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Re: Imidacloprid Registration Review; Draft Pollinator Ecological Risk Assessment; Notice of Availability; docket EPA-HQ-OPP-2008-0844

I am submitting these comments concerning the **Imidacloprid Registration Review; Draft Pollinator Ecological Risk Assessment.**

Pesticide-free pollen and nectar are vital to the health of honey bees. Criteria for determining "lethal dose," and "no observable effect levels," is shown to be misleading in older research. In a study conducted of pollen from apiaries in Connecticut in five locations including urban, rural, and mixed agricultural sites for periods for two to five years, *"Sixty pesticides or metabolites were detected. Because the dose lethal to 50% of adult worker honey bees (LD50) is the only toxicity parameter available for a wide range of pesticides, and among our pesticides there were contact LD50 values ranging from 0.006 to <1000 ug per bee (range 166,000x), and even among insecticides LD50 values ranged from 0.006 to 59.8 / bee (10,000x); therefore we propose that in studies of honey bee exposure to pesticides that concentrations be reported as Hazard Quotients as well as in standard concentration, such as parts per billion. . . . The pesticides with the greatest Pollen Hazard Quotients at the maximum concentrations found in our study were (in descending order); phosmet, Imidacloprid, indoxacarb, chlorpyrifos, fipronil, thiamethoxam, azinphos-methyl, and fenthion, all with at least one Pollen Hazard Quotient (using contact or oral LD50) over 500. At the maximum rate of pollen consumption by nurse bees, a Pollen Hazard Quotient of 500 would be approximately equivalent to consuming 0.5% of the LD50 per day. We also present an example of a Nectar Hazard Quotient and the percentage of LD50 per day at the maximum nectar consumption rate. When we provide beekeepers in our region with information about what pesticides the bees are bringing into the hive at different sites and over a period of years, the beekeepers need to be able to put those pesticide concentrations into a context of hazard to their bees, and PHQ values provide a step toward relating pesticide concentrations to acute toxicity to worker bees. Then the next step is to relate PHQ values back to a percentage of the LD50 consumed by the bees as pesticide residue in the pollen." (PLOS One, Stoner and Eitzer, 2013)*

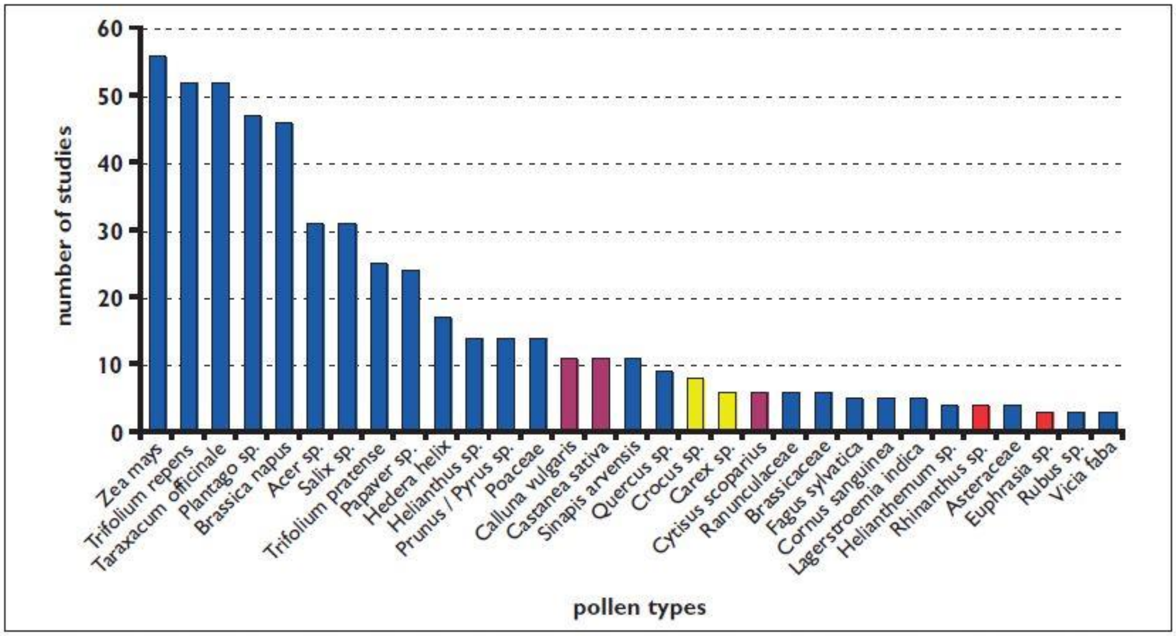

FIG. 1. Number of studies in which a given plant taxon ranked among the five most common pollen sources. A total of 114 data sets were included in the analysis. (blue bars = pollen types found in several locations; mauve bars = pollen types found only at Intragna, Switzerland; red bars = pollen types found only at Schönried, Switzerland; yellow bars = pollen types found only at Schönried and Davos, Switzerland).

In a review of literature concerning pollen collection and nutrition relative to honey bees across five decades it was found that “High- quality pollen is necessary to induce the development of the hypopharyngeal glands in young worker bees.”

> *“These glands secrete the food jelly which is fed to the larvae. During its entire life, one worker bee requires an estimated 160 to 180mg of pollen with an average nitrogen content of 20%. This implies that a colony rearing 150,000 bees in one season has to collect about 25 kg of pollen. A direct relationship between pollen availability and colony development can be expected. . . . Agricultural crops with an important role as pollen sources included white and red clover (Trifolium repens and T. pratense), corn (Zea mays), rape (Brassica napus) and sunflowers (Helianthus sp.). Several other plants shown in figure 1, such as plantain (Plantago sp.), dandelion (Taraxacum officinale) and mustard (Sinapis arvensis) are generally abundant in meadows and pastures. A third group of important pollen sources included different tree species such as maple (Acer sp.), willow (Salix sp.), stone fruits such as plums and cherries (Prunus sp.) and pome fruits such as pears (Pyrus sp.). . . . Out of these, only three plant taxa were detected in all three study areas (Brassica napus, Trifolium repens and Zea mays), while the remaining pollen types were found at only one or two of the locations. . . The results of this literature review support the hypothesis that honey bee colonies may differ in their use of the pollen available at a given location. . . Alternatively, it is possible that our assumption of equal availability of flowers for different colonies at a given location is false. Synge, for example,*

observed that one of his study hives was shaded much longer than the other in the mornings, which delayed the start of pollen foraging in this colony. As the available flower spectrum generally varies throughout the day, this could lead to differences in the botanical composition of the collected pollen. . . . Further, annual weather differences may influence the phenology of the flora and consequently the period when a given pollen type is available. If we considered the mode of pollination of the dominant plants, we observed a consistent pattern at different localities. Generally, wind-pollinated plants were dominant pollen sources in spring and were then replaced by insect-pollinated plants. This was a consequence of the importance of anemophilous trees as early pollen sources. The frequency of pollen from wind-pollinated plants may show a second peak in midsummer at locations where corn (Zea mays) was an important pollen source. . . . Like all animals, honey bees have to consume certain essential nutrients with their food. Pollen is their main source of proteins, minerals, fats and several other substances, while nectar provides the bulk of carbohydrates. . . . Honey bee foragers mix freshly collected pollen with some nectar before packing it into their corbiculae. In the hive, the workers add more nectar and glandular secretions to the pollen, which then undergoes lactic acid fermentation. . . On average, animal-pollinated plants do not appear to be richer in pollen protein than wind-pollinated plants. . . . It has been shown that honey bee foragers may indeed exhibit preferences for certain pollen types . . .. Even when pure pollen was offered to eliminate visual signals of the flowers, honey bee foragers gathered higher quantities of some pollen types than of others. However, it remains to be seen if such preferences are really associated with pollen quality or if they are due to other factors such as, for example, smell or visual signals of the pollen itself. . . . Some indirect evidence is provided by the observation that, on average, animal pollinated plants do not have higher pollen protein contents than wind-pollinated plants. This would not be expected if pollinators preferred protein-rich pollen. Indeed, it is possible that honey bees are not able to assess the nutritive value of pollen because they do not consume it directly but transport it to the hive in their pollen baskets. This could also explain why honey bees may readily collect toxic pollen. In conclusion, it is well possible that colonies regulate the quantity rather than the quality of the pollen that is collected. In a natural environment, this may suffice to ensure an adequate supply with all essential nutrients. . . An adequate pollen supply is indispensable for the development of some of the internal organs of worker bees. . . The vitamin and mineral requirements of honey bees, for example, are virtually unknown, although these substances play a significant role in the growth and development of all living organisms. . . . while little meaningful data is available on other pollen types and the efficiency of pollen digestion in general. Crailsheim et al. found that the percentage of empty grains in the rectum was higher for pollen from Castanea than from Trifolium. Further, the efficiency of pollen digestion appeared to decrease with the age of the bees. In agreement with this result, the lipase activity was found to be highest in the gut of 3–12-day old workers, but we do not know if similar patterns exist for other digestive enzymes. Schmidt & Buchmann carried out a detailed analysis of food intake and excretion in a *honey bee colony. They found that 83% of the nitrogen ingested with pollen was indeed utilized by the animals, which would indicate a very efficient pollen digestion. Although larvae consume only very little pollen directly, they also appear to be very efficient at digesting this food source. Thus, analyses of the gut contents of larvae fed with corn pollen showed that 98% of the pollen grains were at least partially digested." (Bee World,* Keller, Fluiri, Imdorf, 2005)

Value of Pollination

Much attention has been given to crop yield from pesticides. According to The University of Georgia, College of Agricultural and Environmental Sciences' publication, "Pollinator: a grower's last chance to increase yields,"

> *"For fruit or nut bearing crops, pollination can be a grower's last chance to increase yield. All post pollination inputs, whether growth regulators, herbicides, fungicides, or insecticides, are generally designed not to increase yield but to conserve losses."*

The value of pollination from Honey bees is $12.4 billion for dependent crops, and $6.8 billion for indirectly dependent crops. Other insects provide this ecosystem service of pollination contributing $4 billion to dependent crops, and $5.9 billion to indirectly dependent crops according to Researcher, Krishna Ramanujan, in the *Cornell Chronicle*, 2010. This $29.1 billion of value to agriculture is consistent with the *Rabobank* assessment of $30 billion in value pollinators add to American agriculture. Whether crops are dependent upon insect pollinators, or simply "attractive" to insect pollinators, the crop and the pollinators all benefit. The crop can increase its yield from 5% to 81%, depending upon the crop. Pollinators experience diverse, nutritious pollen and nectar from a landscape that welcomes and supports their ecosystem service.

The total and cumulative risk cup of all exposures and the synergisms of these exposures to pesticides are part of the health issues presented in the 2015 National Strategy to Promote the Health of Honey Bees and Other Pollinators. Pollinators do not encounter one pesticide at a time during a growing season. As the pesticide use maps show, even the "older pesticides" Imidacloprid was supposed to "replace," are still in use. Those older pesticides interacting with Imidacloprid, other neonicotinoids, and the many fungicides, insect growth regulators, fertilizers, herbicides, adjuvants, surfactants, degradates, metabolites, and "other ingredients," including acaricides for Varroa control are unstudied, and lack analysis of their interactions upon and within honey bee colonies, as well as with native pollinators.

To place a toxin into the agricultural ecosystem without examining the real-world experience of, in this case honey bees which are so important to crop production, is short-sighted in the least ignoring proven Integrated Pest Management practices; and reckless and willful in the decimation of the honey and crop pollination industry of American beekeepers.

Recommendations

The report of the Worldwide Integrated Assessment of the Impacts of Systemic Pesticides On Biodiversity and Ecosystems *summarizes the* scientific assessment of pesticides like Imidacloprid, stating "*the current large-scale prophylactic use of systemic insecticides is having significant unintended negative ecological consequences. The evidence indicates that levels of systemic pesticides that have been documented in the environment are sufficient to cause adverse impacts on a wide range of non-target organisms in terrestrial, aquatic, wetland, marine and benthic habitats. There is also a growing body of evidence that these effects pose risks to ecosystem functioning, resilience and services such as for example pollination and nutrient cycling.*"

I respectfully requesting the following in support of the bee industry, honey bees, and native pollinators in relation to the Imidacloprid re-registration review:

1. Imidacloprid should be registered as a "Restricted Use pesticide," with use granted only during times of documented need, similar to the Ontario plan, until a complete risk assessment is conducted. This risk assessment must comprise acute, chronic, and sublethal effects and longitudinal reproduction studies to the second and third generation of bees at field relevant doses and field relevant exposure times.

2. The Tier II Colony Level Assessment is Insufficient
   Field realistic, colony level assessments must be completed when assessing pesticides, including water quality, fungicides, herbicides, insect growth regulators, adjuvants, surfactants, degradates, metabolites, and "other ingredients" in the "formulated grade."

3. Field studies should be conducted on all plants foraged by bees including a pollen analysis, including soybeans, cotton, and canola.

4. Conduct research on bee attractive crops for the value of pollination, the value of crop pollination services, and the loss of crop yield when bees are killed.

5. Institute incident reporting of bee losses to include the sublethal effects upon bees; ensure the investigation is not retaliatory, but data collection driven; remove primacy of states that decline investigating bee kills that are under an arbitrary financial threshold. Trends of product use, as well as problem end users can be observed from the loss of one hive as well as the loss of 100 hives.

6. EPA needs to complete a cumulative assessment of the multiple stress factors that managed and native pollinators currently experience including tank mixes, fungicides, insect growth regulators, "other ingredients" in pesticide formulas, and their interactions with bee pests and pathogens.

7. Evaluate the efficacy of acaricides used for Varroa control, and the synergisms with crop protection pesticides.

8. Evaluate Imidacloprid use across the landscape prior to creating pollinator habitat, especially for Monarchs. Research has shown the half-life of imidacloprid remains toxic for up to three years depending upon the soil. Agricultural buffer/pollinator strips, and similar pollinator habitat needs to be protected from imidacloprid soil and water residues, as well as dust off onto plants in bloom or water sources from coated seed planting.

9. Native pollinators must be included in colony level assessments. While there are unique concerns in assessing native pollinators they are a valuable contributor to the agricultural economy.

10. Institute comprehensive authentic Integrated Pest Management best practices to protect farmers, crop yields, and beekeepers from the impact of the prophylactic use of pesticides and coated seeds.

Resources

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