# Neonicotinoid Contaminated Dust and Pollinator Exposure during Planting; Results from 2013

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This study was initiated in the spring of 2013 in response to the number of Ontario bee kill incidents occurred in 2012 during corn planting. Funding for the study was provided in part by the Corn Dust Research Consortium (CDRC) which had two main objectives: 1) to determine the available flowering resources around corn fields during corn planting and 2) determine how effective the Bayer Fluency Agent was at reducing neonicotinoid contaminated dust from vacuum planter exhaust manifolds.

We partnered with the Grain Farmers of Ontario to obtain additional funding through OMAF and MRA and through the Canadian Agricultural Adaptation Program in order to investigate other potential routes of exposure of pollinators to neonicotinoid seed treatment. By gaining a better understanding of the routes of exposure, we hope to strengthen Best Management Practices for pollinator protection during corn planting.

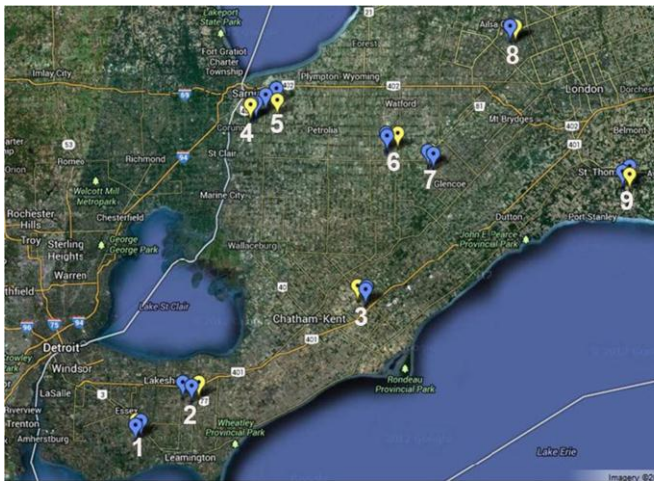



**Figure 1. Field (blue) and bee yard (yellow) locations in 2013.**

Our study involved nine paired fields (= 18 fields) located in southwestern Ontario. Growers in our study had negative vacuum planters that were 16 to 24 rows wide and fields were 20 to 100 ha in size. Each grower planted one corn field using their conventional lubricant (talc, or combination talc/graphite) at the recommended rate or rate they were accustomed to using and one field using the Bayer Fluency Agent at the recommended rate of 1/8 cup per unit of seed. Activities took place from April to late June 2013 and focused on weekly field surveys and sample collection within the field and bordering landscape. Nine bee yards within 2 to 3 km of the paired fields were also monitored prior to planting and weekly following planting to week 6 to collect pollen and dead bees for pollen identification and residue analysis.

**KEY FINDINGS:**

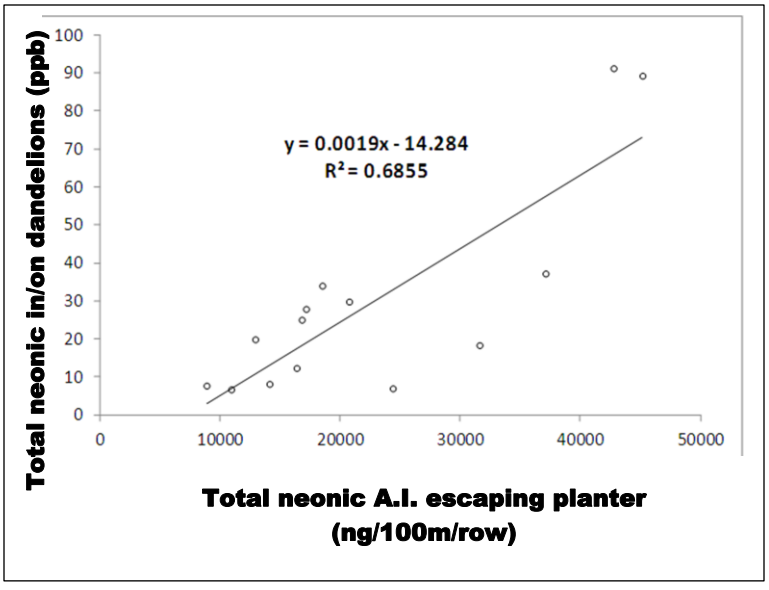
1. **Flowering Trees are a Major Foraging Resource During Planting**
   Based on pollen samples collected at the bee hives and from weekly scouting around our field sites, the major foraging resources near corn fields are flowering trees including willows, maples and from the Rosaceae family including hawthorn, apples etc. Dandelions represented only a small fraction of the pollen collected by the bees in our study. This same

finding was independently observed by the two other institutions funded by the CDRC (Ohio State University and Iowa State University).

2. **Neonicotinoid Dust is Emitted from Negative Vacuum Planters**
   A virgin vacuum bag was placed over the exhaust port of one exhaust manifold on each of our grower's negative vacuum planters, and dust was captured for a specified period of time while the growers planted our field sites. Significant levels of dust highly contaminated with neonicotinoid residues dust were emitted from vacuum planters. This contaminated dust was also captured at 2 metres above the ground using dust towers positioned downwind from the corn planting, and on dandelion blooms collected from the downwind edge of the test field, suggesting that dust leaves the field via wind drift, landing on flowering resources off-site.

3. **Bayer Fluency Agent Reduced Quantity of Neonic Active Ingredient in Exhausted Dust by 28%**
   The Bayer Fluency Agent (BFA) reduced the amount of dust emitted from the planter by 67.5% compared to when the conventional lubricant (*i.e.*, talc and/or graphite) was used. The concentration of neonicotinoid residues in dust escaping from the vacuum planter using the BFA was on average 3.7-fold higher than the conventional lubricants. Therefore the use of BFA at the recommended application rate reduced the quantity of neonicotinoid active ingredient escaping from vacuum planter exhaust by 28% by comparison with the conventional lubricants applied at rates the cooperators were accustomed to using.

4. **Neonic Dust Emitted from Planters is Related to Neonic Levels Found in/on Dandelions Downwind from Planting**
   Dandelion blooms on the downwind side of each field were collected immediately after planting and were analyzed to determine the total neonicotinoid active ingredient present. We found a direct relationship between the total active ingredient escaping the vacuum planters and the total active ingredient found in/on these dandelions. This provides compelling evidence that managing the dust escaping from the planters will have a direct effect on what is found in/on the flowering resources downwind.




5. **Other Potential Routes of Exposure May Exist but Likely Minor Compared to the Dust Emitted from Planters**
   Our study also investigated other potential routes of exposure. Samples were collected to

determine the neonic residue levels in standing water, in soil at the field surface (top 5cm), in the dry soil dust layer stirred up by the movement of planter equipment through the field, and in virgin corn pollen during tasseling. All samples collected contained neonicotinoid residues, though the majority of these samples were below 10 ppb. (Water: avg. = 3.6 ppb; Soil surface: pre-plant avg. =4 ppb, post-plant = 9.9 ppb; corn pollen avg. = 5.3 ppb).

A few samples, however, were found to be at higher concentrations. In particular, 7 out of 103 water samples had levels above 10 ppb. Some of these samples were associated with replanting (2 fields were replanted 17 days after the first planting due to poor emergence) or a heavy rain event shortly after planting. Also, samples taken from the dry surface "dust" layer stirred up by the action of moving planter equipment across the field had a mean neonicotinoid concentration that was more than 10-fold greater (48 ppb) than that found in the top 5 cm of soil (4 ppb) before planting. In virgin corn pollen, two of our field sites had neonic concentrations at 30 ppb and 36.1 ppb. These pollen samples were from the same two fields that were replanted and mentioned above and therefore received a double application of neonicotinoid seed treatment.

Though these higher residue incidents require further investigation to determine the level of risk that they pose to pollinators, they are several orders of magnitude lower in neonicotinoid concentrations than those found escaping the planter manifolds which are posing a serious risk to pollinators, requiring immediate mitigation.

**Conclusions and Recommendations:** Dust emitted from negative vacuum planters escapes fields reaching flowering resources downwind. Flowering trees including maples, willows, hawthorn, apple etc. during the planting season are a major flowering resource for honeybees. All efforts must be made to keep the contaminated dust from escaping the field and landing on these flowering resources. In this study, the Bayer Fluency Agent reduced the quantity of neonicotinoid active ingredient by 28% indicating that several combined measures will be needed to further reduce the risk of dust drift during planting.

Growers are encouraged to plant fungicide only seed in fields at low pest risk. When planting neonicotinoid treated seed, use Bayer Fluency Agent, reduce soil erosion particularly in spring, and where appropriate, use deflectors on exhaust manifolds to deflect dust towards the ground to avoid contaminating flowering resources outside the field.

For further information on ways to mitigate dust drift during planting, refer to the Best Management Practices for Pollinator Protection and Responsible Use of Insecticide Seed Treatment by PMRA/OMAF and MRA.

**Acknowledgements:** We would like to thank our grower and beekeeper co-operators for their time and effort put towards this study. We could not have carried out this research without the dedication of the research associates, technicians and summer staff involved including, Todd Phibbs, Jennifer Bruggeman, Darryl Galbraith, Morgan Kluka, Connor Gibney, Don Mcfadden, Winfield Ly, Janet Lowther, Rob Seal, Lennard van Oord, Carissa Zandstra and Corina Bierling.