1.9 Analysis and Conclusions from USEPA's Neonicotinoid Preliminary Bee Risk Assessments

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Abstract

In 2016-2017, USEPA issued Bee Risk Assessments for imidacloprid, clothianidin, thiamethoxam and dinotefuran. The conclusions from these four assessments are summarized and compared with respect to risks at the individual and colony levels. Although the focus in these documents is for honey bees, consideration of potential risk to non-A*pis* bee species is also evaluated. Dietary exposures are based on pollen and nectar residue concentrations from magnitude of residue studies. Exposures of thiamethoxam and imidacloprid used a total toxic residues approach to account for their relatively toxic metabolites while clothianidin and dinotefuran considered parent-only. For risks to individual bees, nearly all use patterns posed potential on-field risk for one or more honey bee castes, except for some seed treatments (*e.g.,* canola, cotton, sunflowers). On-field risk was assumed to be low for crops harvested prior to bloom. Regarding off-field risks, foliar applications for all uses resulted in risks at distances >1000 feet from the edge of the field.

At the colony level, the Tier II risk assessment utilized semi-field Colony Feeding Studies (CFS) to establish endpoints based on honey bee colonies consumption of exposed sucrose solution over an extended period of time. Exposures following foliar applications (*e.g*., cotton, citrus, cucurbits) were more likely to indicate colony-level risk than exposures from soil applications while seed treatments generally did not result in expectations of colony-level risks, though uncertainties were noted for several crop groups where refinements could not be made. Other lines of evidence, including ecological incidents, eco-epidemiological evaluations, full field studies, and monitoring studies are also considered in evaluating overall risk.

1.10 Quantifying Sources of Variability in Neonicotinoid Residue Data for Assessing Risks to Pollinators

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Abstract

The U.S. Environmental Protection Agency's 2014 guidance for assessing pesticide risks to bees relies on higher-tier studies of residues in pollen and nectar to refine pesticide exposure estimates obtained from lower tier information (e.g., default values and model-generated estimates). These higher tier residue studies tend to be resource intensive due to the need to address spatial and temporal factors which influence pesticide residues in pollen and nectar. Time and resource considerations restrict the number of samples, crops, and locations which can be studied. Given these resource constraints, questions remain on how to best optimize the design and number of residue studies for obtaining a robust dataset to refine exposure estimates of bees to pesticides. Factors to be optimized include the number of replicates in each sampling event, the number of sampling events over time, the number of sites/regions per study, and the number of crops to be assessed within and across crop groups. Using available field residue data for the neonicotinoid class of insecticides, we conducted an analysis of variability in residue data to address these and other study design elements. Comparisons of the magnitude of residues and variability are made across neonicotinoid chemicals (imidacloprid, clothianidin, thiamethoxam and dinotefuran) as well as the variability associated with intra- and inter-crop group comparisons and regional and soil texture gradients. Additionally, this analysis includes consideration of bee-relevant toxic metabolites for imidacloprid and thiamethoxam. Results of these analyses of neonicotinoid residue data are presented in the context of optimizing field residue study designs for assessing pesticide risks to bees.