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Introduction

Recently, there has been a growing concern over the impact of an increasingly common class of pesticide known as neonicotinoids on honey bees and native bee pollinators, especially in urban areas. Many feel the decline in honey bee populations, known as colony collapse disorder (CCD), is directly linked to the increased use of these products. Unfortunately, there is a lack of data on the urban use of these products and their impact on the pollinators, and it would be a mistake to single out any variable as the definitive cause of the decline of honey bees and native pollinators.

Industry Use

Neonicotinoids have become an increasingly important class of pesticide for agricultural, landscape and residential use. There are currently more than 465 products containing neonicotinoids (often called neonic’s) approved for use, in the State of Washington of which approximately 150 are approved for use in the home or garden. Because of their relative mammalian safety and efficacy they are one of the fastest growing classes of chemicals (Jeschke and Nauen, 2008). One of the main advantages for using neonicotinoid products is that they work systemically within the plant, thus reducing the direct exposure to the applicator and the environment. Ironically it is this systemic action that makes the neonic’s a problem for honey bees and other pollinators. The neonicotinoid pesticide carried within the plant can also be expressed in the nectar and pollen of the flowers.

Uptake by Bees

In laboratory experiments researchers have documented several neonicotinoid products that are toxic to bees. Depending on the exposure, the effect on the bees can be lethal or sub-lethal. The sub-lethal effects of neonicotinoids include impaired learning behavior, short and long term memory loss, reduced fecundity, altered foraging behavior, and motor activity of the bees. Researchers have documented similar issues with other pesticides including some products used by beekeepers to control Varroa, a parasitic mite of the honey bee.

European Concerns

The current discussion presented by a growing number of individuals draws a direct link to the decline of native bees and honey bees in the use of neonicotinoids. The European Union has suspended the use of neonicotinoids for two-years as they reassess the impact of this material. Clearly there is justification for taking a closer look at neonicotinoids and placing a cautionary emphasis on their
use, but at this point there are insufficient data to suggest that this product is a substantial contributor to the decline of either native bees or honey bees. The value and the benefit of neonicotinoids to agriculture, professional landscapers, and homeowners as a relatively safe and effective product should be considered when making a determination on availability and restrictions for this class of pesticides.

**Lab versus Field**
Most of the studies on neonicotinoid toxicity to bees have been documented in laboratory studies attempting to emulate field exposure levels to the bees. The handful of field experiments have been conducted in plots where the predominate source of nectar and pollen comes from plants treated with neonicotinoids. Individual honey bees forage on just one source of pollen or nectar at any one time, but the colony as a whole will collect from a variety of sources when available. Most bumble bees and other native bees are generalists and will forage on a diverse array of nectar and pollen sources on any given trip.

**Urban Concerns**
The suggestion that bees are more likely to be exposed to neonicotinoid pesticides in urban areas where homeowner application of the material may be common is, at this point, undocumented. There are virtually no data showing levels of neonicotinoid use in urban areas being in excess of the levels demonstrated to have either lethal or sub-lethal affects on bees. Further, it is unlikely that all plants grown in urban areas would be treated with the product. Thus, it seems likely that urban exposures would be far less than levels experienced by bees in agricultural monocultures. Prior to enacting restrictions on urban homeowner use of this product, it would be prudent to collect data to quantify urban homeowner use of neonicotinoid pesticides and pollinator exposure from this source.

**Decline in Honey Bee Populations**
Sudden disappearance of bees has been reported by beekeepers and researched by scientists for decades and was often called Disappearing Disease (Wilson and Menapace, 1979). In 2006 this phenomenon suddenly became more widespread and has been coined by researchers and the media as Colony Collapse Disorder or CCD. The increase in colony losses and corresponded to the increased use of neonicotinoid pesticides (Johnson et al., 2010; Cresswell et al., 2012). This has led many beekeepers to speculate there is a causative relationship between the increased use of neonicotinoids and this widespread decline in bee populations (Suryanarayanan, 2013). However, to put things in their proper context it is important to look at all the variables associated with CCD.

Reports of dramatic declines in honey bee stock have been widely reported especially in the United States and Europe (Mullin et al., 2010), however, FAO data revel that globally there has been a ~45% increase in managed colonies since 1960 (Aizen and Lawrence, 2009). The definitive cause for the declines in the United States and Europe has of yet to be fully understood, however, more than 61 variables have been associated with CCD, but none have been clearly identified as the definitive cause of the phenomena (Evans et al., 2009). Some of the major factors associated with the decline in honey bee stocks in the United States include the Varroa mite, pesticides, pathogens, loss of habitat, and nutritional deficiencies. One additional stress placed on honey bees is the intense management strategies needed to ensure strong colonies for almond pollination in California from mid-February through mid-March. Researchers have ruled out individual stressors such as long distance hauling of bees on tractor-trailer trucks (Ahn et al., 2012). However, recent studies have placed some additional concerns on the “feed-lot” feeding widely practiced by commercial beekeepers. Beekeeper’s reliance on high-fructose corn-syrup and sucrose in these feed lot situations where tens of thousands of bees are kept prior to their movement into the almond orchards may significantly reduce the bees ability to detoxify pesticides (Mao et al., 2013). Similarly, beekeeper’s reliance on pollen substitute may make adult bees more susceptible to the effect of some pesticides (Jeri Wright, personal communication).
Varroa Mite

Clearly the Varroa mite is playing a major role in the decline of managed honey bee colonies in the United States. Not only the actual impact of the mite, an ectoparasite that impacts adults, pupae, and larvae by feeding on its hemolymph, but also the chemical control measures used by beekeepers to control the Varroa mite. Beekeepers routinely use both registered and unregistered products to control the mite. Without treatment colonies would be dead within two years from exposure to Varroa. Two studies have found the highest levels of pesticides in bees wax and pollen from commercial honey bee colonies are products used by beekeepers in their effort to control the mite (Wu et al., 2011; Mullin et al., 2010). Interestingly, neonicotinoids found in bees wax and pollen was far less common and at much lower concentrations than the miticides or metabolites of these products commonly used to control the Varroa mite (Mullin et al., 2010). Regardless of the levels of the product found in the colonies, sub-lethal effects of many pesticides including some products used for the control of the mite and neonicotinoids have been shown to cause memory impairment of honey bees at field realistic levels. (Williamson and Wright, 2013).

In Summary

Neonicotinoids clearly have a negative effect on honey bees and other insect pollinators including various important species of native bees. However, it is unclear that at field realistic levels if they have a detectable sub-lethal effect on bees. Exposure levels from dust during planting of neonicotinoid treated seed can have a devastating lethal impact, but this mode of exposure can be avoided and more work needs to be done on controlling levels of dust during planting. The real concern is the chronic exposure to neonicotinoids in nectar, pollen, and water (guttation) picked up by bees and returned to the hive. For now the best means of minimizing any adverse effects may be in increasing awareness of the potential through educational forums and via the product label.

As is evident from the references listed below a great deal of research is currently under way, in both Europe and the United States looking very intently at the effects of neonicotinoids on honey bees. Researchers at the University of Minnesota, Washington State University, and Washington Department of Agriculture are specifically looking at the issue of neonicotinoids in urban areas. Within the next 8 to 12 months WSU Extension will produce one or more factsheets for the general public and for the small beekeeper on the effects of neonicotinoids on honey bees in urban environments.

REFERENCES


Williamson, S. M. & Wright, G. A. (2013). Exposure to multiple cholinergic pesticides impairs olfactory
learning and memory in honeybees. *J Exp Biol.*

**ADDITIONAL REFERENCES OF INTEREST**


Included on the next page is a list of research.
<table>
<thead>
<tr>
<th>Authors/Date</th>
<th>Species</th>
<th>Pesticide(s)</th>
<th>Setting</th>
<th>Application</th>
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<th>Effects Tested</th>
<th>Exposure Range</th>
<th>Comments</th>
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<td>Creswell et al 2012</td>
<td>A. mellifera</td>
<td>neonic</td>
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<td>Oral</td>
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<td>Homing success</td>
<td>foraging</td>
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<td>Imid.</td>
<td>Lab/Field</td>
<td>Oral</td>
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</table>
PHOMOPSIS DIE-BACK ON BLUEBERRIES IN BRITISH COLUMBIA

Mark Sweeney and Siva Sabaratnam
BC Ministry of Agriculture, Abbotsford, BC

In recent years, an unusual die-back symptom has been observed in many young blueberry fields, particularly in cultivars Draper and Liberty.

These fields establish well, a few years after planting, when cropping begins, the oldest canes undergo a slow decline. Leaves get smaller, new growth ceases and fruit fails to size. Affected canes eventually die. Over the years, fruiting canes continue to collapse sometimes resulting in the death of the entire plant. Roots are always healthy. No obvious external symptoms are visible on canes, but on close inspection, an internal discolouration of the wood is seen which often extends down the cane and into the crown. In the lab, Phomopsis can be readily isolated from these affected areas. While Phomopsis has certainly been detected before in BC blueberry fields, mostly causing distinct cankers on stems, it has not been seen to behave so aggressively in young plantings. Further research is underway to characterize this pathogen and to better understand its infection process and disease cycle. It is suspected that the disease begins as undetected twig infections which occur after plants are set in the field. These infections are believed to grow internally over two or more years and eventually affect and kill the entire cane or crown.

Pending more information, the following are preliminary recommendations which should help to minimize Phomopsis infection and damage in young blueberry fields, particularly cultivars Draper and Liberty.

1. Monitoring. Inspect young fields for blighting and dieback on twigs and shoot tips in late winter/early spring. Several other organisms including Botrytis and Pseudomonas can cause similar injury. A lab test can confirm if Phomopsis is present.
2. Pruning. Prune out and destroy diseased wood.
3. Frost Protection. Phomopsis damage seems to be more severe in fields which are prone to fall and spring frosts. Infection may be favoured by the presence of frost-damaged tissue. Avoid planting Draper and Liberty in frost-prone fields or provide frost protection.
4. Nitrogen Management. Both Draper and Liberty have a tendency to grow vigourously though the fall and can be slow to become dormant.
Avoid excessive nitrogen fertilization which can encourage soft and late growth in the fall which, in turn, may contribute to greater infection.

5. **Fungicides.** Aside from the use of copper to manage Pseudomonas, most growers do not use fungicides during the non-bearing years because there is no fruit to protect. For Draper, Liberty and other cultivars that are susceptible to Phomopsis, protective fungicide sprays should be applied during the first flush of growth in the spring and prior to the onset of fall rains. Pristine, Cabrio, Bravo and Quash are among the effective fungicides labeled for Phomopsis control.
Anyone without the benefit of shade, cool water, air conditioning or fans during the recent heat wave probably experienced some uncomfortable hours. Livestock can also experience significant heat stress, which can affect feed intake, growth, production, reproduction, comfort and health. High environmental temperatures can take animals out of their thermoneutral zone—the environmental temperature range in which animals do not have to expend energy to either warm or cool themselves. Temperatures were hot enough recently to take livestock out of their comfort zones.

Unlike humans, most animals cannot sweat to any appreciable extent to cool themselves. Some animals only have sweat glands on their nose, which is not much effective area to dissipate heat through evaporative cooling. To a point, animals can cool themselves through increased respiration rates. However, increased respiration effort eventually causes increased body temperature due to increased muscular activity; animals can become afflicted with heat exhaustion and unable to cool themselves, trapped in an upward heat spiral that can be fatal.

One of the main ways animals manifest signs of heat stress is to stop eating. Ensuring adequate feed intake is particularly important for lactating and growing animals to meet their high nutritional needs. Anything that interferes with feed intake will affect growth rates and production.

Wise livestock managers will do whatever they can to keep animals both comfortable and productive during weather extremes. In hot weather, this means providing shade and unlimited cool fresh water for every animal. Water needs can increase substantially during hot weather and additional watering locations may be needed. If waterers do not automatically refill, frequent monitoring will be required throughout the day. Stagnant ponds are poor sources of high quality cool water on hot days and can be a source of diseases such as mastitis, as well.

Shade is essential for animal comfort during hot weather. Barns aren’t necessarily more comfortable than outdoor shaded areas, however, especially if there is poor air quality in the barn. Animals might
be most comfortable outdoors under shade trees with a light breeze. Temporary shade can be provided by tarps, shade cloth, wagons, lean-tos, etc.; see Photo 1 for an example. Make sure such temporary structures are not safety hazards for livestock, especially curious goats.

Air flow can increase animal comfort significantly. In some horse and small herd situations, fans can keep air moving and animals feeling cooler. As an example, the traditional British system for summertime equine care involves stalling horses with fans during the day and turning them out to pasture in the evening. Ventilation fans in barns must exchange air at a rate in keeping with animal density to ensure the barn does not become oppressively humid and uncomfortable. Hot air can hold more moisture; ceiling vents route rising hot and humid air up and out.

Observing animal behavior can help assess the degree of heat stress: if animals return to eating/grazing and activity within a few hours of the hottest time of the day, they probably aren’t experiencing residual heat stress they can’t dissipate. If animals remain off feed and inactive even through the next morning, they are seriously affected by the heat. If animals never cease eating or being active, they aren’t demonstrating significant heat stress. Black or dark-colored animals may appear to be more severely affected than lighter-colored animals because they absorb more heat and may have more trouble dissipating it.

Pigs respond well to periodic wetting with sprinklers to help them stay cool via evaporation. Thoroughly wetting them periodically with large water drops and allowing them to dry is more effective than misting or continuous access to water. As the temperature increases, increase the frequency of sprinkler episodes.

Wool is an excellent insulator and protects sheep from both extreme hot and cold. Although shearing is not absolutely essential for sheep to be comfortable during hot weather, animals will have less work to do if they don’t have to carry 10 extra pounds everywhere. Annual shearing is a best practice for wool breeds and most producers do this before lambing for cleanliness purposes; shorn ewes therefore usually have short fleeces during the summer anyway.

Because animals experience an increase in body temperature after meals, feed the majority of rations in the evening as animals head into the cooler part of the day. Animals can be encouraged to consume the rest of their ration by offering frequent small, fresh meals. This approach can work well with nearly-finished market animals, which can be seriously affected by heat due to their fat cover, which increases heat retention.

The fiber and roughage portion of rations may need to be temporarily reduced somewhat during extremely hot weather so animals continue to meet their nutritional requirements in a more nutrient-dense ration. Roughage causes higher increases in body heat as a result of digestive processes; this is an advantage in the winter, but not in hot weather. Never reduce roughage to the point that rumen health is affected, however, and make all ration changes slowly and carefully. Keep an eye on the week-long weather forecast and adjust rations for hot weather accordingly.

Other management practices during hot weather involve simple common sense: do not overcrowd animals, move them slowly if at all, and work them in the early morning if necessary. When possible, delay any work, treatment, transportation or handling until a heat wave passes.

### LIVESTOCK THERMONEUTRAL ZONES

<table>
<thead>
<tr>
<th>Animal Type</th>
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<tbody>
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<td>Dairy cattle</td>
<td>41 - 68°F</td>
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<tr>
<td>Beef cattle</td>
<td>59 - 77°F</td>
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<tr>
<td>Calves</td>
<td>50 - 68°F</td>
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<tr>
<td>Sheep</td>
<td>40 - 88°F*</td>
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<tr>
<td>Goats</td>
<td>50 - 68°F</td>
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<tr>
<td>Piglets</td>
<td>75 - 100°F</td>
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<tr>
<td>Weaner pigs</td>
<td>60 - 80°F</td>
</tr>
<tr>
<td>Grower/finisher pigs</td>
<td>50 - 70°F</td>
</tr>
<tr>
<td>Sows and boars</td>
<td>50 - 70°F</td>
</tr>
</tbody>
</table>

*Extremely variable, dependent on fleece
Standard care principles obligate livestock owners to provide food, water, shelter and care to their animals. Hot weather can tax managers’ abilities to keep animals comfortable, but meeting this obligation is part of the sense of accomplishment and satisfaction that comes from being a compassionate and effective animal caretaker.

For more info
http://vetmed.iastate.edu/vdpam/extension/beef/
current-events/heat-stress-beef-cattle

www.extension.umn.edu/swine/components/pubs/
Whitney-MinimizingHeatStress.pdf

http://tinyurl.com/mfu3cbl

http://jokko.bae.uky.edu/awqpt/plans.htm
WEATHER UPDATE

All information here is derived from the four weather WSU AgWeatherNet stations (http://weather.wsu.edu/awn.php) in Whatcom County. Current weather conditions can be found at: http://whatcom.wsu.edu/ag/currentdata.html. Station information can be found here.
**Upcoming Events**

**July**

**OSU Blueberry Field Day**
Wednesday July 17th
1:00 pm—5:00 pm
OSU NWREC

**Whatcom Dairy Speaker Series**
Thursday July 18th
12:00 pm - 1:30 pm
Ten Mile Grange

**How to Identify and Fix Engineering Issues on Farm**
Chris will talk about identifying issues with lagoons, filter strips, silage bunkers, slabs, and other areas on farm. Knowing the potential issues that may be on your own farm can help you prevent them before they become a serious issue. Chris will also give guidance on how to fix problem areas and keep up with proper operation and maintenance to keep your farm running smoothly.

**The Art of Queen Rearing**
Friday July 19th
9:00 am - 4:30 pm
WSU Mt. Vernon

This workshops will provide an understanding of what it takes to rear high quality queens. Basic biology and methods of queen rearing will be presented. The workshops emphasize hands on instruction in queen rearing methods, with some lectures and demonstrations. [http://entomology.wsu.edu/apis/](http://entomology.wsu.edu/apis/)

**Northwest Raspberry Festival**
July 19th - 20th
Lynden WA

Celebrate the largest harvest of raspberries in North America here in Lynden, Washington! Mid-July is the peak time to get your share of Lynden's bountiful crop of red raspberries (approximately 2/3 of the nation's total production) while enjoying the summer sunshine and a variety of family-friendly activities at our annual downtown celebration, attracting nearly 20,000 visitors last year!

**Organic Seed & Breeding Field School**
Thursday August 8th
9:00 am - 5:30 pm
WSU Mt. Vernon

Organic plant breeding, seed production and research are critical to the success of healthy, local food systems. Much of this knowledge is held by very large private companies, who tend not to pay any attention to the needs of smaller farmers, organic growers or niche markets. But the public plant breeders and independent seed companies that remain have banded together to help train a new generation of breeders and farmers so that together we can identify and develop the genetics we need for the emerging new food system.

**Organic No-Till Field Day**
Monday August 12
10:00 am - 1:00 pm
WSU Puyallup

Come visit reduced tillage plots at WSU Puyallup along with researchers. More information to follow.