Ontario

MINISTRY OF AGRICULTURE, FOOD AND RURAL AFFAIRS

2012 Ontario Provincial Apiarist Annual Report

Introduction

The 2012 season for beekeeping in Ontario was a mix of opportunity and emerging issues. Beekeepers had their lowest level of winter mortality in more than a decade demonstrating that the Integrated Pest Management and sustainable stock development strategies employed by most Ontario beekeepers have been worth the investment. The opportunities for beekeepers to expand and diversify for pollination services are increasing. At the same time, emerging invasive pests such as small hive beetle (SHB) and apparent pesticide damage are providing new challenges to the industry.

Industry Make-up and Statistics

At present, there are 3,100 registered beekeepers in Ontario. This represents 45 per cent of beekeepers in Canada. The 100,000 managed honey bee colonies in Ontario represent 17 per cent of the honey bee population in Canada.

Two hundred and thirty commercial beekeepers manage 80,000 of the 100,000, or 80 per cent, of the colonies in the province. Honey bee colonies are currently managed at approximately 6,400 sites.

In 2012, 66 beekeepers held queen and nuc permits allowing for the regular sale of honey bee material. Although most of these bees were supplied to beekeepers within Ontario, some were exported to other Canadian provinces and the United States of America.

Weather Patterns

The spring of 2012 was very warm and early. Honey bee colonies became active (foraging and brood rearing) approximately 4 weeks earlier than most years across the province. At the same time, agricultural practices and plant production shifted with the weather. This meant that honey bee forage was available when the bees needed it.

The summer was generally hot and dry with some isolated precipitation across the province. The unusual early spring may be a contributing factor to the higher fall levels of varroa. This could be due to four additional weeks of honey bee brood rearing / varroa reproduction.

Honey Production

Honey production was variable in 2012. The dominant factor was location, and how much precipitation each location received. The average honey crop in 2012 was 81.95 lbs / colony (2012 Honey Survey).

Pollination

Demand for pollination services for berry crops in Eastern Canada has increased in recent years. In 2010, 12,600 honey bee colonies left Ontario for pollination, with 14,700 colonies in 2011 and approximately 26,000 colonies in 2012. This represents almost one quarter of the managed colonies in Ontario. These colonies left Ontario to pollinate blueberries, cranberries and canola in the provinces of Quebec, New Brunswick and Nova Scotia. There are indications that the blueberry acreage will increase substantially in Eastern Canada and Ontario with areas being developed in different areas of Northern Ontario within the next decade. This will further increase the demand for pollination services by Ontario honey bee colonies and provide additional opportunities for the industry to expand and diversify.

Pest and Disease Levels in Ontario

Varroa and Tracheal Mites

In September 2012 varroa mites were detected in the region of Thunder Bay, in multiple locations. The findings of varroa are significant as varroa mites have not been detected in this region previously.

The general trends of varroa levels encountered through varroa sampling during regular apiary inspections showed low levels in spring and high levels in fall (Figure 1). This follows the natural population progression of varroa as they increase throughout the season. However, the low levels encountered in many operations in the spring of 2012 seems to confirm the health of colonies reported by beekeepers and the success that beekeepers have had with their management of varroa mites in late spring 2011. There have been concerns with the high levels of varroa encountered in the fall of 2012 as the longer season may have allowed populations to build up at damaging levels in advance of late summer and early fall when winter bees are developing. It is essential that beekeepers monitor their levels of varroa and treat before damage occurs.

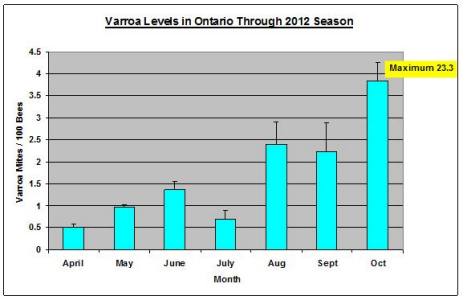

Figure 1. Varroa levels in sampled colonies in Ontario throughout the 2012 season. *The maximum proportion of varroa encountered in a sample was 23.3 per cent.*

American Foulbrood (AFB) and Other Brood Diseases

In 2012, AFB was found in 71 beeyards, representing 311 honey bee colonies or 2.5 per cent of inspected colonies in Ontario. This figure may reflect the focus on "at risk" beeyards, based on proximity to other infected locations and available information from past disease status history.

Other brood diseases that were tracked by the inspection program include European Foulbrood, Mellisococcus pluton (found in 0.01 per cent of inspected colonies), chalkbrood, Ascophaera apis (found in 5.6 per cent of inspected colonies) and sacbrood (found in 1.4 per cent of inspected colonies).

2012 Ontario Apiculture Survey Results - Levels of Winter Loss and Management Practices of Ontario Beekeepers

Winter Loss

The level of honey bee colony mortality over the winter was 12.39 per cent. This is much less than the winter loss documented over the past decade and is significantly lower than the 43 per cent last winter (Figure 2). This level of loss is much closer to what is considered to be acceptable and sustainable by most apiculturists (5 to 15 per cent) (Furgala and McCutheon, 1992). The level of winter mortality has decreased from the winter of 2010/2011 to 2011/2012 in all provinces across Canada (Figures 6 and 7). The recent severity of winter loss in Ontario has been a major concern for beekeepers where the winter mortality has more than doubled in the years of 2007 to 2009 and nearly tripled in the year of 2011 from the 15 per cent threshold.

This survey represents 71 of the 230 commercial beekeepers in Ontario and 35,000 of the 90,000 or 39 per cent of the honey colonies in Ontario. The Ontario winter loss report has been combined with the statistics from the other provinces to make up the 2012 Canadian Association of Professional Apiculturists Winter Loss Report (Figures 6 and 7). See: http://capabees.org/home/wp-content/images/2012/11/2012capawintloss1.pdf

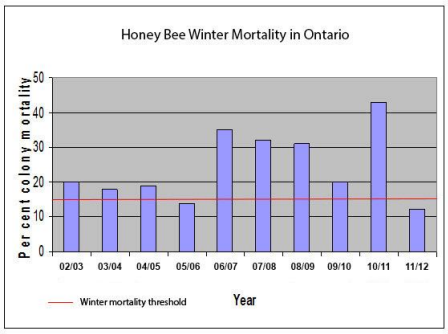

Figure 2. Honey bee winter mortality in Ontario

Management Practices

Survey results indicated that, on average, Ontario beekeepers are replacing 41 per cent of their queens through regular management and 13 per cent due to queen problems.

The majority of queens used in commercial beekeeping operations originated from Ontario (43 per cent), followed by queens imported from Australia (32 per cent), California (16 per cent) and Chile and New Zealand (2 per cent each).

Sixty four per cent of commercial beekeepers are making the investment in producing nucleus colonies and overwintering for the following season. This is considered by apiculturists in Canada to be an important strategy to grow and sustain populations of honey bee colonies within operations and as an industry.

Fifty four per cent of the colonies surveyed were used for pollination.

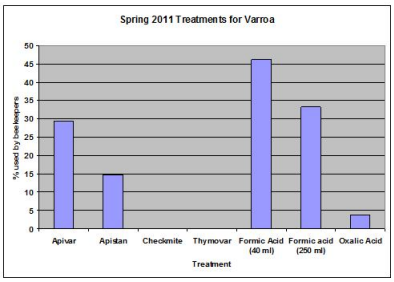

Figure 3. Spring 2011 treatments for varroa mites

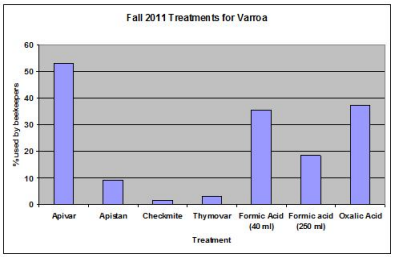

Figure 4. Fall 2011 treatments for varroa mites

Ontario beekeepers have a variety of chemical treatment options available to manage varroa mites. The most popular synthetic acaricide treatment is Apivar®, with hardly any commercial beekeepers using Checkmite+ +™, as the resistance issues with Checkmite+ +™ are well recognized. Beekeepers are still using Apistan®. Although there are populations of varroa in Ontario that are resistant to Apistan®, this resistance can vary (70 to 90% - Technology Transfer Program, Ontario Beekeepers' Association (OBA) - personal communication). Many beekeepers are still using formic acid as a regular treatment option, especially in spring.

It is important to note that varroa populations are always increasing, even after treatments are applied. Therefore, the success (efficacy) of the treatment may have implications for the levels of the surviving varroa population and how soon varroa will reach damaging levels and ultimately on the survival of a honey bee colony.

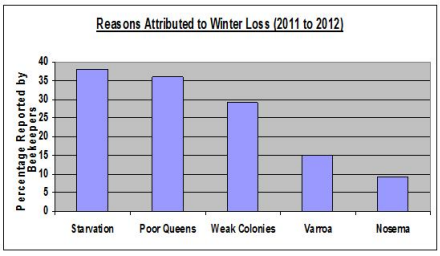

Figure 5. Reasons attributed to winter loss 2011/2012

The major reasons for colony mortality during the winter of 2011 to 2012 attributed by beekeepers were starvation, poor queens and weak colonies. The levels of winter mortality experienced by most beekeepers in 2011/2012 could be considered low, especially compared with the recent high levels of winter morality in the years 2007 to 2009 and the year 2011 (Fig. 2). It is interesting to note that two factors that have been attributed to increasing levels of colony decline (varroa and nosema) were not seen to be a major cause of loss in the winter of 2012 by beekeepers. This may reflect the recent success that beekeepers have had controlling varroa and the uncertainty of nosema's impact on honey bee health in Ontario. It should be noted that Guzman et al. (2010) have demonstrated the importance of effective varroa control for honey bee colony survival. Dr. Guzman and the Technology Transfer Program, Ontario Beekeepers' Association are currently conducting research to assess the virulence of Nosema ceranae in Ontario.

The scale of reported acute pesticide damage incidents in Ontario is worth noting. Approximately four per cent of all registered beeyards in Ontario have been impacted and in some counties over 30 per cent of registered beeyards may have been impacted. Why Ontario had so many reports this past season has yet to be determined. Further research, incident reporting and environmental assessment by regulators may clarify this issue in the future - particularly the potential chronic impacts on honey bee colonies.

Colony Collapse Disorder (CCD), which has been identified in the USA, has not been identified in Canada as of the 2012 field season. There has been concern amongst the industry that the levels of higher losses experienced by beekeepers in Ontario (2007 to 2009 and 2011) may have some relation to the higher losses experienced by beekeepers in the United States and the first reports of CCD (2006). To be clear, this disorder has been associated with a distinct set of symptoms (VanEngelsdorp et al., 2008). These symptoms may be considered separate from other reported losses of colony mortality (varroa damage, etc.). At present CCD has not been validated in Canada in field conditions by regulatory, research or extension staff in apiculture (Currie et al., 2010). The issues of both CCD (USA) and increased levels of colony loss (USA and Canada) are something that the Canadian Association of Professional Apiculturists (CAPA) is taking seriously. Provincial Apiarists and other members of CAPA are working to identify causative factors associated with reports of honey bee mortality in their respective provinces.

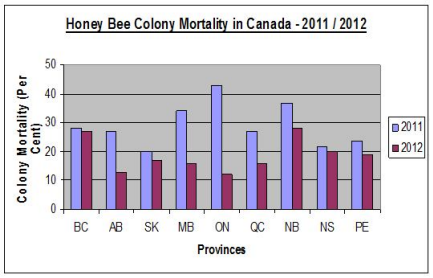

Figure 6. Honey bee colony winter mortality in Canada from 2010/2011 to 2011/2012

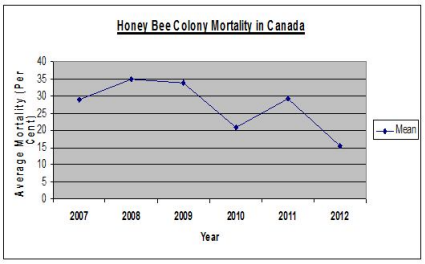

Figure 7. Honey bee winter mortality in Canada from 2007 to 2012

Small Hive Beetle Status

The distribution and population levels of small hive beetle (SHB) in Ontario are being tracked by the Apiary Inspection Program. Colonies are visually inspected for the presence of SHB adults and larvae with particular attention to areas of the hive where SHB is more likely to be found (top bars and pollen patties).

Two types of traps (top bar traps and bucket traps) were used in field inspections where required. Top bar traps were used in Dufferin County and the immediately adjacent regions. These traps are relatively inexpensive, easy to install, chemical-free, can be used throughout the season and are effective at capturing SHB. In certain higher-risk locations where it was important to determine if SHB was present, bees from the frames of supers were filtered through a screened bucket to examine for the presence of SHB.

Apiary Inspectors have also monitored targeted sites. These targeted sites are located in areas that are of potentially higher risk of being infested by SHB (Counties of Lambton, Niagara, Chatham-Kent and those along the St.Lawrence), either by their geographic proximity (along the USA border) to areas known to have SHB or by suspected association with a known area (e.g. through known or suspected trace-outs, selling or movement of honey bees).

Eight hundred and seventy six sites were inspected in the 2012 beekeeping season. This represents 355 beekeepers, 12,655 honey bee colonies inspected and covering approximately 31,000 honey bee colonies represented in the beeyards. SHB was found to be present in six of the 876 sites (Table 1). This is the same number of positive sites as in 2011.

For more information on biosecurity practices and identification of SHB see:
http://www.omafra.gov.on.ca/english/food/inspection/bees/biosecurity.htm
http://www.omafra.gov.on.ca/english/food/inspection/bees/shb-reportfindings.pdf

Figure 8. Small hive beetle locations in Ontario in 2012

Table 1. Details on SHB findings in Ontario in 2012

County	# of Honey Bee Colonies	Township	Status
Chatham-Kent	5	Chatham-Kent	All sites were depopulated. There are no positive sites for SHB beyond the Quarantine Area at present.
Dufferin & Simcoe	20	Adjala-Tosorontio	
	6	Mulmer	
Niagara	6	Niagara	
	3	Niagara	
Lambton	5	Chatham-Kent	

All positive sites have been reported to the Canadian Food Inspection Agency (CFIA) and the World Organization for Animal Health (OIE). Ontario will continue to work on monitoring and mitigating SHB. At present, all positive infested sites found outside of the Quarantine Area have received an individual beeyard quarantine where no honey bees or beekeeping equipment may leave the location. The industry (Ontario Beekeepers Association) has worked with the affected beekeepers to ensure that the infested sites are depopulated. The Apiary Program establishes the protocol and documents the depopulation. At a national level, the CFIA has been working with the provinces, in particular, Quebec, Ontario and Manitoba. For more details on the status of SHB in Ontario see:
http://www.omafra.gov.on.ca/english/food/inspection/bees/apicultu.html

The Quarantine Area (encompassing the entire County of Essex and all the Municipality of Chatham-Kent lying south-westwards of a line made up of a Town Line Road, Pump Road and Merlin Road also known as County Road 7) continues to be in place (Figure 9). This was the first area where SHB was found in Ontario and is the epicentre of the infestation.

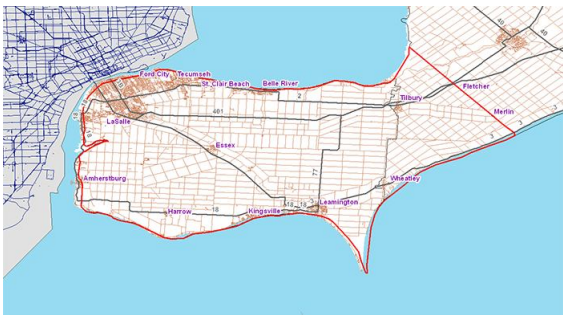

Figure 9. The boundaries of the quarantine area for SHB

Bee Kill Incidents

During the spring of 2012, from mid April to June, there were multiple reports of beekeepers throughout Ontario (~ 230 locations and 40 impacted beekeepers) experiencing bee kill in their honey bee colonies (Figure 10). The symptoms documented and reported by beekeepers were characteristic of acute pesticide poisoning (large piles of dead bees in front of the colony, trembling, shaking and atypical behaviour displayed in bees) (Figure 11).

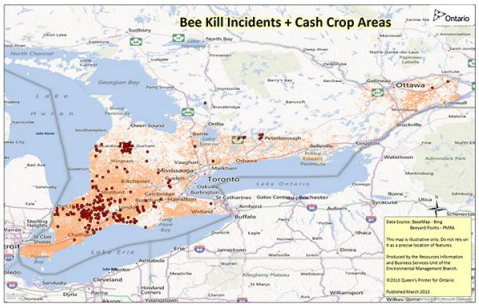

Figure 10. Reported bee kill incidents and cash crop areas

Figure 11. Symptoms of acute pesticide poisoning in honey bees

In most cases, damage was reported in close proximity to treated corn seed that was planted (proximity and by date) (Figure 10). Although this is the first time this issue has been reported in Ontario the issue of insecticides dislodging from corn seeds during seeding has been documented in Quebec since 2009 and was known to be an issue in Europe since 2008. In late 2011, a research paper highlighted this as an issue in the Mid-Western USA (Krupke et al., 2011) where levels of two insecticides (thiamethoxam and clothiandin) commonly used to coat corn seeds were found in samples of dead bees. Research has demonstrated that the dust coming from the exhaust of high pressure air-assisted corn planters contained particles of neonicotinoid seed insecticides. Many factors can contribute to the contamination of the dust including abrasion of the seed from the planter lubricant (eg. talc), quality and formulation of the polymer seed coating (sticker), and rough handling of the seed bags causing chaffing of the seed coat. Planting on dry, windy days may also help to carry the "fugitive dust" greater distances. Bees can come into contact with the contaminated dust while flying across the field during planting or from the dust settling on water sources or nearby flowers that they are foraging on. All the initial reports in Ontario detailed acute pesticide poisoning. Further reports related to some of the incidents in Ontario indicated concern with respect to potential lingering effects or continued chronic impacts on the colonies (continued mortality, queen failure, dwindling population of the colony) well after the suspected initial exposure to the pesticide.

Health Canada has analyzed numerous samples of dead bees collected from these incidents. Samples were screened for several pesticides associated with the reported cases of atypical bee deaths in the province. Seventy per cent of the samples were positive for levels of a commonly used pesticide on corn seed (clothiandin). It is also important to note that, though the analysis indicates the presence of clothianidin, thiamethoxam breaks down to metabolites that include clothianidin. The Pest Management Regulatory Agency (Health Canada) reported that "the information evaluated suggests that planting of corn seeds treated with the nitro guanidine insecticides clothianidin and/or thiamethoxam contributed to the majority of the bee mortalities that occurred in corn growing regions of Ontario and Quebec in Spring 2012." Health Canada has released a detailed report on the specifics related to the bee kill incidents. It is important to note that with all the incidents there were no known cases of off-label or improper use of pesticides by the growers.

Growers are being made aware that there is a risk to honey bees from treated corn seed. OMAF and MRA specialists have developed a set of best management practices that growers can use which may mitigate the exposure of honey bees and other pollinators to insecticide dust, recognizing that there is no guarantee that these practices may be successful under all conditions.

These practices include:

1. Minimize the amount of insecticide used. Growers should use an Integrated Pest Management strategy, using insecticides only when required. Growers can also use Bt corn varieties instead of insecticides when corn root worm is at damaging thresholds.
2. Strengthening communication between growers and local beekeepers.
3. That growers understand that neonicotinoids are water soluble and should not be used near areas where standing water may become contaminated.
4. Planting on days that are less windy and avoiding mid day planting on windy days.
5. Manage dandelions and other flowering weeds in and around fields prior to seeding.
6. Limit the amount of seed lubricant (eg. talc) used at planting.
7. Aim the exhaust of the planter towards the center of the field away from flowering vegetation and water sources at the margin of the field.
8. Modify planters with air deflectors.

The PMRA is also recommending a set of Best Management Practices for growers in a document called "Pollinator Protection - Reducing Risk from Treated Seed" (February 4, 2013). The risk reduction measures outlined in this document include:

A. Short Term Measures
   - Best Management Practices for Planting Treated Seed
   - Treated Seed Dust Standard
   - Labelling of Treated Seed

B. Longer Term Measures: Development of Technical Improvements and Stewardship
   - Seed Coating Quality
   - Seed Flow Lubricants
   - Planting Equipment
   - Treated Seed Bag Disposal

Also included in this document are announcements on updates to labelling of treated seed, regulatory status and further details on the Best Management Practices and the process of how these were developed. For more information see: http://www.hc-sc.gc.ca/cps-spc/pubs/pest/_fact-fiche/pollinator-protection-pollinisateurs/index-eng.php

In Canada, USA and Europe, regulatory agencies have been addressing the issue of pesticide impacts (specifically neonicotinoid insecticides) to honey bees through working groups, reports and updating the process of field response to incidents. In some of the recent reports from the European Food Safety Agency (EFSA) various research gaps and safety concerns were identified for three different neonicotinoid insecticides (imidichloprid, clothianidin and thiomethoxam). See: http://www.efsa.europa.eu/en/topics/topic/beehealth.htm

The scale of these incidents (reported acute pesticide damage) is worth noting where more incidents have been reported in Ontario than any other region of North America. Approximately four per cent of all registered beeyards in Ontario have been impacted and in some counties over 30 per cent of registered beeyards may have been impacted. Why Ontario had so many reports this past season has

yet to be determined. The majority of corn seed sold in Ontario is treated with some form of the insecticides in question. Further research, incident reporting and environmental assessment by regulators may clarify this issue in the future - particularly the potential chronic impacts on honey bee colonies.

For pesticide incidents related to pesticide treated seeds contact:
Regional Manager, Pesticide Compliance Program - Health Canada
Telephone 519-826-2895; Fax 519-826-2129; www.healthcanada.gc.ca/pmra

For updates on pesticide reporting, including pesticide incidents unrelated to seed treatments see: www.omafra.gov.on.ca/english/food/inspection/bees/bee-poisoning.htm

References

Currie R., Guzman E. and Pernal S. 2010. Honey bee colony losses in Canada. Journal of Apicultural Research. 49 (1): 104-106.

Furgala B., McCutcheon D.M. 1992. Wintering productive colonies. In Graham J M (Ed). The hive and the honey bee (revised edition). Dadant and Sons; Hamilton, IL, USA. pp. 829-868.

Guzman-Novoa E., Eccles L., Calvete Y., McGowan J., Kelly P. and Correa-Benitez A. 2010. Varroa destructor is the main culprit for death and reduced populations of overwintered honey bees in Ontario, Canada. Apidologie. 4 (4): 443-451.

Krupke C.H., Hunt G.J., Eitzer B.D., Andino G. and Given K. 2011. Multiple routes of pesticide exposure for honey bees living near agricultural fields. PLoS ONE. 7 (1): 1-8.

E-mail:
ag.info.omafra@ontario.ca