



## Protecting Bees Through Informed Pesticide Choices

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Producing crops to meet consumer quality demands means that growers may use chemicals to control pests and diseases. Some of these products are harmful to bees. To demonstrate good environmental stewardship, growers need an understanding of the issues presenting risks to bees and of strategies to minimize the risks. GGSPRO Bee Safety Codes quickly and easily convey key information to help growers make sound choices regarding application of effective products and demonstrate their commitment to environmental stewardship.

### The Importance of Pollinators to Our Food Supply

Insect pollinators, including bees, are important to our food supply system, both in terms of economics and of production. Pollination by bees alone contributes to over \$15 billion in crop value annually [1]. Many crops require biological pollination, including fruit, nut and vegetable crops. Undoubtedly, our grocery store shelves would look quite different without bees pollinating our crops.



### Understanding Colony Collapse Disorder

Concern about bee health is widely publicized, due in large part to our dependence on bee pollination for food production. Currently, much research and attention is focused on Colony Collapse Disorder (CCD). CCD describes a syndrome in which an unexpected, sudden loss of overwintering adult bees occurs in a mature colony, though the queen and brood generally survive [1]. These colonies are drastically weakened by the loss of the adults. Not all colony losses are attributed to CCD. CCD is diagnosed when colony loss is noted in the absence of dead bees, implying that the bees did not return to the hive [3].

Multiple factors contribute to CCD, though the exact mechanism is not well understood. The following factors play a role:

- Parasites – The *Varroa destructor* mite is found in association with CCD hives and is considered to be a serious threat to honeybee health.

- Pathogens – CCD hives have greater numbers of pathogens present [4], including *Nosema* fungal infections. Viral infections are also correlated with CCD, including systemic Tomato Ring Spot Virus [5].
- *Varroa/Nosema* disease complex – Interactions between parasite and pathogen are suspected [6].
- Hive management – Concerns range from strong reductions in genetic diversity to the impact of long-distance transport of hives for pollination services.
- Pesticide toxicity – In previous decades, concern focused on risks from the use of organophosphates and other highly toxic classes of pesticides. Recent concern has focused on the neonicotinoid class of chemicals.
- Habitat loss – Expansion of agriculture, changing agricultural practices (elimination of wind rows and buffer strips) and housing has led to a reduction in native and wild areas, which serve as rich sources of food for foraging bees.
- Hive nutrition – Nutrition is often provided in the form of commercial foods.

### Understanding Pesticide Toxicity

Some pesticides are known to be harmful to bees and should be used in a way that minimizes exposure. Labels for these products include bee hazard statements. Current EPA labeling describes bee toxicity by degree, using the following terms: low toxicity, toxic, highly toxic and very highly toxic. Harmful exposure occurs in several ways. Some products are harmful upon direct exposure; the exposure risk occurs at the time of application. Other products are harmful through residual exposure; the exposure risk occurs for some time after application. Some products present direct and residual risks.

Current EPA labeling addresses exposure routes by describing when to avoid application. For products with direct exposure risk, bee hazard statements indicate that the product should not be applied when bees are *actively* visiting or *actively* foraging in the treatment area. For products with residual exposure risk, the label will indicate that the product should not be applied when bees are visiting or foraging in the treatment area. Note that the use of the term “actively” is the key word which indicates a direct exposure risk.

### Understanding Pollinator Foraging Behavior

For most bees, including commercial honeybees, foraging behavior follows a predictable, daily pattern [7]. Feeding starts just before or very close to sunrise, peaking in late morning. A second activity peak may occur in the early afternoon. Foraging is greatly diminished by early evening and essentially non-existent at night [7]. Bees tend to collect pollen in the morning and nectar throughout the day. Bumble bees are active later into the afternoon than honeybees.





Foraging behavior of bees is strongly tied to temperature and weather. Beekeepers view 55°F as the minimum temperature at which foraging will occur [8]. Bumble bees have a wider temperature range, with potential for foraging as low as 47-50°F. Bees will continue to forage under light rain and drizzle, though winds of 10-15 mph will slow activity.

## Understanding the GGSPro Bee Safety Codes

GGSPro strongly encourages growers to thoroughly read and follow all product label instructions. GGSPro also recognizes the need for a simple, easy to use system that will help growers plan effective and safe pesticide applications. Additionally, it would be nice to have a cue in place to remind growers that use of a certain product will require additional planning to protect bees. In response to these needs, GGSPro has developed a simple, effective rating system to communicate key information regarding bee safety: the GGSPro Bee Safety Codes.

The Bee Safety Codes convey two important pieces of information derived from the pesticide labels for which the EPA currently presents a bee hazard statement. The first is the toxicity of the product, reflected in the color coded bee icons shown below. With so many pesticides in the Griffin catalog, it is probably not a surprise that a few do not fit neatly into the three toxicity categories. The blue bee identifies these special cases.

**Table 1. GGSPro Bee Safety Codes: Toxicity Key**

Toxicity Key	
	<b>Highly Toxic</b> EPA describes as very highly toxic, highly toxic or very toxic to bees
	<b>Low Toxicity</b> EPA describes as a potential pathogen or with low toxicity to bees
	<b>Toxic</b> EPA describes as toxic to bees
	<b>Special Case</b> Special use notes per label; contact GGSPro for more information.

The toxicity designation is an important piece of information but it does not tell the whole story. The exposure rating defines how long the pesticide affects the bees. Remember that bees are often attracted to weeds blooming in the vicinity of the treated crops. Product applied to weeds may present an exposure risk to bees.











































**Table 2. GGSPro Bee Safety Codes: Exposure Key**

Exposure Key	
<b>1</b>	Toxicity risk through direct exposure only - avoid treatment when <i>bees are actively visiting or actively foraging</i> in the treatment area. <i>Actively visiting the treatment area refers to bees you see on the plants and pertains to products that do not show residual effect. Bees are protected when bees are absent during treatment.*</i>
<b>2</b>	Toxicity risk through residual exposure only - avoid treatment when <i>bees are visiting</i> the treatment area. <i>Visiting the treatment area refers to bees that may visit the plants after treatment. Bees are protected when bees are absent from the area following treatment. Avoid use of these products when crops and/or weeds are in bloom.*</i>
<b>3</b>	Toxicity risk through both direct exposure and residual exposure - avoid treatment when <i>bees are visiting</i> the treatment area. <i>Visiting the treatment area refers to bees that may visit the plants after treatment. Bees are protected when bees are absent from the treatment area both during and following treatment. Avoid use of these products when crops and/or weeds are in bloom.*</i>

*\*adapted from NAPPC [2]*

Combining the toxicity color and the exposure number allows a specific Bee Safety Code to be assigned to each product sold by Griffin which has a bee hazard statement on the product label. These products are listed in Table 3. It's worth noting that some application methods (ex. granular) and some product classes (ex. fungicides, surfactants) are not currently subject to bee hazard evaluation by the EPA. Therefore, the lack of a Bee Safety Code should not be considered an indication of complete lack of risk. The GGSPro team is available to discuss specific your specific concerns.

**Table 3. Bee Safety Codes-Products Sold by Griffin Greenhouse Supplies (Oct. 2014)**

Fungicides		Herbicides	
Oxidate		Axxe	
TerraCyte Pro			
X-3			
ZeroTol			
Insecticides			
1600 X-clude Formula 2		Mainspring	
Acephate 97UP		Mallet	
Ardent EC		Mantra	
Avid		Marathon 60 WSP	
Benefit 60 WSP		Marathon II	
BotaniGard 22WP		Menace GC	
BotaniGard ES 11.3%		Mesuroil 75 WP	
Chlorpyrifos SPC		Minx	
Conserve SC		Mycotrol O	
Decathlon 20% WP		Preferal	
Discus NG		Pylon EC	
Discus Tablets		Safari 20 SG	
Duraguard PT1325 ME		Sanmite 75 WP	
Endeavor		Sirocco	
Flagship G		Talstar Pro	
Flagship WG		Tame 2.4 EC	
Floramite SC		TriStar 8.5 SL	
Kontos SC		XXPire	
Lada SC			

*\*Blue bee icons indicate slight differences in label language. Preferal label does not specifically state toxicity. Kontos toxicity applies to larvae, but not adults.*



In addition to the label information reflected in the Bee Safety Codes, GGSPro has access to other data for the above products and products lacking bee hazard statements. This data may influence product choices, application methods and efficacy. Please contact GGSPro for more information to help you shape a program to meet your needs.

### Putting the Information to Work

Not all pesticides present a risk to bees and other pollinators. When the product of choice does present a risk, steps should be taken to minimize the exposure risk.

Responsible application can be achieved by considering the following points:

- Use the GGSPro Bee Safety Codes to identify products that may require special consideration for pollinator safety.
- Review product labels for a full understanding of the direct and residual toxicity of selected pesticides to pollinators.
- Plan applications to minimize residual exposure.
  - Select products with lower toxicity and residual exposure risk for outdoor applications.
  - Avoid outdoor application of toxic, highly toxic and very highly toxic products with residual risk exceeding 12 hours to crops when flowers are open and bees may visit the area.
  - Avoid application of toxic, highly toxic, and very highly toxic products with residual risk if the crop will come into bloom outdoors within the residual risk period.
- Plan applications to minimize direct exposure.
  - Conduct outdoor pesticide application as late in the day as possible, preferably in the early evening.
  - Alternatively, outdoor applications could be made when temperatures are expected to remain below 50°F for the entire application period.
- In all cases of outdoor application, a visual check for pollinator presence should be performed.
- Avoid application to nearby, flowering, non-crop plants (including weeds).
- Provide a 48-hour courtesy notification to area beekeepers regarding your application plans and measures taken to avoid toxic exposures (direct and residual).



Photo Credit: Z. Brubaker

### References

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