA,
Nancy Ostiguy,AAPA,
Anette Phibbs,AIA
Peter Bizzoso, ESHPA,
Rob Currie, U of M,
and all sponsors.
Be it further resolved that the CHC encourages the opportunity for further joint meetings.

M/S Phil Veldhuis / Wink Howland.
Carried Unanimously.

18 Be it resolved that Jack Mackay be appointed as auditor for the coming fiscal year.

M/S Wink Howland /Alain Moyen.
Carried

Elections

Elections were held and the positions were filled as follows:

President: Wink Howland
Vice President: Alain Moyen
Executive Director: Stan Reist

Adjournment

The meeting was adjourned at 5.00 PM Saturday 7 December 2002.

Motion to adjourn the meeting by David MacMillan, seconded by Wink Howland.
CARRIED

CAPA REPORTS

CAPA President: Cynthia Scott Dupree

This has been a very busy year for me and the membership of CAPA. I would particularly like to thank our committee chairs and committee members who have been busily working on issues that arose from last year's annual meeting and new items that have come to our attention. Thanks to the communication committee our web site www.capabees.com is now "up" and waiting to be filled with content. Our importation committee and many of our members have been busy consulting with industry over border issues related to movement of bees from Canada to the U.S. and visa versa. Our executive was involved in lobbying to retain research positions within U.S.D.A. These are but a few of the issues that have occupied us during the year.

The discovery of Apistan resistant mites in a number of Provinces also generated a lot of work for our members. Emergency registration was not automatic and many of us spent a great deal of time working with PMRA to ensure that coumaphos would be available during the spring and/or fall for those producers who needed it.

Pesticide issues flowing from the workshop on imidacloprid last year were also an important issue. John Purdie from Syngenta (formerly Novartis, Cebi Giegy) and JoAnne Buth from the Canola Council circulated a study form their company on the effects of helix on honeybees to some of our CAPA members. They would like to see greater interaction and cooperation between their industry organization "Crop Life" and ours to ensure that issues related to the beekeeping industry are addressed and that any concerns that the beekeeping industry might have are flagged. I indicated that CAPA appreciated the proactive approach that the Syngenta was taking and that we would a) like them to ensure honey bees are considered when assessing pesticides and b) inform CAPA members of these results so we can deal with calls when they come in. CAPA members were also called upon by the Pest Management Regulatory Agency to participate in a workshop on pesticide assessment endpoints that was held in October in Val Morin Quebec. We were able to identify criteria that should be assessed to ensure pollinators are properly considered when new pesticides are registered. Hopefully, this will help to ensure that new pesticides are not released without prior assessment of their impact on bees and the beekeeping industry.

CAPA Chemicals Committee

John Gruszka

1. Committee Members

John Gruszka (Chair), Doug McRory, France Desjardins, Rhéal Lafrenière, and Steve Pernal.

2. Resistant American Foulbrood (rAFB)

Resistant American Foulbrood has been reported in B.C. and Alberta and continues to be a significant problem and concern for the industry.

Many thousands of infected boxes of frames from Alberta have been irradiated with electron beam irradiation and the beekeeper reports no new outbreaks and good brood patterns.

Beaverlodge Research Station continues with research to determine an effective technique to use honey samples for the early detection of AFB and rAFB. They report success in developing a better growth medium and believe they are close to having a very sensitive and reliable test.

The Saskatchewan samples that were forwarded to Beaverlodge for re-testing all proved to be highly susceptible to oxytetracycline.

There have been no reports of rAFB found in other parts of Canada, to date.

3. Registration of Tylosin and Lincomycin

Tylosin and lincomycin have yet to receive registration for use in Canada or the United States. Work is continuing at Beaverlodge on Tylosin and Lincomycin to determine the most appropriate application methods to minimize residues. Additional data will be gathered in 2003 for efficacy and residues with plans to submit the data for registration in the future.

USDA has recently submitted the entire data package for both drugs (efficacy, target animal safety and residue data) to the Food and Drug Administration (FDA) for approval.

Tylosin is available to Alberta beekeepers, via off-label prescription from a Veterinarian, for fall use on hives with rAFB.

4. Emergency Registration of Coumaphos

Emergency registration for the use of CheckMite+ (Bayer product containing 10% Coumaphos) has been granted by Pest Management Regulatory Agency (PMRA) under Reg. No. 27147 for use in 2002 in New Brunswick, Ontario, Manitoba, Alberta and British Columbia to control Varroa mites resistant to Apistan (fluvalinate).

Coumaphos may be a short-term

solution. Whether long-term registration will be available will be impacted by the organophosphate review that PMRA is currently undertaking. Unless the product receives full registration, PMRA is unlikely to allow emergency use for more than two years.

1. Product only for sale for use in those areas identified as being at risk from infestations of fluvalinate-resistant Varroa mites.
2. The occurrence of resistance of Varroa mite to fluvalinate should be documented during 2002.
3. The efficacy of Coumaphos treatment in designated colonies should be monitored by ensuring that Varroa mite counts (average number of mites per bee), as determined by an appropriate method (e.g., alcohol wash of approximately 100 bees), are taken both before treatment (within 24 hours before Coumaphos treatment) and after completion of treatment (within days after the Coumaphos strips are removed).
4. Any adverse effects of Coumaphos treatments to bees are to be recorded.
5. Over wintering losses of honey bee colonies during 2001-2002 are to be recorded, as are over wintering losses during 2002-2003 (i.e., losses attributable to Varroa mite and not to other causes such as American Foul Brood).
6. Honey supers are to be removed during treatment with Coumaphos and replaced no sooner than 14 days after the strips are removed.
7. The sale and distribution of CheckMite+ Beehive Pest Control Strips should be monitored. Any problems encountered in complying with label requirements should be recorded.
8. If possible, studies should be conducted in commercial apiaries to compare the effectiveness of other treatments (i.e., fluvalinate, formic acid) with Coumaphos.

5. Antibiotic Residues

Chinese honey has been banned from Europe as a result of chloramphenicol residues in honey. This has virtually caused the elimination of Chinese honey from the world market as importing countries, including Canada, are testing for residues before allowing the entry of Chinese honey into their markets. This has caused a worldwide shortage of honey, a disruption of traditional trading patterns and record high honey prices.

Food products containing Chinese honey were removed from store shelves in Canada by CFIA.

CAPA Importation Committee

Doug McRory

The Import Committee dealt with three issues this past season.

Dr. Jamieson of CFIA also contacted the CAPA Executive and the Provincial Apiarists in regard to information to develop a Canadian Risk Assessment on the United States Border.

Russian stock importation was the only importation of genetic material this year. Alison Skinner and the OBA Tech-Transfer Program carried out this project. They worked with Francois Petit who will be the breeder of the Russian bees in Ontario. Francois, as luck would have it, is now in the area of Apistan ® resistance. The stock was also out with two other Ontario beekeepers and two Saskatchewan beekeepers who can sell queens next season for beekeepers who are located outside areas with Apistan ® resistance.

The USDA will be releasing three stock lines each year. Ontario Beekeepers Association support the continue importation of these new lines. The OBA Tech-Transfer Program has it in their plans to do this importation.

Motion: Be it resolved that Canadian Association of Professional Apiculturists supports the Canadian Honey Council resolution to import Russian eggs and semen of the new Russian lines being released by USDA through the existing Russian Bee Project of the OBA Tech Transfer/Applied Research Program.

As Chairperson of the Import Committee Chris Ranger of CFIA ask if Dr. Rob Currie, President of CAPA, and I would review the proposed OIE Bee Diseases inspection requirements. The only suggestion for change was to do inspections on the basis of a statically based survey not on all apiary sites being inspected.

As Chairperson of the Import Committee, I sent comments to Dr. Brian Jamieson on the proposed US Import regulation changes. These proposed changes would limit the import of bees to queens and package bees from Canada. No used bee equipment would be allowed to go into United States (US) from Canada. CFIA would be responsible to do an inspection of each shipment of queens or packages going into the US within 10 days of the shipment going to the US. The shipping beekeeper would have to pre-notify the US authorities that his shipment would be coming in 10 days. CFIA would be responsible to provide a declaration of Canadian Origin for each shipment of bees. This is to prevent transshipment though Canada of offshore bees. This is a non-issue as the US is considering opening their border to New Zealand and Australia, the only countries that Canada allows imports from.

Canadian Bee Research Fund

Rob Currie
Chair CBRF

The Canadian Bee Research Fund is now in its sixth year of operation, and by the end of 2002 we had raised $700,000 towards supporting bee research in Canada (Appendix 3; audited financial reports). From these funds, grants have been awarded to support research important for the survival and prosperity of the Canadian beekeeping industry. Expenses have been minimal and the remaining funds have been used to establish a long-term endowment that is now generating income to fund future projects.

The committee will meet in February 2003 to review applications for funding. An announcement will be made in Hivelights magazine May 2003.

Reports of the three projects funded in 2002 are found in the proceedings of the Research Symposium.

1. Use Of Formic Acid To Control Varroa And Tracheal Mites In Indoor Wintering Facilities:

R. Underwood and R. Currie

2. Oxytetracycline-Resistant American Foulbrood: Evaluation Of New Antibiotics For Residue

Nelson, D.L., S F. Pernal and A.P. Melathopoulos

3. Comparative Population Dynamics Of Varroa Destructor In Russian And Ontario Honey Bees And Their Hybrids

Wilson G.E., M. E. Nasr and P. G. Kevan.

Section II
North American Apiculture Research Symposium

SESSION 1:
Integrated Pest Management for North American Beekeeping Operations: How Do We Get There?

Use Of Formic Acid To Control Varroa And Tracheal Mites In Indoor Wintering Facilities

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Indoor winter fumigation of honey bee, *Apis mellifera L.*, colonies with formic acid is effective at controlling varroa mites, *Varroa destructor* (Anderson and Trueman). This study was conducted to determine the best dose-time combination for controlling varroa mites without harming worker or queen bees. Four experimental rooms, each containing 21 honey bee colonies were maintained at 5°C in total darkness from November 2001 until April 2002. Colonies were randomly assigned to treatments using mean abundance of varroa mites as a block. On January 11, 2002, fumigation began. One room served as an untreated control while three others were treated with formic acid; 20 ppm for 28 days, 45 ppm for 11 days, and 60 ppm for 9 days. Each day during the 28 day experimental period, the contents of a white board (non-sticky) on the floor of each hive were collected and counted. In April 2002, the colonies were brought outdoors. Long-term effects of fumigation on queens were tested by estimating the spring population size, queen performance, and honey production of each colony.

All three formic acid treatments caused significantly more mite mortality than the control and no one treatment was better than the others. The 9 day 60 ppm fumigation treatment increased mortality of worker honey bees. The 9 day 60 ppm treatment and the 11 day 45 ppm treatment both caused queen loss; 6 and 5 queens died during the experimental period, respectively. No long-term effects of treatment were noted in colonies containing their original queens; there was no treatment effect on population size in the spring, performance of the queen, or honey production.

Integrated Pest Management Using Apiguard, A New Treatment For Honeybee Diseases

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To reduce the likelihood of the development of any pest resistance it is advisable to vary the treatment type used every season. Varroa mites have become resistant to pyrethroid and to organophosphate treatments in many areas and new approaches to the control of this voracious pest are necessary.

Essential oils such as thymol, menthol and camphor have been widely used as control agents and preservatives for centuries. More recently, they have been used in beekeeping, with varying degrees of success, to improve the health of honeybee colonies.

Many beekeepers would prefer to use natural or near-natural hive treatments but one of the major problems with essential oils [and organic acids] is their inherent volatility. In their raw form or in crude formulations, the dose applied varies enormously with temperature and humidity and the release rate cannot be controlled.

Bee repellency, honeybee brood mortality and absconding are common with these treatments and can lead to unacceptably high residues in hive products. At low temperatures, the dosage may be too low and the health of the colony suffers.

APIGUARD is a near-natural product, the result of 6 years' laboratory and field testing in Europe, where it is registered as a veterinary medicine. Apiguard consists of a specially designed and patented slow-release gel containing thymol. Although still dependent to some extent on environmental temperature, Apiguard gel regulates the liberation of thymol within the honeybee colony and provides a much more efficient control of hive pests than was possible before.

A range of experiments have been conducted on the control of varroatosis in different climatic conditions by official research institutes of many countries. Apiguard has been shown to be well tolerated by the bees and brood even under high temperature conditions such as in North Africa. Except where temperature is low, Apiguard gives a good control of varroatosis and when used outside the harvest period, Apiguard does not impair the natural flavour of honey.

Apiguard is currently registered or under registration in 27 countries worldwide.

Toward Delaying Economic Threshold For Varroa

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W.M. Hood and I developed an economic threshold for *Varroa destructor* for our region which we define as an overnight sticky sheet mite count of 59-187, unassisted by acaricide (Delaplane & Hood, 1997 J. Apic. Res. 36: 125-132; Delaplane & Hood, 1999 Apidologie 30: 383-395). A threshold like this permits apiculturists to monitor the success of IPM practices at impeding mite buildup and to determine if and when treatment with acutely toxic miticides is warranted. Insofar as an economic threshold can be delayed, this represents additional time during which mites can reproduce unencumbered by the potent selection effect of acute toxins. Therefore, one justification of an economic threshold is to permit a maximum number of mite generations between treatments, thus conserving genes for miticide susceptibility. Many workers are identifying IPM practices that may delay economic thresholds. In the present study I focus on three: apiary isolation (Sakofski *et al.*, 1990 Apidologie 21: 547-550), heritable honey bee hygienic behavior (Spivak, 1996 Apidologie 27: 245-260), and bottom screens (Ellis *et al.*, 2001 Am. Bee J. 141: 813-816). This report is part of a three-state project in collaboration with W.M. Hood (SC), J.P. Parkman and J.A. Skinner (TN).

In June 2001 forty Langstroth colonies were set up from packages in Habersham County, Georgia and each randomly assigned an experimental treatment so that every combination of the following main effects was replicated five times: (1) isolated apiary or non-isolated, (2) hygienic-selected queen or non-selected, and (3) screen bottom board or conventional solid bottom board. Isolated apiaries were ca. 5 km from other known apiaries while non-isolated apiaries were set up within established apiaries. Hygienic queens were purchased from a commercial producer, maternally-selected, and open-mated. Bottom screens were those described by Ellis *et al.* (2001 Am. Bee J. 141: 813-816). Populations of V. destructor were permitted to increase without additional control measures. At ca. monthly intervals colony mite levels were determined with overnight sticky sheets. Colony strength assessments (Skinner *et al.* 2001 J. Apic. Res. 40: 81-

89) were performed in April 2002 and hygienic behavior (Spivak & Gilliam, 1998 Bee World 79: 169-186) appraised in June 2002. Colony survival and time to economic threshold (≥60 mites) were determined up to press time (August 2002).

There was a predictable increase in average mite drop as number of months increased ($F=25.1$; df=12,74; $P<0.0001$). The type of hive bottom significantly affected mite drop ($F=13.3$; df=1,74; $P=0.0005$); average mite drop was significantly lower in colonies with screens (12.4±1.4) than in colonies with conventional bottoms (20.3±3.3). Average mite drop was unaffected by apiary isolation or queen type ($F\geq0.02$; df=1,74; $P\geq0.5$). However when expressed hygienic behavior was included as a covariate for the June 2002 data, hygienic behavior was shown to significantly affect mite drop ($F=4.7$; df=1,13; $P=0.0502$); this relationship was explained by a negative linear relationship (figure) in which mite drop decreased as the expression of hygienic behavior increased. The discrete variable queen type — hygienic-selected or non-selected — did not affect actual expression of hygienic behavior ($F=0.6$; df=1,16; $P=0.5$).

None of the colony strength parameters measured in April 2002 – quantity of bees, brood, honey and pollen – was affected the independent variables. As of August 2002 (month 14), 21 of 29 surviving colonies have achieved an economic threshold of ≥60 mites; this has occurred during months 10-14, inclusive. Chi-square analyses indicate that the proportion of colonies achieving threshold has not varied by month, whether sorted by apiary isolation, queen type, or hive bottom. In other words, the comparative earliness or lateness of threshold has been unaffected by the independent variables. Of the eight colonies still below threshold, 4 (50%) are from isolated apiaries, 3 (37.5%) are headed by hygienic-selected queens, and 6 (75%) have screen bottoms. Colony survival is 80% in isolated apiaries and 65% in non-isolated apiaries, 70% with non-selected queens and 75% with hygienic, and 65% with conventional hive bottoms and 80% with screen bottoms.

I conclude that apiary isolation, hygienic-selected queens, and screen bottom boards have presently failed to delay economic threshold for V. destructor. However, the pooled data for 14 months support earlier evidence that bottom screens reduce colony mite levels. Moreover, hygienic behavior significantly reduced average mite drop, but its expression varied independently of the reported selection status of the queens.

Evaluating IPM Tactics For Varroa To Delay Onset Of Treatment Threshold In Tennessee

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Because populations of *Varroa destructor* have exhibited resistance to fluvalinate and coumaphos in recent years, we are conducting a cooperative study in three southeastern states (Georgia, South Carolina and Tennessee) to evaluate alternative Varroa management tactics which may delay or alleviate mite treatments. First-year results from Tennessee are presented.

Tactics evaluated included using honey bee stock expressing the Suppression of Mite Reproduction (SMR) trait (Harbo and Harris, 1999 J. Econ. Entomol. 92: 261-265); using screened, open bottom boards (Pettis and Shimanuki, 1999 Am. Bee J. 139: 471-473); and isolation of apiaries (Safoskie *et al.*, 1990 Apidologie 27: 245-260). In early May 2002, we established 40 colonies in Illinois hive bodies by combining adults from established colonies to produce 1 kg packages. Packages were provided with new queens: either non-resistant, Italian queens or instrumentally inseminated, SMR queens. Management tactics were randomly assigned to colonies so that there were five replications of each combination of tactics: 1) SMR or non-resistant queen, 2) open or solid bottom board, and 3) isolated or non-isolated apiary. Isolated apiaries were located at least 2 km from known apiaries; non-isolated apiaries were adjacent to traditionally managed colonies.

Mite abundance was estimated using bottom board sticky trap collections of natural mite fall. Mite collections were taken at three-week intervals. Colony strength estimates (Skinner *et al.*, 2001 J. Apic. Res. 40 (3-4): 81-89) were made at six-week intervals. Colonies exceeding established Varroa treatment thresholds (Delaplane and Hood, 1999 Apidologie 30: 383-395) were treated with ApiLife VAR or 65% formic acid gel.

Because of problems with colony establishment, only data from early September were used to analyze treatment effects. To account for differences in colony size, Varroa abundance was converted to a ratio, designated Avarroa ratio@, calculated for each colony as:

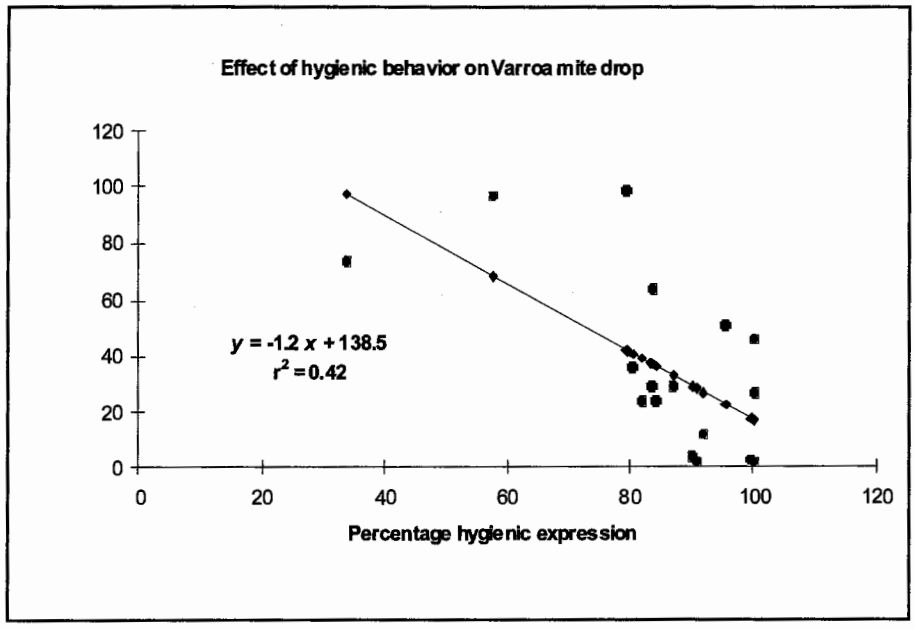
varroa ratio = mean daily mite drop _ (bee abundance + capped brood abundance).

Bee and brood abundance, determined from strength estimates, were measured in frames.

Establishment proved difficult for colonies with SMR queens and/or open bottom boards. Twenty-three colonies with SMR queens, open bottom boards or a combination of both had to be re-established, some more than once. Several SMR queens were inferior egg-layers and many SMR queens possibly were superceded. Also, open bottom boards apparently were not conducive to establishing small packages.

Despite these problems, results indicated that management tactics affected Varroa abundance. Although analysis of variance failed to detect a significant difference in varroa ratio among the treatment combinations (F=2.02, P=0.10, df=7, 21), more than 40 times as many Varroa were collected from non-resistant, non-isolated colonies with closed bottom boards (varroa ratio = 3.1) than from SMR, isolated colonies with open bottom boards (varroa ratio = 0.07). There were also substantial, although not significant, differences in varroa ratio for main treatment effects: SMR (0.42) vs. non-SMR (1.36); isolated (0.50) vs. non-isolated (1.41); and open (0.55) vs. closed bottom board (1.23). (Because colony strength varied according to time elapsed after establishment or re-establishment, strength data were not used to compare treatment effects.) By mid-August, four colonies exceeded treatment threshold. None exceeding threshold had the tactic combination of SMR queen, open bottom board and isolation.

Results suggest that Varroa may be managed effectively with a combination of non-chemical tactics. However, we recommend that open bottom boards should not be used when installing small packages.



Trapping Small Hive Beetles (*Coleoptera: Nitidulidae*) Inside Colonies Of Honey Bees (*Hymenoptera: Apidae*)

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The small hive beetle, *Aethina tumida Murray*, is the newest honey bee pest found in North America.

The beetles infest not only honey bee colonies, but they can also damage honey supers stacked in honey houses and cause the honey to ferment. A trapping program is needed to safely and economically control this pest.

Various materials, alcohol, beer, ethylene glycol, mineral oil, honey and cider vinegar were examined for their attractancy and lethality to small hive beetles. A series of field and laboratory experiments over a 2 year period tested whether these materials show promise as control agents when placed in an inside hive trap. The Varroa Treatment Device which is a plastic reservoir originally designed for administering liquid formic acid for varroa and tracheal mite control in honey bee colonies (Hood and McCreadie. 2001 J. Agric. and Urb. Ent. 18(2):87-96) was used in these investigations to hold the test materials. The Varroa Treatment Device was attached to a solid bottom bar of a brood frame and placed in test colonies. The device had nine vents (3x21 mm) on the removable lid that allowed entry of SHB, but excluded honey bees. One hundred-forty ml of the various test materials were poured into the VTD and placed in bee colonies which were housed in 10-frame Langstroth hive bodies with queen excluder and one 10- frame shallow super.

Cider vinegar showed the highest dead small hive beetle trap counts in the field, but showed low level lethality to beetles in lab tests. Apparently, SHB were attracted to the traps containing cider vinegar in bee colonies, but a high percentage of the beetles likely escaped the cider vinegar because of its low level lethality. Mineral oil showed high level small hive beetle lethality in lab tests, but

resulted in lower beetle trap kill in the field when compared to cider vinegar.

The number of surviving SHB left behind in these field test colonies was substantial,

therefore these material when used alone as tested here are doubtful in showing promise in controlling this hive pest. These investigations suggest that small hive beetles can be attracted to an inside hive trap, but further work will be required to develop this technique into a successful control program.

This field work indicates that the SHB overwinters only in the adult stage inside honey bee colonies in coastal South Carolina which concurs with Pettis and Shimanuki (2000 Am. Bee J. 140:152-155). An effective SHB adult trap placed in an infested colony in late winter prior to the onset of the first SHB generation may offer beekeepers an efficient and safe method of beetle control. The removal of one frame from a hive body or super as tested here should not have a detrimental effect on honey bee colony strength or production, especially in winter. During spring nectar flows, the VTD placed in a hive body frame resulted in drone brood production in the void area of the frame. The mature drone pupae could be removed and destroyed at a time when varroa mites are present resulting in an example of a broad spectrum IPM system approach (Rice *et al.*, 2002 J. Econ. Ent. 95:221-226).

Session 2
Colony Management: Is There Room For Improvement?

Effects Of Pollen Availability On The Quality And Quantity Of Workers Produced In Spring

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Colony growth in spring is dependent on the ability of an overwintering colony to initiate mid-winter brood rearing with pollen and protein stores (Seeley and Visscher, Ecol. Entomol. 10:81-88). Colonies can become protein-stressed if these protein reserves are depleted before adequate foraging conditions exist. We examined the effects of pollen availability on the quality and quantity of brood reared by colonies in the spring. Pollen stores were manipulated by trapping pollen in the fall (low pollen), feeding pollen patties in late winter (high pollen) or left unmanipulated (control).

Sealed brood measurements were made on colonies from mid-March to late April. Three times in April, newly emerged workers were collected from colonies, if available. Some workers were tagged and introduced into a common observation hive to determine differences in behaviour and longevity between treatments, while others were measured for size, symmetry and protein content.

Pollen-fed colonies reared significantly more brood than control or low pollen colonies (see table). Worker size, protein content and symmetry were not affected by pollen availability at any sampling date, except for forewings, which increased in size over time for control and low pollen colonies but remained constant for high pollen colonies. Longevity was significantly greater for workers reared in high pollen colonies compared to low pollen and control colonies. A two-week difference in longevity between high and low pollen treatments was found even though workers spent their adult life in the same observation hive. This increase in workforce translated to significant increases in honey production in the source colonies by mid-summer, where high pollen colonies produced two times more honey than low pollen colonies. The results indicate that protein-stressed colonies compromise both quantity and qual-

ity of brood. No differences in behaviour were found between bees from each treatment to 10 days of age, but our data suggest that bees reared under high pollen conditions may spend more time performing in-hive duties at the age when control bees became foragers (20 days).

The Role Of Honey Bees In Lowbush Blueberry Pollination

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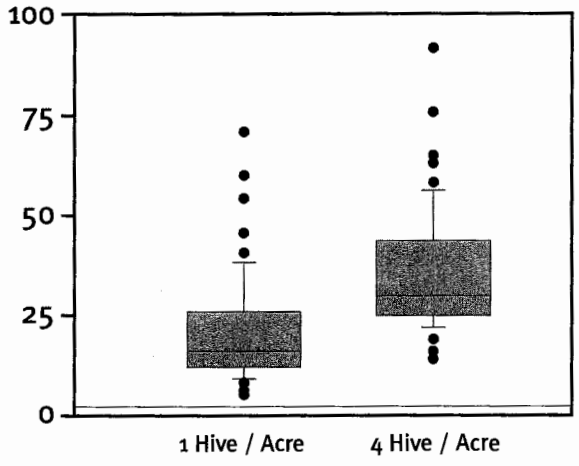
Recent production increases in lowbush blueberry have been related to the use of honey bees for pollination. Yet, the pollination contribution of honey bees on this crop has remained equivocal as it is difficult to relate stocking rate to yield. In a series of surveys from 1991 to 1997, honey bees comprised only 37% (range 0-91%) of the bees on commercial blueberry fields. Thus indigenous bees, especially bumble bees and Andrena spp., continue to play an important role as crop pollinators.

Honey bees forage on lowbush blueberry solely for nectar. Vaccinium comprised a minute proportion of the pollen collected by honey bee colonies located in lowbush blueberry. On an individual bee basis, indigenous bees are better pollinators than are honey bees (Javorek *et al.*, 2002 Ann. Entomol. Soc. Amer. 95: 345-351). For example, a honey bee pollinates only one quarter of the blueberry flowers she visits and of the flowers pollinated, deposits an average of 12 pollen tetrads per stigma. In comparison, a pollen-foraging queen bumble bee pollinates over 95% of the flowers visited and deposits 50 tetrads. In a green house study, it was determined that between 25 and 50 tetrads are required for good fruit set and size in wild blueberry. Thus, to reach this level of pollination, a flower must be visited repeatedly by honey bees.

Due to the difficulty in relating stocking rate to yield, we have begun to use pollen deposition as a tool to monitor pollination within fields. In a study using 16 wild blueberry fields in New Brunswick, average pollen deposition per stigma of those flowers that were pollinated range from 18 to 64 tetrads. Of those fields stocked with honey bees, pollen deposition varied with stocking rate. Significantly more pollen (27 versus 13 tetrads/stigma) were found in fields stocked with 4 colonies /acre as compared to those stocked with only 1 colony/acre (Fig. 1). It is apparent, then, that higher honey bee stocking rates are required for lowbush blueberry pollination. Greater numbers of honey bees will ensure repeat visits and thus, good crop pollination. Whether or not, it is economic to stock fields with 4 or more colonies depends in part on the cost of colony rentals, field productivity and the price of berries.

Figure 1. The effect of honey bee stocking rate on the deposition of pollen on stigmas of wild blueberry flowers.



Effect Of Honey Bee Density On The Pollination Of Rabbiteye Blueberry *Vaccinium Ashei*

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To investigate the influence of different population densities of honey bees (*Apis mellifera L.*) on pollination of rabbiteye blueberry (*Vaccinium ashei* Reade var. 'Climax'), a 2-year (2000, 2002) study was conducted at the University of Georgia Horticulture Farm in Oconee County, Georgia. Mature orchard plants plus potted pollenizers ('Premier') were caged with varying densities of honey bees (0, 400, 800, 1600, 3200, 6400 or 12800 bees plus open plot) during the bloom interval. The number of legitimate honey bee flower visits / 2 min was repeatedly measured, then at harvest

each cage was analyzed for percentage fruit set, berry weight (g), seeds / berry, percentage soluble solids (sucrose content), and speed of ripening (% fruit ripe at an arbitrarily chosen date).

The percentage of legitimate flower visits tended to increase as bee density increased within a range of 400 – 6400 bees; there were more legitimate visits in cages with 6400 bees than in those with ≤1600 bees (table). Similarly, within a range of 400 – 6400 bees there was a trend for a corresponding increase in fruit set with means ranging from 25.0 – 79 percent. Fruit set was higher in cages with 6400 or 3200 bees than in those with ≤800 bees. Regression analyses showed that fruit set increased linearly with the number of legitimate bee visits (y = 34.7 + 1.6 x; r2 = 0.66). Mean weight of berries was unaffected by bee density but varied significantly between years. Within a range of 0 – 3200 bees the average seeds / berry tended to increase with increasing bee density; there were more seeds in open plots than in cages with 12800 honey bees or ≤1600 bees. Sucrose content ranged from 12.1 – 16.7 percent and fruits tended to be sweeter in cages with lower bee densities; percent sucrose was higher in cages with 400 bees than in those with ≥1600 bees or in open plots. Speed of ripening tended to be higher in cages with higher bee densities, however this trend was weaker than for the other variables; fruit ripening was faster in cages with 3200 bees than in those with ≤1600 bees or in open plots.

The effectiveness of *A. mellifera* as a pollinator of rabbiteye blueberry is partly variety-dependent. Honey bees were demonstrated to be inefficient pollinators of 'Tifblue' (Cane and Payne, 1990 Alabama Agric. Exp. Sta. 37: 4) but effective for 'Climax' (Sampson and Cane, 2000 J. Econ. Entomol. 93: 1726-1731) based on assays of single-bee flower visits. Our results support those of Sampson and Cane, confirming that A. mellifera is an effective pollinator of *V. ashei* var. 'Climax.' Our data further indicate that the effectiveness of *A. mellifera* is bee density-dependent. Fruit set, seed number, and speed of ripening increased as bee density and flower visitation rates increased. More broadly, our results underscore the need to consider the pollinator densities achievable with candidate pollinator species. It is possible that a relatively inefficient pollinator, as determined by a lack of specialized behaviors or phenologies, may nevertheless be effective if it can field a forager force large enough to effect multiple flower visits.

Importance Of Forager Type, Colony Size And Colony Location For Optimal Cranberry And Bluebery Yield, Fruit Quality And Pollination

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Distribution of pollen counts and pollination levels in blueberry and cranberry fields can be explained by the high or low nectar and pollen production of a crop.

Taking this information into account, honey bee colony placement, size and stage of development can be adjusted to optimize pollination of blueberry and cranberry flowers.

Distribution of pollen counts and pollination levels in commercial blueberry fields are highest close to honey bee colonies and lowest away from honey bee colonies. In contrast, cranberry pollen counts and pollination levels are lowest up to a distance of 100m (300') from honey bee colonies and remain consistent up to a distance of 300m (1000').

Blueberry flowers provide nectar that is easily accessible to honey bees but pollen is difficult to collect by honey bees. Thus, nectar foragers dominate in blueberry fields. They forage close to their colonies because of abundant nectar. Large colonies with large number of nectar foragers would be the optimal honey bee colony for pollinating blueberry bloom.

Cranberry flowers produce little nectar, and similar to blueberry flowers, pollen is difficult to collect by honey bees. Nevertheless, pollen foragers dominate foragers in cranberry bloom. This means that honey bee colonies with the largest number of pollen foragers are the best pollinators of cranberry bloom. They forage more distant from colonies than close to colonies since honey bees are searching for better nectar and pollen resources away from their colonies.

Dispersal of colonies throughout blueberry fields would optimize blueberry pollination since foragers remain relatively close to honey bee colonies. On the other hand, the distribution of colonies throughout cranberry fields is not necessary since bees will disperse in search of nectar and or pollen resources.

The interplay of the honey bee colony requirements (pollen and nectar), that are dependent on colony size and development, and the floral nectar and pollen availability, that depends on the crop, determines the optimum placement of honey bee colonies in a commercial crop.

Fruit quality characteristics of 'Climax' rabbiteye blueberry as affected by honey bee density in cages (ca. 2x2 m). Data are pooled for years 2000 and 2002 except for speed of ripening which was collected only for 2002. [a]

Honey bee density	Legitimate bee visits / 2 min	Fruit set (%)	Berry weight (g)	Mature seeds /berry	Sucrose content of juice (%)	Speed of ripening (%)
Open plot	2.3 ± 0.8 (21) cd	68.9 ± 3.1 (98) ab	1.2 ± 0.06 (55) a	21.9 ± 1.3 (54) a	12.1 ± 0.2 (54) c	27.2 ± 3.5 (67) b
No bees	NA	32.4 ± 3.5 (67) c	0.8 ± 0.04 (43) a	0.2 ± 0.1 (43) c	15.9 ± 0.3 (43) ab	11.5 ± 4.8 (25) c
400	0.5 ± 0.3 (22) d	25.0 ± 3.3 (68) c	0.9 ± 0.05 (33) a	1.0 ± 0.5 (34) c	16.7 ± 0.5 (34) a	9.9 ± 3.7 (18) c
800	4.9 ± 1.4 (21) bcd	48.4 ± 4.1 (78) bc	1.1 ± 0.07 (57) a	6.9 ± 1 (57) bc	16.0 ± 0.4 (57) ab	28.8 ± 5.4 (35) b
1600	7.8 ± 2.4 (21) bcd	52.4 ± 3.5 (70) abc	0.9 ± 0.04 (61) a	8.1 ± 0.8 (60) bc	13.2 ± 0.4 (59) c	8.0 ± 2.5 (32) c
3200	20.3 ± 2.9 (21) ab	78.1 ± 3.3 (63) a	1.2 ± 0.07 (62) a	14.2 ± 0.9 (62) ab	13.1 ± 0.3 (62) c	49.3 ± 5.1 (36) a
6400	25.5± 3.4 (20) a	79.0 ± 2.9 (71) a	1.2 ± 0.06 (66) a	14.1 ± 0.8 (64) ab	13.8 ± 0.3 (65) bc	37.1 ± 4.8 (36) ab
12800	16.4 ± 2.1 (22) abc	52.2 ± 4.0 (67) abc	1.1 ± 0.06 (57) a	6.5 ± 0.6 (57) bc	13.7 ± 0.4 (56) bc	38.2 ± 5.5 (33) ab

[a] Values are means ± standard errors, with n in parentheses. Column means with the same letter are not different at the a = 0.05 level.

Long Term Effects Of Bottom Board Screens For Control Of *Varroa Destructor*

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In one study, hives either with or without screened traps on the bottom board were monitored for 14 months to determine their effectiveness in controlling their effectiveness in controlling the mite *Varroa destructor*. A second study compared fluvalinate sensitivity in live mites that had fallen to the hive bottom both before and during fluvalinate (Apistan®) treatment.

For the first study, bottom board traps were constructed of corrugated plastic and wire mesh screen (3 openings/cm). Nearly all of the mites falling from the bees in a hive would pass through the screen to the trap. Twenty-four hives with equivalent mite infestations were monitored for 14 months beginning June 2001. Twelve of the hives were fitted with traps and the remaining 12 were without traps. All hives were treated with coumaphos (Checkmite+®) during October - November 2001.

Sticky boards were used periodically for 10-day sampling periods to estimate mite infestations. By 2-12 August 2002 the colonies with traps had a daily mitefall of 3.5+1.3 (mean + std. error) while those without traps had a daily mitefall of 11.7+2.8. This 70% reduction is highly significant ($p < 0.05$). Our results are consistent with those of Pettis and Shimanuki (1999) and Ellis *et al.* (2001). The large effect we found may be due to our inclusion of two summers and one acaricide treatment. Earlier work (Webster *et al.* 2000) indicated that live mitefall, and hence the efficacy of the traps, is especially high during very hot weather and during acaricide treatment.

In our second study, mites were collected from an apiary known to harbor fluvalinate-resistant mites, during October and November 2001. Shallow, screen-covered traps were

inserted on the bottom boards of the hives, and retrieved the following morning. Live mites were collected from the traps, and placed into individual glass vials coated with fluvalinate. Four and 24 hours later the mites were examined to determine their survival. This procedure was conducted for 6 days before and 7 days during fluvalinate treatment. We found that live mites collected during fluvalinate treatment were less sensitive to fluvalinate than those collected before fluvalinate treatment. This suggests that many of the live mites which fall during fluvalinate treatment are an incipient fluvalinate-resistant population. These fallen mites are easily eliminated with a screened bottom board trap.

Both of the above studies support the use of screened bottom board traps (or bottom boards open and screened) in routine beekeeping. By slowing the growth of the mite population, acaricide treatments can be greatly reduced. Furthermore, such bottom boards should slow the development of acaricide resistance in two ways. First, selection for resistant mites will be reduced because the treatments will be less frequent. Second, the bottom boards may eliminate many of the mites that are somewhat resistant to the acaricide, while the hive is treated with that acaricide.

Ellis, J.D., K. S. Delaplane and W. M. Hood. 2001. Efficacy of a bottom screen device, Apistan, and Apilife VAR, in controlling Varroa destructor. Amer. Bee J. 141:813-816.
Webster, T.C., E. M. Thacker and F. E. Vorisek. 2000. Live Varroa jacobsoni (Mesostigmata: Varroidae) fallen from honey bee (Hymenoptera: Apidae) colonies. J. Econ. Entomol. 93:1596-1601.
Pettis, J.S. and H. Shimanuki. 1999. A hive modification to reduce varroa populations. Amer. Bee J. 139:471-473.

Using Inert Dust In An Integrated Pest Management Program To Reduce Varroa Mite Populations

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We evaluated powdered sugar for reducing varroa mite populations on adult bees that were driven from their nest with a bee repellant (Bee-Go®)into cages placed over the colony entrance. During the summer, we evaluated three treatments at seven-day intervals. In the fall we evaluated one treatment after colonies had ceased rearing brood. Both summer and fall treatments significantly reduced varroa populations. Our results indicate that beekeepers can use powdered sugar dusting of adult bees to reduce varroa populations both during the summer honey flow and the fall.

Winter Treatment Against *Varroa Destructor* Using A Fluvalinate-Tau Aerosol

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The experiment was conducted in five environmentally controlled modules (1,3 m x 0,6 m x 2,4 m) at the Centre de recherche en sciences animales de Deschambault (CRSAD). Each module accommodates five standard Langstroth hives staked vertically.

A venturi nébuliser (capacity of 1 ml/hour) is used to produce the aerosol mist. The source of Fluvalinate-tau is the commercial product Yardex (23,6% Fluvalinate-tau) available in USA (EPA Reg. No. 2724-478).

Infested hives were obtained from a local apiary. These colonies had never before been treated for Varroa infestation. Initial infestation rates of hives were estimated in early September after a 24 hour treatment with one Apistan strip in each hive. Thirty hives with infestation rates greater than 500 mites per colony but less than 2000 where chosen. During treatments, dead mites where collected on a sticky board placed under each hive. A final control treatment was done in early spring with two Apistan strips per hive. Efficiency was calculated by dividing the number of dead mites during experimental treatments by the total number of dead mites (experimental + final control). Fluvalinate residues in honey and wax samples were measured with a Hewlett Packard gas chromatograph II 5870.

A factorial 2x2 experimental design was chosen for statistical analysis. Two different concentrations of Fluvalinate (0,5 g/L and 5,0 g/L) are combined to two different application strategies (15 consecutive days in December and one day every month from December to march) are tested. During each daily treatment, 24 ml of the appropriate solution is nebulised in each module.

There is a significant effect of the concentration (a< 0,001). Best results are obtained with a Fluvalinate-tau solution of 5,0 g/L. There is no significant effect of the application strategy and no interaction between treatments (a = 0,05).

The treatment with the highest dosage (5,0 g/L during 15 days in December) gives the most residues in the honey (0,01 mg/Kg).

This winter treatment could added in a integrated pest management program. It has a low cost and its application is relatively simple.

Colony Behaviors Affecting Bee Management — Uncoupling Odor-Searching From Dance Behavior

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Recently, we have been engaged in audited trials aimed at characterizing the performance of bees conditioned to find substances based on olfactory clues alone. This work, sponsored by the U.S. Defense Advanced Research Projects Agency (DARPA), focused on the ability to train bees to locate trace levels of explosives mixed into soil. Bees were trained within six feet (2 meters) of the hive using a rich syrup, 2,4-DNT (an explosive), and a unique conditioning system (UM patents pending). Trials were conducted over periods of two to six weeks. Each evening, one (2001 trials) to three (2002 trials) bee colonies were moved onto the test site. Conditioning began at dawn the following day. Within 1-2 hours, bees were ready to be tested. Each trial included an open-field area for a blank, sand in petri-dish as a control, and a sand-2,4-DNT mixture as the explosive target. Amounts of DNT ranged from125 gm 2,4-DNT in 300 gm sand down to 0.1 gm DNT in sand. Each blank, control, or target was placed 75 ft (25 m) from the hive in 2001; 300 ft (100 m) from the hives in 2002. Bees over blanks, controls, and targets were video-taped and then counted. Sandia National Laboratory personnel measured vapor plumes 6 in above the ground and 12 in downwind for the target. The results revealed an amazingly exact ability of bees to locate trace amounts of explosives. The bee threshold of detection for 2,4-DNT appears to be about 50 parts per trillion, and possibly lower. Probability of explosive detection was conservatively calculated at 98-99%, with a false positive rate of about 1-2%, and a false negative rate of 1% or less. In all cases, conditioning took place just in front of the hive, and none of the targets provided any reward. Yet, bees searched all day long, and conditioning was maintained without a break for 36 days (2002). These findings should be of interest to beekeepers and growers. The idea of using odor to direct bees to crops has been proposed by Russian researchers, Ribbands (C.R., 1954, Proc. Royal Ent. Soc. London (A) 29:10-12), Wenner, A.M. (J. Insect Behav., In Press), and others, but the concept has been largely ignored and the technology for automating conditioning was lacking. By next summer, we hope to be able to determine whether the methods that we have developed can be used to improve crop pollination.

IPM Tactics To Manage *Varroa Destructor* In Honey Bee Colonies

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Varroa destructor, an external parasite of the honey bee, is a widespread problem in Canada and the United States. It has been controlled by fluvalinate, a pyrethroid, or coumaphos, an organophosphate but resistance to both these miticides has developed. Resistance to fluvalinate, which began to be a problem by 1998, is now widespread in the US. Mite resistance to coumphos, used since 1998, was first detected in 2000 and has now been reported in Florida, New Jersey and Maine. Integrated Pest Management (IPM) may offer possible alternatives to synthetic pesticides for varroa control. Unlike the single tactic used in traditional chemical control, it is likely that multiple IPM tactics will be needed to control varroa. In 2002 tested the use of hygienic queen stock, screened bottom inserts, a naturally derived miticide and environmental factors to determine the efficacy of these tactics, either singly or in combination, on varroa control. Colony health, such as foulbrood and wax moth were evaluated along with honey production and colony strength.

Genome Sequences Of Kashmir Bee Virus And Deformed Wing Virus

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We have sequenced the entire genome of Kashmir bee virus and about 75% of the genome of deformed wing virus. The Kashmir bee virus sequence is similar to that of acute bee paralysis virus across the genome, with about 85% identity at amino acid level and about 80% identity at nucleotide level. These data are consistent with the serological similarity between these viruses. The Kashmir bee virus genome has two major open reading frames, each encoding a polyprotein that presumably is subsequently processed into its active enzymatic constituents. The deformed wing virus sequence shows it to be a "true" picornavirus, containing a single open reading frame with the structural proteins expressed in the N-terminal part of the polyprotein. It is unique and has only distant similarities with other (insect) picornaviruses.

To prove that these genome sequences belonged to their respective viruses, two tests were used. In the first test the N-terminal amino acid sequences of the purified structural proteins of the virus particles were determined directly, and were matched with the predicted amino acid sequence of the genome open reading frames. In the second test the viral open reading frames were cloned into bacterial protein expression vectors and the proteins thus produced were recognized exclusively by antibodies specific to each virus.

The expressed virus proteins will be used in the development of a serological field test for the simultaneous detection of several honeybee viruses (and other bee pathogens) at subclinical levels. This will improve the management of honeybee diseases through earlier, more accurate and faster detection of diseases, enabling specific rather than prophylactic treatment of the hives. The test kit is intended for use by beekeepers, to disease diagnosis accessible and affordable for individual beekeepers and hence encourage better disease management across all types of beekeeping operations.

Session 3
Queen and Bee Stock Issues: Are We Moving in the Right Direction?

Comparative Population Dynamics Of *Varroa Destructor* In Russian And Ontario Honey Bees And Their Hybrids

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Russian queens, Ontario queens and two types of hybrid honeybee queens were established in two apiaries near Guelph, Ontario. The hybrids were made either by mating Russian queens with Ontario honeybee drones, and by mating Ontario queens with Russian drones. Ten colonies of each stock were used for this experiment.

The population of adult bees, and the brood area, were monitored every 2 weeks to determine the bee population dynamics in each of the experimental colonies. Within 24 hours the mite population in each colony was monitored. Mite populations were determined using 3 different methods; 1) 24 hour mite fall onto sticky boards placed under a screen bottom board to determine the natural mite fall, 2) a sample of approximately 150 bees was taken from the brood chamber and shaken in 70% alcohol to dislodge the mites to determine the proportion of varroa mites per worker bee, and 3) 100 worker pupae and 25 drone pupae were pulled and examined for mites to determine the percentage of infested pupae.

Hygienic behaviour was measured for each colony by using a liquid nitrogen freeze kill bioassay. The suppression of mite reproduction was determined as described by Harbo and Hopingarner (J. Econ. Entomol. p.893-898, 1997). For grooming behavior, 30 mites were randomly collected from each sticky board and inspected for body damage. Capping period were also evaluated for all colonies.

On day 0 of the experiment, mitefall on the 24 hour sticky board was 4.1 ± 2.67, 4.4 ± 4.04, 3.0 ±3.19 and 3.9 ± 2.02 for Ontario, Ontario X Russian, Russian X Ontario and Russian stocks, respectively. On day 126, the 24 hour mite fall was 132.2 ± 47.1, 113 ± 58.2, 103 ± 52.8, and 84 ± 33.3 mites for Ontario, Ontario X Russian, Russian X Ontario, and Russian stocks, respectively.

Hygienic behavior varied greatly between the strains. The Russian and hybrid stocks were the most hygienic, displaying between 71% and 75% hygienic behaviour. The Ontario stock was the least hygienic displaying 53% hygienic behaviour.

Grooming behaviour varied between the stocks. Body damage was found on 24% ± 10.2%, 22% ± 13.6%, 20% ± 7.1%, 18% ± 9.1% for Ontario X Russian, Russian, Ontario and Russian X Ontario stocks, respectively.

Suppression of mite reproduction varied between stocks. Reduced mite reproduction was found on 7.2% ± 6.52%, 4.71% ± 2.01%, 4.4% ± 3.61%, and 3.0% ± 2.6O% of honey bee pupae for Russian, Russian X Ontario, Ontario X Russian, and Ontario stocks, respectively.

Based on these results; 1) Russian honey bees have lower varroa population build up in relation to bee population than Ontario bee stock, and 2) Russian bees also show high hygienic, reducing Varroa mites in bee colonies. It is advisable to use Russian bees as source for varraoa resistance. Russian bees can be incorporated to Canadian bee stocks because the hybrids demonstrate some of the resistance of the pure Russian stocks.

The effects of attendant bees, second queens, and drifting bees during queen introduction

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Queens killed during introduction are an expensive loss in beekeeping. Initially bees tend to display hostility towards a new queen by balling her protective cage. In the typical scenario, the number of ballers decreases, and they are not present upon the queen's release. Queen acceptance is expected to decrease by factors that extend the duration of balling. One of these factors may be the presence of the attendant bees. Previous experiments (presented last year) indicated a shorter balling period without attendant bees

(under marginal foraging conditions). Once the number of ballers went to zero, it did not rebound, though infrequently 1-2 ballers were observed on some cages. In contrast, the number of ballers on cages with attendant bees exhibited complicated patterns of aggression. In addition to the typical scenario (termed a decay), some colonies had no decrease in the number of ballers (chronic balling), or the number decreased to zero and then suddenly showed a dramatic increase subsequently decreasing to zero again (reversion) or never decreasing to zero again (reversion and chronic balling). At the termination of the experiments, colonies continuing to ball were checked for second queens, and those with them were removed from the above experiments. Some colonies displaying chronic balling, reversions, and both of these scenarios only had one queen. Nevertheless in colonies with second queens, the number of ballers fluctuated over time and formed some interesting patterns of aggression that will be shown and discussed.

Single queen colonies showing a reversion prompted further experiments to investigate why balling resumed. Other observations suggested that drifting might be a possible cause. Since chronic balling, reversion, and both scenarios together were only observed in colonies with attendant bees, it was hypothesized that some interaction might be occurring between the attendant bees and the drifted bees to cause the resumption of balling. In a preliminary experiment, queens were introduced into observation hives with and without attendant bees. An additional treatment was included where the attendant bees shipped with the queens were replaced with bees from the recipient colonies. When balling ceased, these hives were switched with other observation hives having established queens. This procedure resulted in numerous foreign bees entering the hives over several days, thus mimicking a severe drifting problem. In four of the five colonies with queens accompanied by attendant bees (irrespective of the source), some balling resumed, though the response was variable in both bee number and duration. The worst case had 3-27 ballers for the last six days of the experiment and resembled a reversion. Balling resumed in one of the three colonies having queens without attendant bees. That response was weak with only 2-4 ballers for about 24 hours. It resembled, though to a slightly greater degree, the minor transient balling (1-2 bees) infrequently seen in the decay pattern when queens were without attendants. Biologically, drifted bees in colonies with attendant bees may be associated with the recurrence of balling. However compared to colonies without attendant bees, the recurrence of balling was not significant ($P = 0.28$, Fisher's exact test). This result may be due to the small sample sizes. Larger experiments are planned to resolve this issue.

Comparative Resistance Of Canadian And French Colonies Of Honey Bees (*Apis Mellifera*) To *Varroa Destructor*: Influence Of Bee Strain, Mite Strain, And Environment

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In several areas of France, *Varroa destructor* initially depressed both managed and feral populations of honey bees, but feral populations have subsequently recovered. The obvious explanation for the survival of these unmanaged feral colonies would be that they have evolved resistance to the mites. However, there is also the possibility that the Varroa mites have evolved into less virulent strains, that environmental factors are affecting the Varroa population growth, and/or there are interactions between these variables.

We established an experiment in summer 2000 to discriminate between these factors, using two populations of bees: (1) bees from France that exhibited no obvious detrimental effects from Varroa mites in the absence of chemical treatments and (2) Canadian stocks of bees in which Varroa mites increase quickly. Queen bees reared from these two geographic populations were exchanged and used to requeen sets of colonies in both southern France and Ontario, Canada. The colonies were inoculated with Varroa mites, after which mite populations were quantified continuously (in France) or at irregular intervals (in Canada) and with no chemical treatments to affect Varroa mite populations. In Canada, samples of adult bees from each colony were also evaluated for prevalence of tracheal

mites (Acarapis woodi) in fall.

In Canada, we demonstrated that there were significantly lower levels of tracheal mites in the French colonies than in the Canadian colonies. This may reflect the much longer period of selection in France where tracheal mites have existed for approximately 70 years. Varroa mite populations varied in both geographic races approximately equally, with no clear evidence that the bees from France had lower mite populations.

In contrast, in France the French colonies had fewer Varroa mites falling on the bottom boards of hives (a measure of mite populations) than the Canadian colonies. All colonies showed a large decline in numbers of mites in early June, 2002, apparently in response to environmental variables. Sampling of these colonies has continued to the present and results of the most recent assessments will be reported during the presentation.

In summary we observed that the French bees had significantly lower Varroa populations than Canadian bees in France but approximately equal Varroa populations in Canada. This suggests that the relatively low populations of Varroa in France result from either the presence of less harmful strains of mites, an interaction of the bee strain with the mite strain, or environmental differences. Environmental differences by themselves do not seem likely to cause these differences given the highly variable environmental conditions worldwide under which *Varroa destructor* causes significant damages to bee hives.

Breeding For Hygienic Behaviour In Honey Bees Using Open-Mated Nucleus Colonies

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Hygienic behaviour is a heritable character that confers resistance against American foulbrood disease (AFB) (Spivak and Reuter 2001 Apidologie 32: 555-565). Colonies carrying the traits that make up hygienic behaviour detect early AFB infections, uncap the cells and then remove the larvae before the disease has had an opportunity to produce spores (Woodrow and Holst 1942 J. Econ. Entomol. 35: 327-330). Although hygienic behavior occurs endemically among North American honey bee stocks (Spivak and Reuter 1998 Apidologie 29: 291-302), increasing the frequency of the trait within populations has only been demonstrated by the use of artificial insemination and isolated queen mating systems. Both mating systems are not widely used or easily implemented in many regions of Western Canada. Our ongoing study is evaluating the feasibility of establishing hygienic behavior using standard open-mating breeding practices used in the establishment of nucleus colonies during the month of June in Alberta, Canada.

Our study compares the expression of hygienic behavior between lines of bees that have been repeatedly selected for hygienic behavior to lines that are not under selection. A total of nine lines have undergone two successive generations of selection and have been compared to four unselected lines for their ability to express hygienic behaviour using a freeze-killed brood assay (Spivak and Reuter 1998 Am. Bee J. 138: 283-286). All lines used in the experiment were derived from five different commercial beekeepers in northeast Alberta. Following each generation of selection lines were compared for hygienic behavior at a common site (progeny yard), to reduce the effects of environmental factors on the expression of the trait. Selection is expected to continue for two more generations.

A total of 100 potential breeder colonies were assayed for hygienic behaviour prior to the first generation of selection in May 2001. Only 30 colonies from this unselected breeding stock expressed hygienic behaviour. Following the first round of selection 54% of colonies headed by selected progeny (n=13) were considered hygienic, compared to 40% headed by commercial off-shore queens (n=5) and 37% headed by unselected progeny (n=8) ($c2 = 0.627$; $df = 2,26$; $P = 0.73$). A total of 74 breeders that were offspring from the 2001 selection and 22 unselected breeders were assayed for hygienic behaviour in May 2002. The frequency of hygienic behaviour among the selected breeders was 36% compared to 27% among unselected breeders. Progeny from the second round of selection (May 2002) are currently being evaluated.

The Effects Of Pesticide Residues In Wax On Queen Rearing And Queen Mating Success

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Honey bee (*Apis mellifera L.*) colonies are headed by a single mated queen and the success of the colony depends in part on her health and longevity. When a queen begins to fail the colony will begin the supersedure process to replace her. Beekeepers have reported an increase in supersedure rates and this corresponds with the increased use of pesticides to control parasitic mites. We explored the relationship between wax residues and queen rearing as a possible cause of increased supersedure rates. Recent research (Haarmann *et al.* 2002, J. Econ. Entomol. 95:28-35) has demonstrated that both fluvalinate and coumaphos applied to commercial honey bee colonies resulted in poor queen rearing success but the residues levels varied widely. In the current study we examined the success rate of queen rearing in beeswax queen cups that contained known concentrations of coumaphos, an organophosphate used to control parasitic mites. Additionally, we determined the mating success of queens reared under the varying residue levels.

Session 4
Resistance, Residues And Reality

Early Detection, Tolerance And Alternative Control Methods Of AFB

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AFB is reported world-wide. Recently, increasing problems with resistance in *Paenibacillus larvae larvae* to OTC have been reported. An early detection makes it possible for the beekeepers and bee inspectors to be alert and prevent outbreaks. Several suitable detection methods have been developed e.g. culturing from honey, acidification of carbohydrates and PCR.

Immunity to AFB does not exist in honey bees, but there are different degrees of tolerance to the disease. Important mechanisms are the colony's ability to detect and remove infected and diseased brood (hygienic behaviour) (Spivak and Reuter, 2001, Apidologie 32:555-565) and larval tolerance. However, studies suggest that the hygienic behaviour expressed through removal of frozen capped brood alone or in combination with larval tolerance is not sufficient to model whether a honey bee strain will be able to overcome an AFB infection (Brødsgaard and Hansen, 2001, Proc. 37th Int. Apic. Congr., Durban: 5pp).

In Denmark, the control strategy for AFB does not include antibiotics but a variation of the shaking method is used. The adult bees from colonies with clinical symptoms are shaken onto frames fitted with strips of wax. After 3 to 4 days, the bees are shaken onto frames fitted with new foundation. 15 bee colonies were each fed honey containing 1.0H109 *P. l. larvae* spores and examined for two beekeeping seasons. 43 days after the spore feeding, 12 of the colonies developed clinical symptoms of AFB. Only these 12 colonies were then treated with the shaking method. After the shaking method was carried out a major reduction of the number of spores in the honey of the treated colonies was seen. The number of spores was reduced to a level

that did not provoke further clinical symptoms. 20% of the colonies never developed clinical symptoms. Within one season, these colonies were able to reduce the number of spores in the honey, to a level that was equal to the treated colonies. The advantages of the shaking method are that it saves the bee colonies and that there are no residues from drugs in honey or wax after the treatment. Another reason why the shaking method is a viable control option is that strains of P. l. larvae have developed resistance to antibiotics.

Oxytetracycline-Resistant American Foulbrood: Evaluation Of New Antibiotics For Residue

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American Foulbrood (AFB) is a disease of honey bees caused by the spore-forming bacteria, *Paenibacillus larvae larvae*. Strains of this pathogen that show resistance to the antibiotic oxytetracycline (OTC) were first discovered in the late 1990's and now pose a threat to beekeeping in the Americas (Miyagi *et al.*, 2000 J. Invert. Path. 75:95-96). The current management of AFB relies on preventative medication of colonies with antibiotics, which may lead to the development of antibiotic resistance and an increased risk of contaminating honey with residues. At present, assessment of AFB incidence is based on visual inspection of brood frames for the presence of clinical symptoms of AFB, such as diseased larvae and pupae, and irregularities in brood cell cappings. There are presently only two options for managing OTC-resistance: 1) to destroy infected bee equipment and in some cases whole colonies; and 2) to treat equipment with high energy electron beam irradiation (Nelson *et al.*, 2002 Hive Lights 15(2): 10, 12). Both of these are costly and the latter is only effective for empty combs and bee equipment, because electron beams can not effectively penetrate honey to kill spores. Colony inspections are extremely labour intensive and require trained staff to properly diagnose AFB. To prevent high colony losses, beekeepers urgently need a safe, effective and less drastic means for managing OTC-resistance.

Our research project has three objectives to investigate ways to manage AFB resistance. The first, which will be covered in this presentation, is to develop improved formulations and use patterns for new antibiotics to maximize their effectiveness and minimize their residues in honey. The other two objectives are to select for genetic resistance to AFB using commercial bee stocks in Alberta and to predict disease severity by sampling honey for AFB spores.

Alternate antibiotics, such as tylosin and lincomycin, have been shown to be effective against OTC-resistant AFB, but are 10-12 times more persistent in honey than OTC (Alippi *et al.*, 1999 J. Apic. Res. 38:149-158; Kochansky *et al.*, 2001 Apidologie 32:215-222). Our study evaluated several different dose and application methods of treating colonies with tylosin and lincomycin for possible residues in honey. Two studies were conducted; one in which antibiotics were applied during the fall (Sept. 2001), and the other in which antibiotics were applied in the spring (May 2002). Samples of honey were taken from the brood nest and honey supers at weekly intervals until colonies were prepared for winter (fall application) or honey supers were removed (spring application). In addition, target animal safety data was collected to determine the effect of treatments on larvae and adult mortality. The results and significance of this ongoing study will be discussed. The evaluation of these antibiotics may permit their alternating use with OTC to reduce the risk of resistance and to maintain control of resistant AFB.

Relative Impact On Foraging Honey Bees Of Integrated Strategies For Control Of European Corn Borer, *Ostrinia Nubilalis*, Attacking Sweet Corn

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European corn borer (ECB), *Ostrinia nubilalis* (Hübner), is a serious pest of sweet corn in Ontario. Current insecticides used to control ECB are thought to have a negative impact on honey bees (*Apis mellifera L.*) foraging for sweet corn pollen. This study compares the potential risks to honey bees by: the currently recommended ECB control products, carbofuran (FURADAN®) and

l-cyhalothrin (MATADOR®); the experimental control agent, spinosad (SUCCESS®); and transgenic sweet corn (ATTRIBUTETM), engineered to produce the *Bacillus thuringiensis* (Bt) toxin, Cryl Ab. Toxicity of these insecticides to honey bees was evaluated in the laboratory using 3 different assay techniques: direct contact, residual contact and oral toxicity.

Direct contact toxicity was assessed using a Potter spray tower. Insecticides were analytical grade materials (>95% purity), with exception of the Bt toxin, where the formulation Dipel® was substituted. All insecticides were tested at 4 concentrations ranging from 0.00001-1.0% solution (w/v). Direct contact toxicity to forager honey bees was significantly higher for carbofuran (LC50=0.0013), than for l-cyhalothrin (LC50=0.023), spinosad (LC50=0.026) or Bt (LC50 >1.0).

Residual contact assays were done by exposing adult honey bees to a treated pollen-shedding sweet corn tassel. Sweet corn was treated in the field and test-tassels were collected 12 h prior to treatment (Pre-Trt) and then 12 h (Day 1), 36 h (Day 2) and 60 h (Day 3) post treatment. Bt test-tassels were collected at the start of pollen shed (Day 1) and then for 2 consecutive days thereafter. Residual contact toxicity of FURADAN was significantly higher for 2 days following application (refer to table). Tassels treated with either MATADOR or SUCCESS, or engineered to produce the Bt toxin (Cryl Ab), had no negative impact on honey bee mortality (refer to table).

Oral assays were carried out by feeding newly emerged honey bees a 1.5:1 (w/w) pollen-honey patty. Sweet corn was treated in the field and test-pollen was collected 12 h prior to treatment (Prt-Trt) or 12 h (Day 1), 36 h (Day 2) and 60 h (Day 3) post treatment. Bt test-pollen was collected at the start of pollen shed (Day 1) and for 2 consecutive days thereafter. No significant oral toxicity was found for any of the treatments; the need for further research to better assess the oral toxicity of these control agents will be discussed. Findings from this study indicate that the direct and residual contact toxicity to honey bees of spinosad (SUCCESS) and Bt-sweet corn (ATTRIBUTE) is minimal compared to the currently recommended ECB-control product, FURADAN. Results demonstrate that use of SUCCESS, MATADOR or sweet corn cultivars engineered to express the Bt toxin (Cryl Ab) could significantly decrease mortality of honey bees foraging in sweet corn fields.

Residual contact toxicity to adult honey bees of pollen-shedding sweet corn tassels treated with the foliar insecticides: carbofuran, l-cyhalothrin or spinosad or engineered with the Bt toxin (Cryl Ab) in a laboratory bioassay.

Treatment	% Mortalities (24 h)			
	Pre-Trt	Day 1	Day 2	Day 3
FURADAN 4F (530 g a.i/ha)	4.6a1	100b	65.8b	12.0a
MATADOR 120EC (10 g a.i/ha)	8.7a	8.7a	9.4a	5.7a
SUCCESS (70 g a.i/ha)	5.6a	2.7a	7.3a	2.8a
Untreated control	0a	14.5a	4.1a	2.4a
Bt-sweet corn (ATTRIBUTE)	--	3.2a2	3.2a	2.7a
Untreated control	--	0a	3.1a	0a

1 - Means within a column followed by the same letter are not significantly different at the P = 0.05 level, Tukey's (HSD).
2 - Means within a column followed by the same letter are not significantly different at the P = 0.05 level, Two-sample t-test.

Pesticide Resistance In Varroa – What Are Our Options Now?

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The parasitic mite *Varroa destructor* is the most serious pest affecting honeybees in the U.S. Until recent years, excellent control of varroa was afforded by the acaricides fluvalinate and coumaphos. It is now beekeeper experience, however, that fluvalinate has failed on a nationwide basis and that coumaphos has begun to fail in isolated regions of the U.S.

While these treatment methods were relatively easy and effective to apply, other options are available to beekeepers to fight resistant varroa. Several laboratories have developed strains of bees that are partially tolerant to varroa infestations, greatly reducing

the need for chemical controls. Several biorational compounds have also been developed to control varroa. While such approaches are novel, a combined approach will be most likely the greatest in efficacy in dealing with damaging populations of varroa in the U.S.

Fungicide Residues In Honey Bees, Pollen, Larvae, Brood Food And Nectar During Almond Pollination

R. Rivera, F.A. Eischen and H.R. Graham

About 1.2 million honey bee colonies were used during the 2002 almond pollination season in California. During almond bloom, the weather conditions are frequently moist and cool. Spraying one or more fungicides either singly or in combination actively controls fungal diseases such as almond blossom rot. Fungal diseases are controlled during early and peak bloom using iprodione (Rovral®), myclobutanil (Rally®) sprays. During moist conditions, Captan® is typically used prophylactically at late bloom and petal fall. Occasionally it is sprayed during peak bloom.

Honey bee colonies placed in the orchards for pollination are exposed to these fungicides either directly during their application or more commonly by foraging for nectar and pollen. Beekeepers have reported problems during pollination. Anecdotal evidence suggests fungicides as the cause for the problems involving both immature and adult bees.

Atkins (1977) estimated that the LD50 for Captan to be 5.30 ug for a 3-day old larvae and indicated that based on the level of mortality observed in his laboratory assay, that 30-40% of brood could be killed by the sprays applied to trees. Mussen (personal communication) reported that in a laboratory study, giving spiked brood food containing as little as a few ppb of Captan killed 100% of the larvae.

We determined the levels of three commonly used fungicides, Captan®, myclobutanil (Rally®), and iprodione (Rovral®) associated with adult bees pollen, nectar, brood food and larvae in colonies pollinating almonds in California. Samples of these were collected at 24, 48 and 72 hours after spraying the orchard. The analyses for Captan®, Rally® and Rovral® were conducted using gas chromatography with an electron capture detector. Captan® was found in corbicular pollen at 97 ppm (range 0 to 707 ppm) stored pollen at 14.7 ppm average, (range-0.07 to 17 ppm), adult bees, 0.49 ppm (0 to 3 ppm), nectar, 0.13 ppm, (0 to 1 ppm), brood food, 0.18 ppm (0 to 5 ppm) and larvae, 0.13 ppm (0 to 2 ppm). Myclobutanil (Rally®) was found in corbicular pollen at 20 ppm (0 to 57 ppm), stored pollen, 14.24 ppm (0 to 34 ppm), bees at 0.01-ppm average (0 to 0.05 ppm), Larvae, 0.33 ppm (0-3ppm) and Brood food, none detected. Iprodione (Rovral®) was found in corbicular pollen pellets at 10.3 ppm (0.4 to 22 ppm), stored pollen, 2.98 ppm (0 to 15 ppm), bees at 0.49 ppm (0 to3.2 ppm), larvae, 1.5 ppm (0 to 6.3 ppm) and brood food, 3.98 ppm (0 to 25 ppm). Based on these results of field collected pollen we are feeding pollen with Captan® to caged honey bee colonies to determine the effects on adult and immature honey bees.

Predicting American Foulbrood Disease Severity Using Spore Levels In Honey

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American Foulbrood (AFB) is a serious disease of honey bees that is caused by the spore-forming bacteria, *Paenibacillus larvae larvae.* In the Americas, AFB has principally been managed by repeated prophylactic applications of oxytetracycline (OTC), which has contributed to the development of antibiotic resistant strains (Miyagi *et al.*, 2000 J. Invert. Path. 75: 95-96). Long-term reliance on new antibiotics without proper management is unsustainable because: 1) resistance to new antibiotics is likely (Davies, 1994 Science 264:375-382); 2) new antibiotics have the potential to leave residues in hive products (Kochansky *et al.*, 1999 Apidologie 30: 321-326); 3) antibiotics do not kill spores, the infective agent; and 4) antibiotics temporarily mask disease symptoms making assessments of disease hazard difficult (Oldroyd *et al.*, 1989 Aust. J. Agr. Res. 40:691-697).

At present, detection of AFB is based on visual inspection of brood frames for the presence of clinical symptoms. Because of the labour required to conduct inspections, antibiotics are often applied without sufficient knowledge of AFB incidence or severity.

Although selectively medicating colonies that exhibit a high risk of disease would be a more sustainable management practice, this option is unavailable because there are no techniques available to monitor sub-clinical infec-

tions. However, several studies have indicated that P. l. larvae spores can be cultured from honey samples (e.g. Hornitzky and Clark, 1991 J. Apic. Res. 30:13-16; Nordström and Fries, 1995 J. Apic. Res. 34: 97-103), enabling detection of the inocula before symptoms are visible. Hence, spore sampling could provide early warning of AFB incidence and severity, and be used to detect antibiotic-resistant strains.

Our ongoing experiments have the following objectives: 1) to conduct a survey of *P. l. larvae* in honey from Alberta beekeepers; 2) to determine the relationship between clinical symptoms of AFB and levels P. l. larvae spores in honey; and 3) to evaluate selective assay techniques to identify AFB spores. This report will focus on the first two objectives.

Our preliminary survey of honey producers in 2001 (507 samples) indicated that AFB spores could be isolated in samples from 12 of 14 producers; the remaining 2 producers had no incidence of AFB for 3 years. These results further indicate that the total number samples containing spores, and the number of spores per individual sample, both correlate with the past AFB history of a beekeeping operation. In addition, the proportion of samples testing positive for OTC resistance within an operation may provide insight into the relative introgression of resistant strains. Data from 2002 are presently being collected.

To examine the relationship between spore levels and clinical symptoms of AFB, 40 Australian packages were established in the spring of 2002 on equipment previously treated by electron beam irradiation. After progressing through several brood cycles, colonies were separated into five isolated apiary sites. Each group was inoculated with a different spore suspension (0, 105, 106, 107, 108 spores/ml), by aspirating 20 ml of the type strain (NRRL B3650) onto two - 100 cm2 patches of L1 larvae. Colonies were inspected weekly throughout the summer to assess the development of AFB symptoms, and spore samples were taken from adult bees, honey and swabs within the hives. Spores were identified and enumerated by evaluating colony growth on selective microbiological media. The relationship between AFB spore levels and disease epidemiology will be discussed.

A Review And Update Of Bee Health Investigations In Atlantic Canada

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In 2000, some beekeepers on Prince Edward Island, Canada, experienced high, unexplained honey bee colony losses. PEI has about 17% of its land base in rotation with potato production, and about 90% of the crop is treated with imidacloprid in-furrow. Some beekeepers in France felt that imidacloprid use on sunflower crops was negatively affecting honey bee health in that country. Beekeepers who were experiencing high colony mortality on Prince Edward Island wanted this possible connection investigated as well. Their concerns were heard, and as a consequence, a residue study was done in 2001. However, the results did not uncover detectable residues of imidacloprid or two of its metabolites in bee forage plants or hive products. Unexplained and substantial honey bee colony losses continue to plaque and mystify some beekeepers around the world. With increasing demand for honey bees for pollination of fruit crops in Atlantic Canada, this problem is a very real concern. Therefore, a comprehensive, mulitfactor investigation was initiated in the spring of 2002. Feedback was gathered from beekeepers, and partnerships with beekeeper associations, producer organizations, individuals, corporations, institutions and governments were developed. The final version of the project includes seven major components which encompass many of the factors that beekeepers agree can negatively impact honey bee health. Also, these factors are in agreement with those listed in a CAPA/CHC joint committee recommendation regarding the need for broad, factor based studies. The factors included in the studies being done in Prince Edward Island, New Brunswick, and Nova Scotia are presented and the methodologies for collecting data are outlined.

Residues In Honey And Wax: Implications And Safety

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Abstract unavailable

Poster Presentation Abstracts

Poster 1

Infection Of Bee Colonies By Paenibacillus Larvae Larvae Contaminated Wax

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Abstract not available at time of printing

Poster 2

Understanding "Washboarding" Behavior In The Honey Bee

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Worker honey bees exhibit a "group" activity known as washboarding on the internal and external surfaces of the hive. This behavior is believed to be associated with general cleaning activities but virtually nothing is known as to the age of worker engaged in the behavior, under what circumstances workers washboard and the function of the behavior. We investigated the frequency of washboarding behavior in relation to worker age, time of day and surface texture. Marked worker bees began washboarding at 13 days of age, with a peak in washboarding occurring when workers were 15-25 days of age. Washboarding behavior increased from 8:00am to 2:00pm and remained elevated until late evening. We presented workers with a panel containing three textures, unpainted wood, slate and glass on hives that were washboarding. Comparisons of washboarding behavior on the three textures revealed that washboarding increased from glass to wood to slate but these differences were not significant. Washboarding behavior appears to be age dependant with bees most likely to washboard between 15-25 days of age. Washboarding increases during the day and peaks through the afternoon. Workers may respond to rough texture and washboard more on those surfaces as we found and increase in the behavior from bees on glass, wood, and slate but further testing is needed to confirm this. The function of this behavior remains to be elucidated.

Poster 3

Monitoring Varroa Mite Populations

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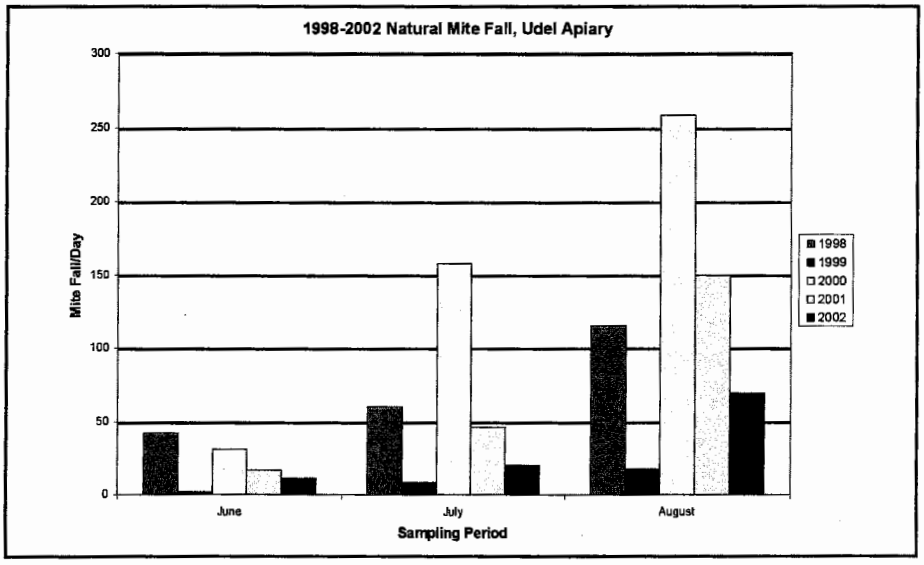
We compared natural mite fall from mid-June to Mid-September over several seasons. There is considerable variation in colony and season in mite numbers demonstrating monitoring is essential in an IPM approach to control (see figure below). We examined several recommended sticky board materials and three commercially available sticky boards (from IPM Technologies, Portland, OR, Great Lakes IPM, Vesterburg, MI and Olsen Industry, Medina OH) for reliability in retaining dropped mites in order to obtain threshold estimates of total mite populations. Vaseline proved satisfactory but vegetable oil, cooking oil spray or contact paper were significantly less reliable; all three commercial products performed well. We also compared sampling whole colony with sticky boards with adult bee (ether roll and powdered sugar methods) and



drone brood sampling. We found little predictability between the three sampling techniques. We feel comfortable with a threshold of 50 mites/day natural fall on sticky boards as a threshold for a Mid August miticide decision threshold but meaningful numbers for ether roll/powdered sugar sampling from adult bee bodies or drone brood sampling are not available.

Poster 4

Research On The Diagnosis And Treatment Of European And American Foulbroods

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American Foulbrood is a widespread bacterial disease that can devastate honeybee colonies. The sole treatment, apart from destruction of the hive by burning, is the use of an antibiotic, terramycin, discovered over 50 years ago. Antibiotic residues in hive products and more recently the spread of terramycin-resistant foulbrood bacteria makes the search for an alternative treatment the more urgent.

During a study of microbial genetics, researchers at Cardiff University discovered that an otherwise apparently innocuous bacteria related to the causative agent of American foulbrood in honeybees produces substances, which destroy American foulbrood and European foulbrood colonies in culture.

A research project set up between Cardiff University, The Central Science Laboratory (UK Government) and Vita (Europe) Limited is investigating the behaviour and fate of this potentially beneficial bacterium within the honeybee colony; also the effects of this bacterium on the health and behaviour of the honeybee colonies in question.

Vita (Europe) Limited in conjunction with the Central Science Laboratory, UK, have also developed a novel field diagnostic kit for the early detection of American and European foulbroods. Based on antibody recognition in a convenient laminar flow system these diagnostic kits are extremely portable, accurate and innovative and promise to be a useful tool for beekeepers and apicultural specialists alike.

Poster 5

Breeding *Varroa Destructor* Resistant Honey Bees (*Apis Mellifera*) Using Natural And Gametic Selection Through Haploid Drones

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The parasitic mite, *Varroa destructor* Anderson and Trueman, has caused serious economic damage to *Apis mellifera* colonies for over fifty years, and continues to be a serious management problem for beekeepers. Recently, concerns have developed over the cost and safety of chemical miticide treatments as well as the evolution of miticide-resistance by Varroa. Therefore, we propose a program for breeding honey bees resistant to Varroa mites using natural selection, an approach that takes advantage of the male hemizygous genome.

Gamete selection through hemizygous males has already proven to be a factor influencing insecticide-resistance of some agricultural pests. Male gamete selection can also be applied to honeybees, as drones with a haploid number of chromosomes lack variability at every gene. Consequently, recessive genes not expressed in heterozygous queens and workers are expressed in the phenotype of drones. Therefore, Varroa can exert direct gamete selection on drones, as drones are genetically identical to their own sperm. This selection can act directly on drones and indirectly through the colonies they inhabit. Direct effects include losses of haemolymph proteins and increased rates of microbial infection that contribute to a decreased lifespan. Also, Varroa parasitization decreases the sexual capacity of drones by affecting their seminal vesicles and mucus glands, decreasing spermatozoa production, and reducing their ability to go on mating flights. Indirectly, Varroa can reduce the numbers of drones reared by a colony by reducing the health and population of worker bees. These effects can be taken advantage of in breeding for mite-resistance, as natural selection will determine which drones are most successful at contributing genes to the next generation. A Closed Population Breeding Program (CPBP), as conceived by Page and Laidlaw (1985), initiated with a diverse population of partially resistant colonies provides the best avenue for a male selection program such as this, as it ensures that queens mate only with drones from colonies within the program. Miticide treatments in the CPBP should be eliminated or greatly reduced to allow Varroa populations to grow naturally and thereby exert their selection pressure.

Many research efforts have focused on individual traits to understand their genetic basis, but for breeding, simultaneous selection for several individual traits (some polygenic) becomes unworkable because of the extremely large number of colonies that must be evaluated. A CPBP incorporating natural selection through drones would greatly

reduce the number of colonies within the breeding population. A methodology that focuses on evaluating overall Varroa populations will be more cost-effective than screening colonies for specific mite-reducing characteristics, thereby allowing resources to be directed towards evaluation of additional daughter queens/colonies per breeder queen.

Poster 6

Nosema Spore Reproduction In Different Honey Bee Castes

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East Lansing, MI 48824-1115

Nosema apis is a microsporadian parasite of honey bees. Nosema disease causes significant reduction in colony performance and honey production, but the damage is "silent" because it is difficult to diagnose the disease.

Because honey bee workers go through various behavioral tasks and there are profound physiological differences between the behavioral tasks, we hypothesized that Nosema spores might reproduce differentially in the midgut of bees performing different tasks. We tested this hypothesis by infecting newly emerged workers, 8-10 day old nurses and unknown aged foragers with the same dose of nosema spores. Bees were caged in an incubator or reintroduced into a colony. After 8 days, bees were sacrificed and the number of Nosema spores counted. We did not detect any significant any difference among workers performing different tasks. It appears that *Nosema Apis* spores can germinate and reproduce at similar rates in newly emerged bees, nurses or foragers. This is unfortunate because we were hoping that perhaps a chemical can be found that reduces either the germination or spore multiplication if difference exists among the various behavioral castes.

Poster 7

Comparison Of Two Thymol-Based Acaricides, APILIFE VAR And Apiguard, For The Control Of Varroa Mites

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APILIFE VAR and Apiguard are two European commercial miticides used to combat Varroa mites. API LIFE VAR and Apiguard were evaluated for their ability to control Varroa mites and for safety to bees following fall treatment (September - October) of full-sized colonies in two different apiaries in British Columbia, Canada. Colonies treated with APILIFE VAR or Apiguard provided comparable Varroa control to that observed among colonies treated with fluvalinate (Apistan), a highly-effective Varroa acaricide. APILIFE VAR-treated colonies at one apiary, however, had 70% fewer Varroa drop on adhesive boards compared to Apistan-treated colonies during the first week of treatment ($F = 3.76$; $df = 2, 23$; $P = 0.040$) (see figure). Although Apiguard-treated colonies had similar levels of Varroa drop to those treated with Apistan, they had approximately 40% the adult bees and sealed brood in one apiary the spring following the treatment (Adults, $F = 6.05$; $df = 2, 22$; $P = 0.009$; Brood $F = 6.45$; $df = 2, 22$; $P = 0.007$). The release rate of all volatile compounds was considerably higher for Apiguard than APILIFE VAR over the first 3 days of treatment, however, rates were similar throughout the remaining treatment period, suggesting the release rate of thymol only differs initially between the products. Our results indicate that fall treatments with either APILIFE VAR or Apiguard provide good control of low-level Varroa infestation with limited negative effects on early spring bee population.

Poster 8

Comparison Of Semi-Selective Media For Selective Growth Of The Honey Bee Pathogen, *Paenibacillus larvae larvae*, From Honey Samples

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*Agriculture and Agri-Food Canada
Box 29, Beaverlodge, AB T0H 0C0

American foulbrood (AFB) in honey bee colonies can be detected at subclinical levels by growing *Paenibacillus larvae larvae* from samples of honey (Hornitzky and Clark, 1991 J. Apic. Res. 30:13-16) or bees (Goodwin *et al.*, 1996 J. Apic. Res. 35:118-120) on microbiological media. Although numerous microorganisms grow in these environments (Gilliam, 1997 FEMS Microbiol. Let. 155:1-10), pasteurization of samples can exclude non-spore forming species (Rose, 1969 J. Invert. Pathol. 14:411-414). Nonetheless, fast-growing spore-forming bacteria remain, inhibiting *P. l. larvae* detection.

The antibiotics nalidixic acid, pipemidic acid, and polymixin B were reported to reduce the growth of pasteurization-resistant species without impacting *P. l. larvae* (Hornitzky and Clark, 1991 J. Apic. Res. 30:13-16; Alippi, 1995 Microbiol. SEM 11:343-350; Kabay, 1995 Aust. Vet. J. 72:33-34;

Schuch *et al.*, 2001 J. Apic. Res. 40:59-64). Various described media-antibiotic combinations, however, have not been compared simultaneously and it is uncertain which are most selective for *P. l. larvae*. Some have proven ineffective at preventing species other than *P. l. larvae* from growing. The objective of our research was to compare previously described and new media for selective and differential growth of *P. l. larvae* from Canadian honey samples.

Previously described media that were evaluated in this study included: Sheep Blood Agar with 3 mg/ml nalidixic acid (Hornitzky and Clark, 1991 J. Apic. Res. 30:13-16), J-agar with 15 mg/ml nalidixic and 20 mg/ml pipemidic acids (Alippi, 1995 Microbiol. SEM 11:343-350), and *P. l. larvae* Agar with 9.1 mg/ml nalidixic acid and 9.1 mg/ml pipemidic acid (Schuch *et al.*, 2001 J. Apic. Res. 40:59-64). In the new media, antibiotics that *P. l. larvae* is known to be resistant to (chloramphenicol, kanamycin, neomycin and spectinomycin) (Kochansky *et al.*, 2001 Am. Bee J. 32: 215-222), were evaluated at concentrations of 0, 0.5, 5 and 50 mg/ml in TMYGP (Dingman and Stahly, 1983, App. Environ. Microbiol. 46:860-869).

In 2001, 507 honey samples were collected from 14 commercial beekeeping operations in Western Canada. About 56% (n=286) of the honey samples collected contained pasteurization-resistant species that were not *P. l. larvae* and 23.5% (n=119) were overgrown with these species such that *P. l. larvae* could not be detected. Isolates of *P. l. larvae* and other pasteurization-resistant species from the samples were preserved and later identified using fatty acid methyl ester (MIDI-FAME) analysis. These were used to assay the effectiveness of the media for selection of *P. l. larvae*. As well, type cultures of spore-forming species typically found in honeybee colonies (Gilliam, 1997 FEMS Microbiol. Let. 155:1-10) were used, including: *Bacillus subtilis* (NRC 3052), *B. pumilis* (NRC 3050), *B. megaterium* (NRC 2852), *B. spherieus* (NRC 9027), *Brevibacillus laterosporus* (NRRL B3677), *Paenibacillus alvei* (NRS 9062, NRRL B383) and *P. l. larvae* (NRRL B3650).

The results show that many of these media had low levels of selectivity, supporting the growth of non-*P. l. larvae* bacteria found in honey. The most promising media were those containing nalidixic and pipemidic acids. Media containing high levels of various antibiotics were inhibitory to *P. l. larvae* growth, as well as other pasteurization-resistant organisms, while lower antibiotic levels supported growth. Evaluations are currently underway to determine the ideal concentrations of nalidixic and pipemidic acids in selective media to inhibit growth of non-*P. l. larvae* isolates.

Poster 9

Assessing The Hazards Posed By Pesticides — Good Laboratory Practices (GLPs) Are Not Enough

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Recently, a new book entitled *Honey Bees: Estimating the Environmental Impact of Chemicals* (J. Devillers and Minh-Ha Pham-Delegue, Eds., 2002, Taylor and Francis, London and New York) was released. This book provides up-to-date accounts of different strategies for evaluating the ecotoxicity of xenobiotic chemicals, ranging from pollutants to pesticides, and also genetically modified plants. Our 30+ years of work, many years of research by groups of investigators in Italy, France, and Croatia, and selected research from the United Kingdom, New Zealand, and other U.S. investigators has been brought together, for the first time, in this 332 monograph. Throughout the book, some common themes appear, that reinforce our own findings: 1) behavioral endpoints in honey bees should be included for an effective assessment of the hazards presented by pesticides and other chemicals, 2) further work is needed to correlate laboratory observations with those of field studies, 3) low doses of many compounds result in various sub-lethal effects, 4) technologies, using bees, exist for effecting continuous, real-time detection of pesticide (and other toxic chemical) exposures and effects at low cost, and 5) the results of any investigation of exposures to and the effects of pesticides and other hazardous chemicals are strongly influenced by experimental design and the methods employed. Good laboratory practices are essential, but can not make up for poor design or improper methods. Some common chemical exposure and residue analysis errors include inadequate sample size, improper sample preparation, using the lowest cost (inappropriate) method, pseudo-replication (false replication) of experiments, and failure to submit both blind blanks and blind spiked samples to an analysis laboratory. For effects, too few colonies, over-reliance on testing of individual bees rather than whole colonies, and an over-emphasis on acute toxicity as the endpoint of interest are common shortcomings. Finally, there is a general lack of understanding of routes of uptake, transfer, and fate of pesticides into honey bee colonies. Most

seriously, these is a failure to understand that bees can adsorb chemical and biological materials directly from the air. Most pesticide hazard assessment protocols assume that bees must either be directly sprayed, contact the poison on vegetation, or take up the chemical from nectar or pollen in order to be at risk. Our own work proves that direct adsorption of chemicals from the air, dusts, and air-borne materials is a common and often significant route of exposure.

Poster 10

Imidacloprid (Admire®) Residue Levels Following In-Furrow Application In Potato Fields In Prince Edward Island And New Brunswick, Canada

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In April 1999, imidacloprid was approved for use in potatoes across Canada and, as a broad spectrum pesticide, it is presently registered in 100 countries for use on over 65 crops. The high molecular mobility of Admire in the xylem of treated plants is due to its high water solubility (510 mg/L) (Elbert *et al.* 1998; Elbert *et al.*, 1991). The molecular ability of imidacloprid makes it an ideal candidate for use on potatoes and numerous other crops. In the spring and summer of 2000, some beekeepers in Prince Edward Island, and New Brunswick suffered high bee losses. After hearing the concerns expressed by beekeepers in France, similar issues were raised regarding the use of imidacloprid in the Maritime Provinces. With input from a coalition of researchers and beekeepers, a study was initiated to determine if residue levels (ppb) of imidacloprid applied in-furrow, plus the hydroxy and olefin-imidacloprid metabolites were present one and two years following application of Admire in: 1) soil, clover leaves, clover flowers, and wildflowers, 2) pollen, and nectar collected from honey bees foraging in previously treated clover fields, and 3) uncapped honey collected from the hives placed in previously treated clover fields. Three classifications of fields were used in this study:

1) Potato fields (Year 1 of rotation),
2) Underseeded grain fields (Year 2 of rotation),
3) First and Second flowering clover fields (Year 3 of rotation).

Runoff areas of some year 1 and year 2 fields were subcategories of soil and wildflower sampling. The samples were analyzed by High Performance Liquid Chromatography-Electrospray Ionization Mass Spectrometry (HPLC-MS/MS). Quantification was accomplished by using weighted (1/x) linear regression from an eight to nine point calibration curve. Residue levels of imidacloprid were detected in soil in all treated fields. The edges of sloped fields in first year rotation (i.e. potato fields) exhibited only one case of residue in soil. Metabolites were not included in the soil analysis because honey bees are not exposed to them in the soil. Three fields had residue levels of imidacloprid in clover leaves at just above detectable levels. Otherwise, all clover flowers, wildflowers, pollen, nectar, and uncapped honey did not have detectable levels of imidacloprid or its hydroxy and olefin metabolites. Furthermore, initial data collected on bee colonies placed in clover fields that were previously treated with Admire®, did not indicate adverse effects during the time frame of this study.

Poster 11

Pesticide Use In And Around Apiaries And Risk Analysis For Honey Bees In Prince Edward Island And New Brunswick

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2Wildwood Labs, Kentville, Nova Scotia B4N 3Z1

The health of the honey bee (*Apis mellifera L.*) may be under intense pressure from disease infestations, pollination stress, and modern agricultural practices that make use of chemical agents such as pesticides. Some Eastern Canadian and French beekeepers have expressed concern about the possibility that imidacloprid, a chemical first granted temporary registration in Canada in 1995, may be responsible for high bee mortality rates witnessed in these localities (Kemp and Rogers 2002). However, a previous study conducted in Prince Edward Island (P.E.I.) and New Brunswick (N.B.) found that imidacloprid residue levels were not detected in the nectar and pollen of clover plants growing in fields previously treated with this chemical. Therefore, honey bees foraging on these clover fields were not exposed to detectable levels of this chemical (Kemp and Rogers 2002). Nevertheless, some beekeepers in Eastern Canada are still reporting widespread honey bee losses, and an overall decrease in colony health. In addition, imidacloprid is only one of the many chemicals used by agricultural growers in these two provinces. For example, the health of honey bee colonies may be either directly or indirectly affected by the use of other chemical compounds (Stapel

et.al. 2000). Furthermore, pesticide activity may be synergistically enhanced when mixed with other pesticide compounds (Pilling et.al. 1995). Therefore, there is still a need to investigate various pesticide use patterns in P.E.I. and N.B., as these patterns continue to be one possible factor negatively impacting honey bee health. One hundred and three (103) apiaries across P.E.I. and N.B. were examined in this study. Mail out questionnaires and phone interviews are being gathered from farmers that have agricultural plots within a 1.5 km radius of each apiary. Data collected from this survey will be used to determine pesticide use patterns in P.E.I. and N.B. Relative toxicities documented in the literature will be used to: 1) develop an environmental impact quotient for buffer zones of each study beeyard; and 2) establish risk patterns posed to honey bees by pesticide products used in these two provinces. Established risk patterns will be related to hive assessment data (which will reveal colony strength in each apiary location) in order to determine if negative impacts to honey bee health can be predicted and measured.

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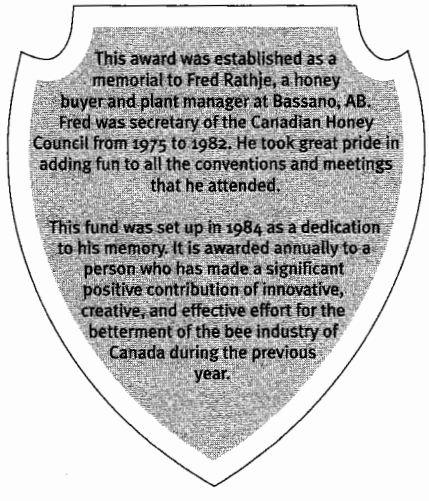
Fred Rathje Award



2002	Doug McRory	Ontario
2001	Don Nelson	Alberta
2000	John Gruszka	Saskatchewan
1999	Doug McCutcheon	British Columbia
1998	Jean Pierre Chapleau	Quebec
1997	Merv Malyon	Manitoba
1996	Lorna and Jack Robinson	Ontario
1995	Gordon Kern	British Columbia
1994	Kerry Clark	British Columbia
1993	Linda Gane	Saskatchewan
1992	Babe and Charlie Warren	British Columbia
1991	Gerry Paradis	Alberta
1990	Cam Jay	Manitoba
1988	Don Dixon	Manitoba
1987	John Corner	British Columbia
1986	Gerry Smeltzer	Nova Scotia
1985	Paul Pawlowski - First year of the award	Alberta

Appendix I: Consolidated Balance Sheet and Statement of Income

Canadian Honey Council
2002 Financial Statement
Consolidated Balance Sheet as at October 31, 2002
(Unaudited)

	2002	2001
Assets		
Current Assets		
Cash		2,157
Short-term investments	**66,414**	58,006
Accounts Receivable	**1,951**	
Inventory	**315**	350
Accrued interest receivable	**9**	2,532
	68,689	63,045
Fixed Assets net book value		
EQUIPMENT	**1,942**	2,696
	$70,631	$65,741
Liabilities		
Current Liabilities		
Bank overdraft	**27**	
Accounts payable	**1,345**	2,284
Deferred income	**5,510**	5,068
	6,882	7,352
Members' Equity		
Reserves for Future Expenditures		
Capital reserve	**5,440**	5,440
Unapropriated Retained Earnings	**58,309**	52,949
	63,749	58,389
	$70,631	$65,741

Canadian Honey Council
Consolidated Statement of Income
For the year ended October 31, 2002
(Unaudited)

	2002	2001
Revenue		
Membership fees	**50,021**	49,840
Annual meeting	**11,084**	4,626
Canadian on Farm Food Safety Program	**13,150**	
Donations - CBRF	**6,993**	92,646
Hive lights	**17,777**	18,406
Interest	**592**	3,393
Promotional materials	**1,276**	360
Other	**4,605**	
	105,498	169,271
Operating Expenses		
Advertising and promotion	**35**	210
Annual meeting	**10,250**	3,783
Awards and donations	**163**	188
Bank charges	**121**	78
CBRF - Donations	**6,993**	92,646
Canadian on Farm Food Safety Program	**13,150**	
Credit card charges	**81**	81
Hive lights	**20,991**	23,387
Office	**2,064**	2,129
President's honorarium	**2,000**	2,000
Professional fees	**1,273**	1,243
Rent- building	**1,200**	1,200
Telephone	**1,511**	1,661
Travel	**937**	5,138
Wages and benefits	**38,616**	38,522
	99,385	**172,266**
Net Income Before Amortization	**6,113**	(2,995)
Amortization	**754**	829
Net Income (loss) for the Year	**$5,359**	$(3,824)

Appendix II: General Fund Balance and Statement of Income

Canadian Honey Council
2002 Financial Statement
General Fund Balance Sheet as at October 31, 2002
(Unaudited)

Assets	2002	2001
Current Assets		
Cash		2,049
Cash Short-term investments	**10,084**	
Inventory	**315**	350
Accrued Interest receivable	**1**	
	10,400	2,399
Fixed Assets net book value		
Equipment	**1,941**	2,695
	$ 12,341	$5,094
Liabilities		
Current Liabilities		
Bank overdraft	**2,636**	
Accounts payable	**1,342**	2,282
Deferred income	**5,510**	5,068
	9,488	7,350
Members' Equity		
Unappropriated Retained Earnings	**2,853**	(2,256)
	$ 12,341	$5,094

Canadian Honey Council
General Fund Statement of Income
For the year ended October 31, 2002
(Unaudited)

	2002	2001
Revenue		
Membership fees	**50,021**	49,840
Annual meeting	**11,084**	4,626
Donations - CBRF	**6,993**	92,646
Hive lights	**17,777**	18,406
Interest	**178**	579
Promotional materials	**1,276**	360
Other	**4,605**	
	91,934	166,457
Operating Expenses		
Advertising and promotion	**35**	210
Annual meeting	**10,250**	3,783
Bank charges	**121**	78
CBRF - Donations	**6,993**	92,646
Credit card charges	**81**	81
Hive lights	**20,991**	23,387
Office	**2,064**	2,129
President's honorarium	**2,000**	2,000
Professional fees	**1,273**	1,243
Rent- building	**1,200**	1,200
Telephone	**1,511**	1,661
Travel	**937**	5,138
Wages and benefits	**38,616**	38,522
	86,072	172,078
Net Income Before Amortization	**5,862**	(5,621)
Amortization	**754**	829
Net Income for the Year	**5,108**	(6,450)
Unappropriated Retained Earnings beginning of year	**(2,255)**	4,194
Unappropriated Retained Earning, end of year	**2,853**	$(2,256)

Appendix III: Canadian Bee Research Fund Financial Statement

Canadian Bee Research Fund
2002 Financial Statement
Consolidated Balance Sheet as at December 31, 2002
(Unaudited)

	2002	2001
Assets		
Current Assets		
Cash	**6,842**	228
Short-term investments	**509,097**	502,860
Accrued Interest receivable	**482**	24
	$ 516,421	$503,112
Liabilities		
Current Liabilities		
Accounts payable	**452**	424
Equity		
General Fund Balance	**30,935**	39,131
Endowment Fund Balance	**485,034**	463,557
	515,969	502,688
	$ 516,421	$503,112

Canadian Bee Research Fund
General Fund Statement of Operations and
Changes in Fund Balances
For the year ended December 31, 2002
(Unaudited)

	2002	2001
Revenue		
Donations	**25,889**	95,173
Investment Income	**602**	3,066
Other	**148**	240
	26,639	98,479
Less transfers to Endowment Fund	**14,336**	89,743
	$ 12,303	$ 8,736
Operating Expenses		
Bank charges	**24**	16
Office	**23**	50
Professional fees	**452**	452
Research grants	**20,000**	
	20,499	518
Net Income for the Year	**(8,196)**	8,218
Fund Balance beginning of year	**39,131**	20,913
Prior years adjustment	**0**	10,000
Balance, end of year	**$ 30,935**	$39,131

Honorary Members

Awarded	Honorary Members		
1950	Hon. J.G. Gardiner		Ottawa ON
1950	William R. Agar		Brooklyn ON
1950	Harry Jones	F.W. Jones & Son	
1951	J.W. Braithwaite		Brandon MB
1950	G.H Pearcey		Kelowna BC
1950	C.B. Gooderham		Ottawa ON
1950	Tom H. Shield*	Manager, Ontario Honey Producers Co-op	Toronto ON
1951	P.C. Colquhoun		Maple Creek SK
1951	C.G. Bishop		Sherbrooke QC
1955	Harriet Grace	Director American Honey Institute	Madison WI
1955	J.N. Dyment		Smithville ON
1956	F.R. Armstrong	Dominion Honey Specialist	Ottawa ON
1956	W.H. Turnbull		Vernon BC
1964	J.Percy Hodgson	Hodgson Bee Supplies	New Westminster BC
1964	H. C. Allen		Toronto ON
1963	C.F. Pearcey		Kelowna BC
1965	Roy M.Pugh		Tisdale SK
1965	Frank Garland*		Winnipeg MB
1973	F.L. Rathje*		Bassano AB
2002	Kenn Tuckey		Edmonton AB

* Deceased

Appendix IV: Canadian honey production, Statistics Canada.

Estimates of the Number of Beekeepers, Colonies of Bees, Production of Honey and Value in Canada[1] by province[2], 2001 and 2002 with Five-year averages, 1997 – 2001

Province and Year Province et année	Beekeepers Apiculteurs	Colonies	Honey - Miel Total Production Production totale		Value Valeur
	number nombre	number nombre	lb '000 liv '000	metric tonnes tonnes métriques	$'000
Prince Edward Island / Île-du-Prince-Édouard					
Average/Moyenne 1997 - 2001	51	1404	107	48	167
2001	78 r	1,702 r	131 r	59 r	217
2002 P	78	1713	124	56	..
Nova Scotia - Nouvelle-Écosse					
Average/Moyenne 1997 - 2001	439	17,740	826	375	1,244
2001	400	20,500	629	285	692
2002 P	418	20,500	755	342	
New Brunswick - Nouveau-Brunswick					
Average/Moyenne 1997 - 2001	318	6,104	316	143	507
2001	284 r	4,874 r	211 r	96 r	471
2002 P	284	5,100	361	164	..
Quebec - Québec					
Average/Moyenne 1997 – 2001	383	30,971	3,374	1,531	5,252
2001	237 r	30,576 r	2,687 r	1,219 r	5,259
2002 P	240	27,500	3,968	1,800	..
Ontario					
Average/Moyenne 1997 - 2001	3,620	79,600	8,109	3,678	8,905
2001	3,000	75,000 r	7,097 r	3,219 r	9,224
2002 P	3,000	75,000	7,695	3,490	...
Manitoba					
Average/Moyenne 1997 - 2001	840	89,800	15,804	7,169	14,904
2001	800	91,000	15,640 r	7,094 r	16,735
2002 P	800	87,000	14,355	6,511	..
Saskatchewan					
Average/Moyenne 1997 - 2001	1,353	95,600	20,113	9,123	18,169
2001	1,315 r	100,000	21,500	9,752	25,800
2002 P	1,325	100,000	19,000	8,618	..
Alberta					
Average/Moyenne 1997 - 2001	733	205,800	27,528	12,486	25,485
2001	739 r	227,000	26,786	12,150	27,488
2002 P	739	229,000	24,045	10,907	..
British Columbia - Colombie-Britannique					
Average/Moyenne 1997 - 2001	2,262	47,504	3,613	1,639	6,674
2001	2,249 r	51,676 r	3,335 r	1,513 r	7,032
2002 P	2,000	39,870	3,104	1,408	..
Canada[2]					
Average/Moyenne 1997 - 2001	9,999	574,523	79,791	36,193	81,307
2001	9,102 r	602,328 r	78,016 r	35,388 r	92,918 r
2002 P	8,884	585,683	73,407	33,297	

[1] Figures are compiled by Statistics Canada from provincial data, with the exception of N.B. and P.E.I. where data are collected through a Statistics Canada mail survey.

[1] Les statistiques pour le Nouveau-Brunswick et l'Île-du-Prince-Édouard sont recueillies par Statistique Canada au moyen d'un sondage par la poste. Les chiffres des autres provinces sont des statistiques provinciales compilées par Statistique Canada.

[2] Does not include Newfoundland - Sans Terre-Neuve

r Figures are revised - Chiffres sont révisés

P Preliminary - Nombres provisoires

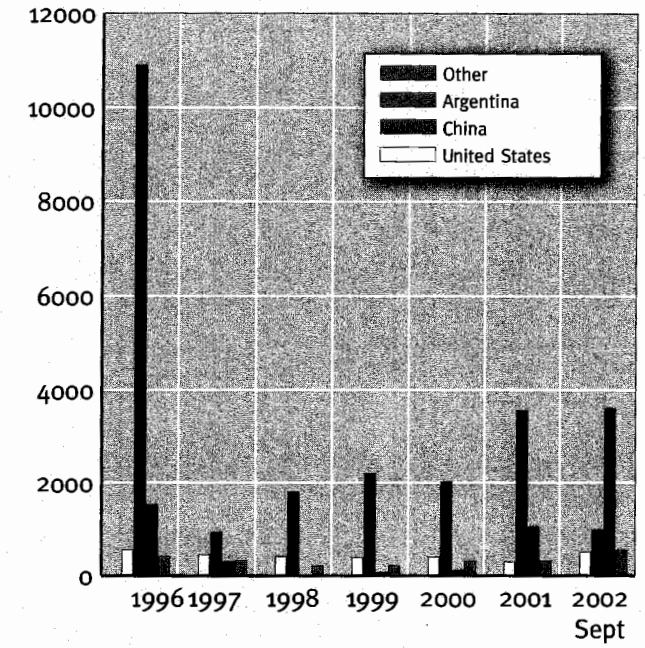
.. Figures not yet available - Chiffres pas encore disponible

Note: 1 Pound = 0.453 kilogram; 2,204,000 pounds = 1 metric tonne.

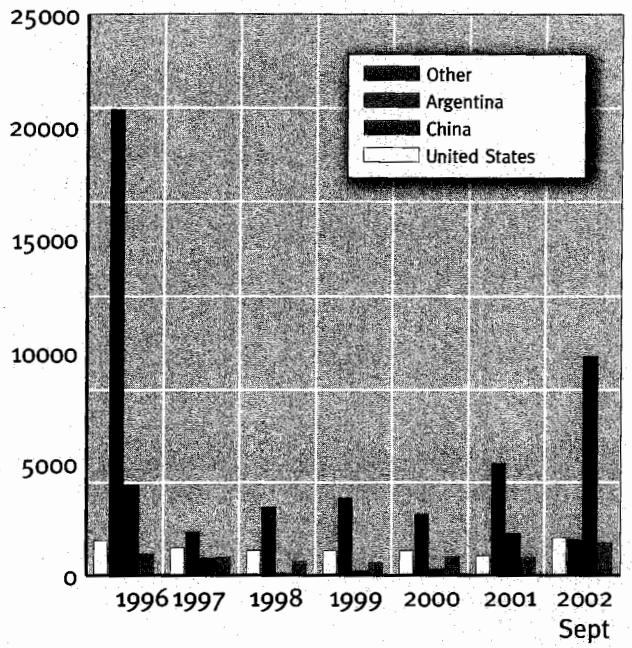
Nota: 1 livre = 0.453 kilogramme; 2 204 000 livres = 1 tonne métrique.

Appendix V: Canadian Imports and Exports.

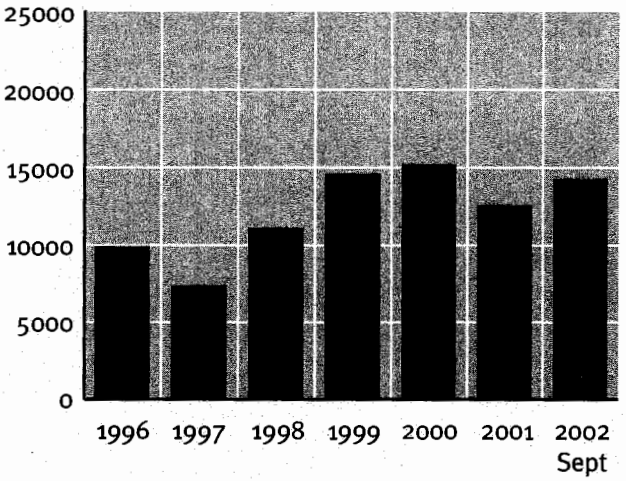
Metric Tonnes



$ X 1000



Metric Tonnes



$ X 1000