



## Mississippi Corn Promotion Board 2014 Progress Report

Project Title: Bee Project: Assessing the Impact of Neonicotinoid Seed Treatments on Pollinators

PI: Angus Catchot

Department: BCH-EPP

### Project Summary (Issue/Response)

Over the last several years declining pollinator health has gained global attention. Many beekeepers and activist groups have named agricultural pesticides as the main culprits. Most scientist believe that varroa mites and disease are likely the main concern but pesticides do in fact play a part. Based on public rhetoric, the European Union banned neonicotinoid insecticides without scientific evidence. It is estimated that rapeseed growers experienced massive losses as direct result in 2014. Entomologist at MSU and other Mid-South Land Grant Institutions felt that it was necessary and forward thinking to begin a research program in our are to address some of these concerns and gain a better understanding how honey bees interact with out cropping systems in the Mid-Southern region before our fate is decided for us without input.

### Project Results/Outcomes

Research was conducted to evaluate the potential exposure of pollinators to neonicotinoid insecticides used as seed treatments on corn, cotton, and soybean. Samples were collected from small plot evaluations of seed treatments and from commercial fields in agricultural production areas in Arkansas, Mississippi, and Tennessee. In total, 560 samples were analyzed for concentrations of clothianidin, imidacloprid, thiamethoxam, and their metabolites. These included pollen from corn and cotton, nectar from cotton, flowers from soybean, honey bees, *Apis mellifera* L., and pollen carried by foragers returning to hives, preplanting and in-season soil samples, and wild flowers adjacent to recently planted fields. Neonicotinoid insecticides were detected at a level of 1 ng/g or above in 23% of wild flower samples around recently planted fields, with an average detection level of about 10 ng/g. We detected neonicotinoid insecticides in the soil of production fields prior to planting at an average concentration of about 10 ng/g, and over 80% of the samples having some insecticide present. Only 5% of foraging honey bees tested positive for the presence of neonicotinoid insecticides, and there was only one trace detection (< 1 ng/g) in pollen being carried by those bees. Soybean flowers, cotton pollen, and cotton nectar contained little or no neonicotinoids resulting from insecticide seed treatments. Average levels of neonicotinoid insecticides in corn pollen ranged from less than 1 to 6 ng/g. The highest neonicotinoid concentrations were found in soil collected during early flowering from insecticide seed treatment trials. However, these levels were generally not well correlated with neonicotinoid concentrations in flowers, pollen, or nectar. Concentrations in flowering structures were well below defined levels of concern thought to cause acute mortality in honey bees.

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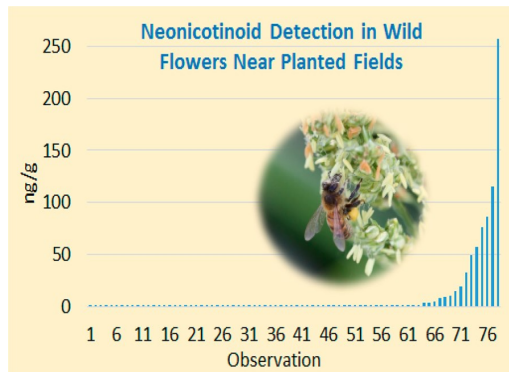


# Project Results

**Table 1. Levels of Neonicotinoid Insecticides (Mean ± Standard Deviation), Total Detections ≥1 ng/g, and Percent Detections Greater than or Equal to 1 ng/g for Corn Pollen from Plots Treated with Different Insecticide Seed Treatments**

	<u>Clothianidin</u>	<u>thiamethoxam</u>	<u>total</u>
Total detections ≥1 ng/g	2	1	4
% detections ≥1 ng/g	10	5	20
Maximum level detected	23.1	1.0	23.1
	<u>Mean by Seed Treatment</u>		
Untreated	0.1 ± 0.25	0.1 ± 0.3	0.3 ± 0.3
Clothianidin a	2.5 ± 4.57	0.1 ± 0.3	2.6 ± 4.5
Clothianidin a 11.5	5.9 ± 11.5	0.0 ± 0.0	5.9 ±
Thiamethoxam a	0.0 ± 0.0	0.4 ± 0.3	0.4 ± 0.3
Thiamethoxam a	0.1 ± 0.3	0.4 ± 0.3	0.5 ± 0.4
N (composited samples)			20

a Applied at a rate of 0.25, 1.25, 0.25, and 0.5 mg ai per seed, respectively.



## Project Impacts/Benefits

This data was published recently published in high impact refereed journal. It is already being using extensively by the academic community. This research has also given the Mid-South Entomology Working Group (MSEWG) a “seat at the table” with groups such as EPA, USDA, and other D.C. groups when it comes to impact of pollinator health and agricultural in our region. There is much more work being currently being conducted and analyzed that is tagged to this project that will be coming out soon.

## Project Deliverables

- Scott Stewart, Gus Lorenz, Angus Catchot, Jeff Gore, Don Cook3, John Skinner1, Tom Mueller, Donald R. Johnson, Jon Zawislak, and Jonathon Barber. 2014. Potential Exposure of Pollinators to Neonicotinoid Insecticides from the Use of Insecticide Seed Treatments in the Midsouth. Environ. Sci. & Tech. <http://dx.doi.org/10.1021/es501657w> Environ. Sci. Technol.
- Mississippi Ag Consultants Association Presentation
- Row Crop short course presentation
- Mississippi Crop Situation Newsletter
- Southeastern Entomological Branch Meeting
- Entomological Society of America Annual Meeting
- 8 Grower Meeting in 2014 presented
- **NUMEROUS** other venues across the southern region

