

## **1.6 Simple modelling approaches to refine exposure for bee risk assessment based on worst case assumptions**

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DOI 10.5073/jka.2018.462.007

### **Abstract**

The risk assessment for plant protection products to bees has attracted a lot of attention over the past five years or more. Current estimates of exposure (e.g. EFSA, 2013) are based on 90th percentile concentrations of active substances present in pollen and nectar in the field. Although suitable for acute risks, in field concentrations are not suitable for chronic assessment especially for honey bees which feed from colony stores before making foraging flights or for larvae which are fed from in-hive food stores via nurse bees. Other areas of exposure such as to pollen and nectar in following crops or to guttation may also be better estimated by use of simple exposure models.

We will present simple methods based worst case assumptions to model chronic adult and larval honey bee exposure to spray applications of plant protection products (PPP) which take into account in-hive storage of pollen and nectar and also approaches to model exposure levels in succeeding crops and guttation water.

Case studies will be presented demonstrating how these worst case model exposure estimates can be used in refining the risk assessment for bees offering a robust, worst case and cost effective alternative to field studies. Having better robust modelled exposure estimates for in-hive food reserves can aid in the assessment of both single PPP stressors and interactions with multiple stressors (e.g. disease and *Varroa* mites).

## **1.7 Pristine™ fungicide does not pose a hazard to bumble bees in lowbush blueberry production**

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DOI 10.5073/jka.2018.462.008

Pristine™ (pyraclostrobin + boscalid) is a broad-spectrum fungicide valued for its effectiveness against fungal diseases in specialty crops such as lowbush blueberry (*Vaccinium angustifolium*), one of the most important horticultural crops in Canada. Blueberry pollination is reliant upon bees which may be exposed to Pristine when applications are made during bloom. In eastern Canada, native bumble bees (*Bombus* spp.) are endemic to lowbush blueberry habitats, and growers supplement the pollination of wild bees by using commercially available *Bombus impatiens* hives. There has been concern among blueberry growers that Pristine could harm bees during pollination. This fear stems mainly from reports from California that suggested exposure to Pristine during almond pollination had deleterious impacts on honey bee queens and developing brood. Although published research indicates that Pristine poses low risk to honey bees, some blueberry growers and beekeepers remain concerned that bees could be adversely affected by this product. We therefore examined the toxicological effects of Pristine to bumble bees through a series of laboratory and field experiments. In laboratory experiments, Pristine was administered to *B. impatiens* worker bees both topically and orally to determine lethal concentrations. Additional laboratory experiments with micro-colonies examined potential sublethal effects on colony development following prolonged consumption of Pristine in sugar syrup. A field experiment studied effects on commercial *B. impatiens* colonies that were in blooming blueberry fields during and after applications of Pristine. Our results indicate that Pristine presents negligible hazard to bumble bees, with no significant deleterious effects on survival or colony productivity metrics found in any experiments.