

PESTICIDE CONTAMINANTS IN BEE HIVES FROM HIGH AND LOW AGRICULTURAL HABITATS

Abstract

Samples were collected from honey bee hives in low and high agricultural areas and tested for pesticide residues. Pesticide contaminants were found at varying levels. Neonicotinoid insecticides were not detected despite some hives being fed low concentrations of imidacloprid in tainted sugar water.

Introduction

Pesticides are being implicated and sometime vilified for recent declines in pollinator health, including honeybees. Neonicotinoids have been especially targeted. This study was designed to assess the levels of pesticide contaminants that occur in bee hives over the course of a growing season in the Midsouthern U.S.

Figure 2. Average Pesticide Concentrations (PPB) in Sheet/Foundation Wax and Packaged Bees Used to Initiate Hives in Arkansas, 2014

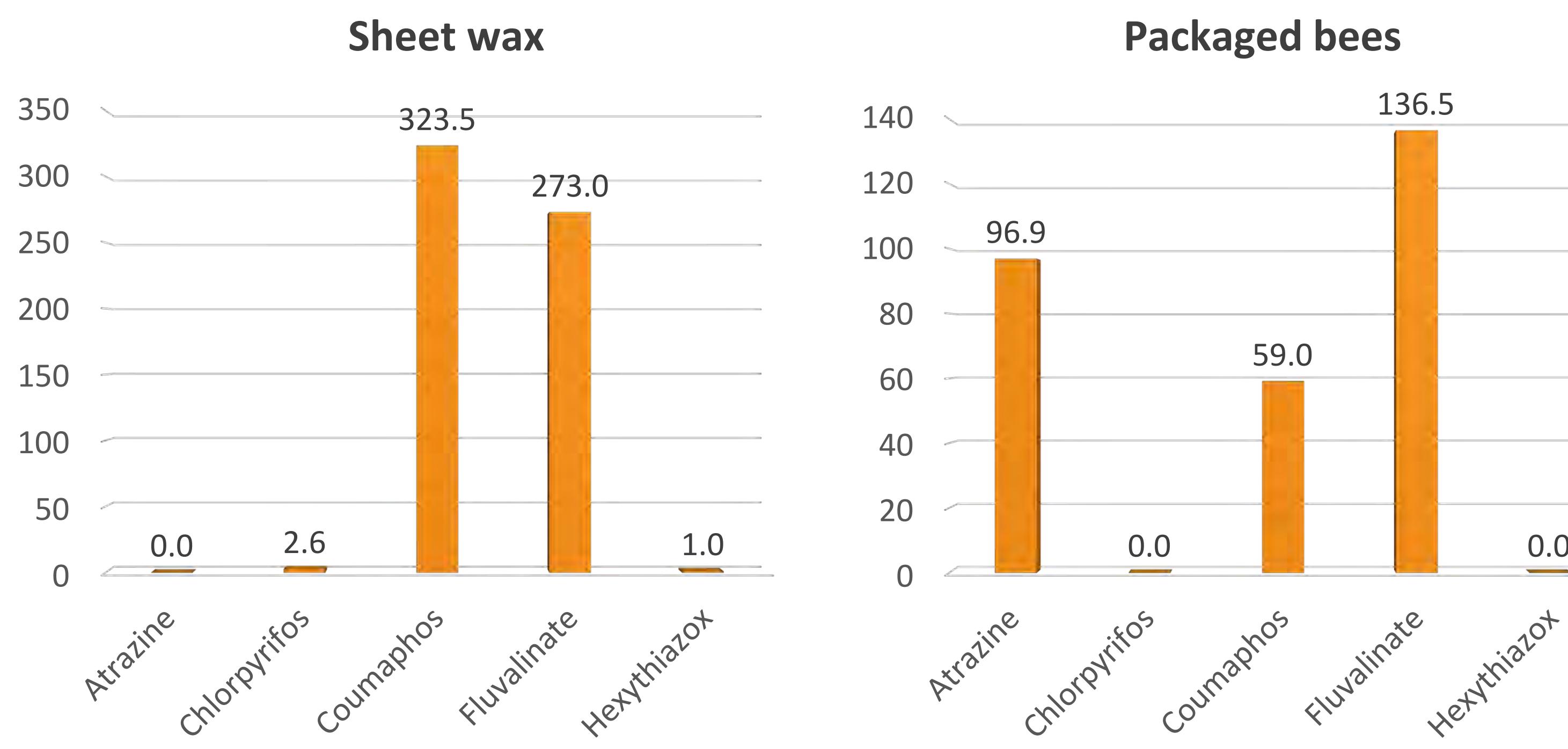


Figure 3. Average Pesticide Concentrations (PPB) from 4 Honey Bee Hives per Location (Arkansas, August, 2014)

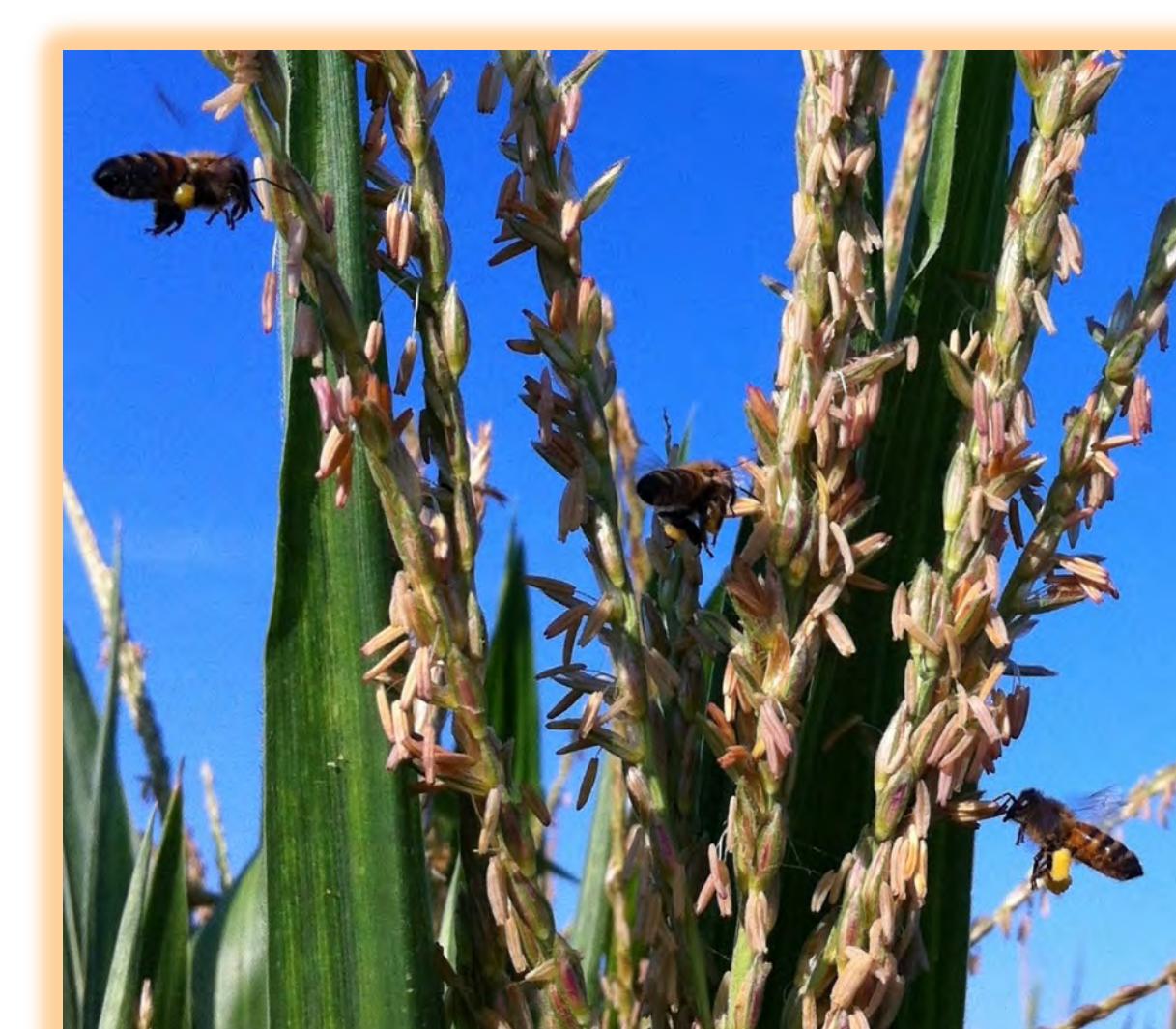
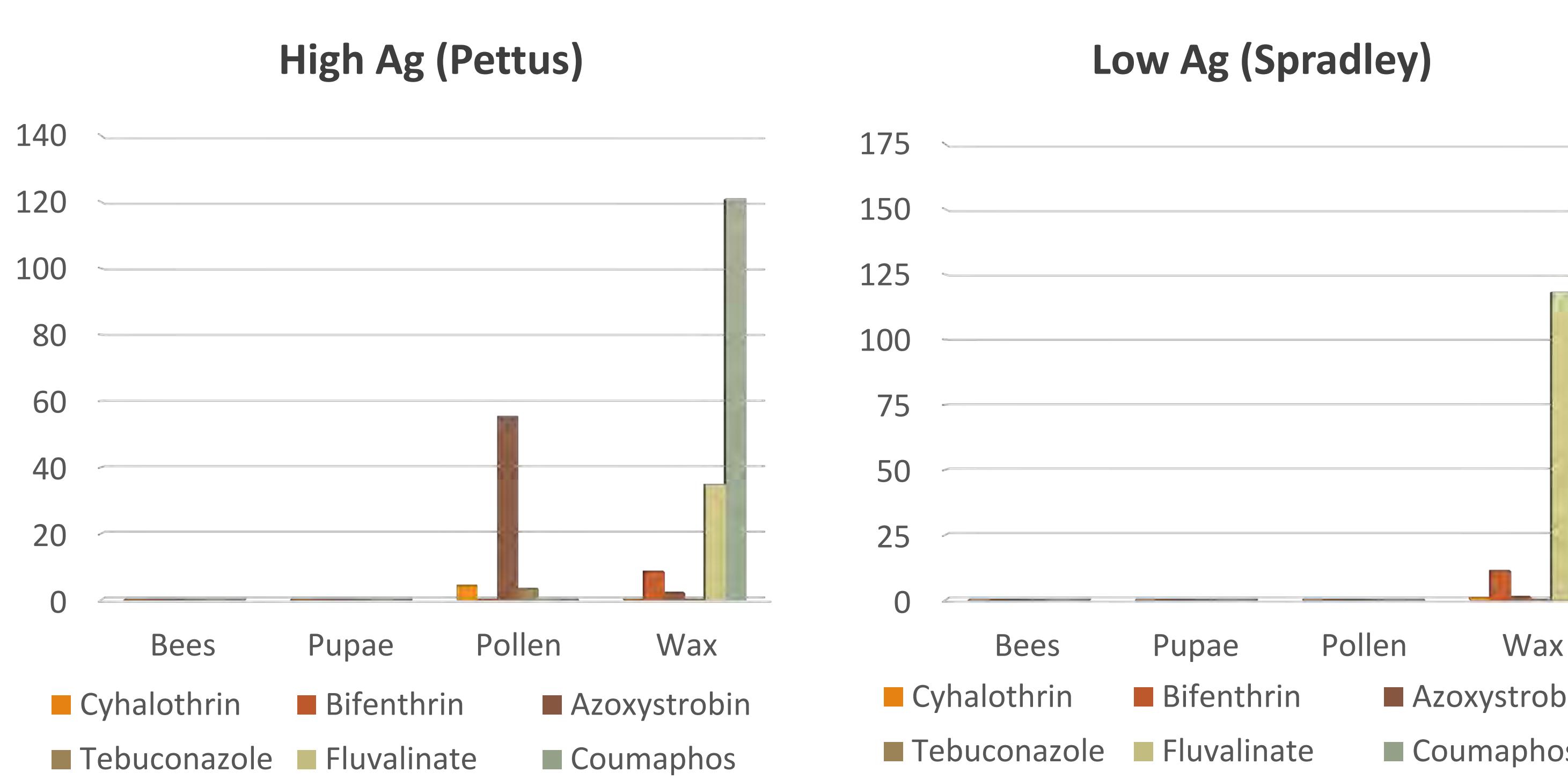
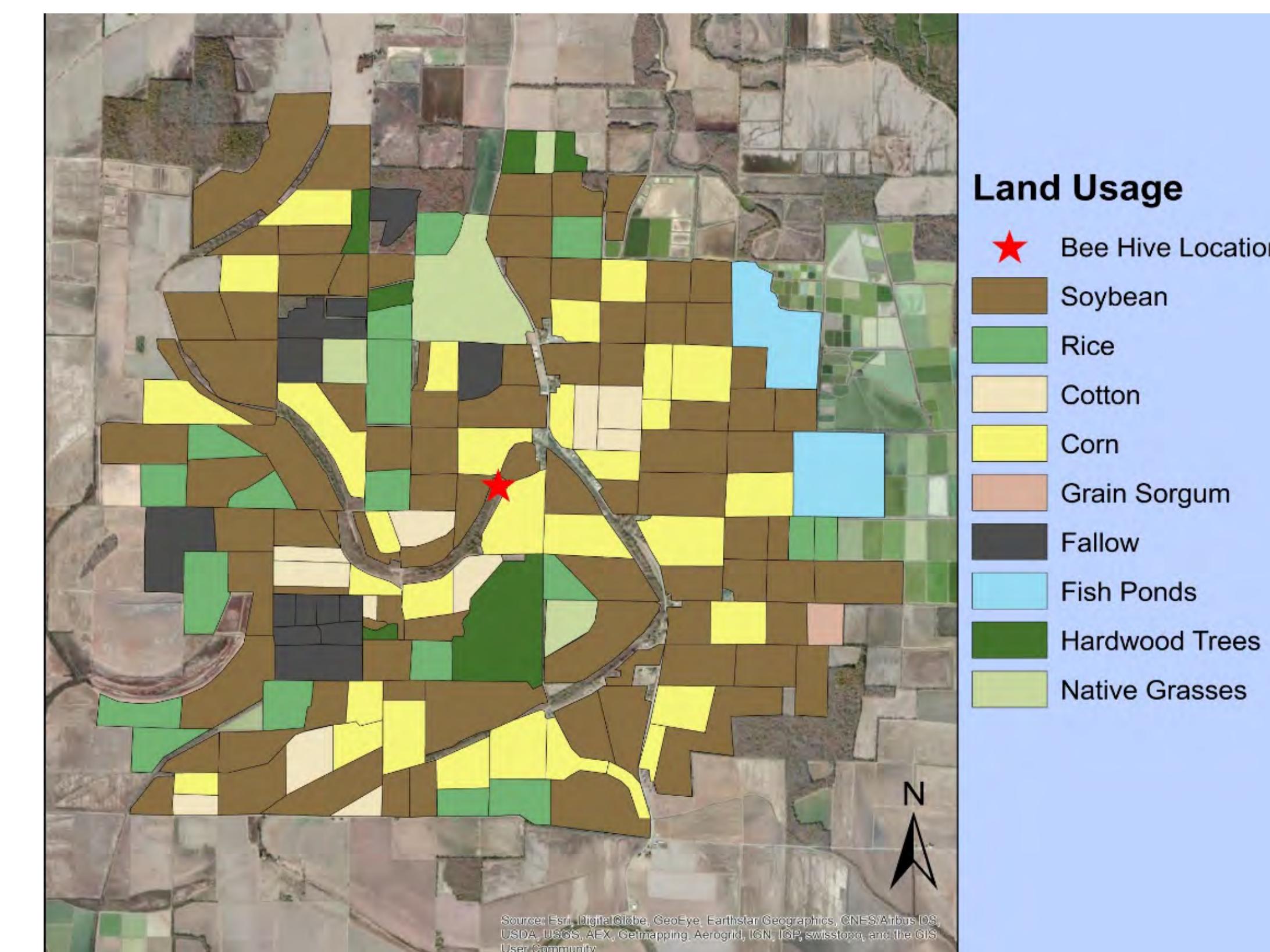


Figure 1. Land usage in high agricultural environment of one test location at Pettus, Arkansas (2014)



Materials and Methods

- During April of 2014, new apiaries were established in high and low agricultural production areas
- There were 2 apiaries in Arkansas (AR) and 4 apiaries in Tennessee (TN)
- At 3 (TN) or 4 (AR) times from June through September, two hives (TN) or four hives (AR) at each location were fed 3 liters of sugar water tainted with imidacloprid at a target dose of 5 PPB
- Samples of bees (foragers and/or pupae), bee bread (pollen), honey, and beeswax were collected to determine pesticide residue levels
- USDA AMS National Research Lab in Gastonia, NC performed the comprehensive residue analyses
- Only results from the two Arkansas locations were available at the time of this report
- Results are reported for contaminants averaging greater than 1 PPB at either location
- Non-detection was assumed to equal 0 PPB for purposes of averaging

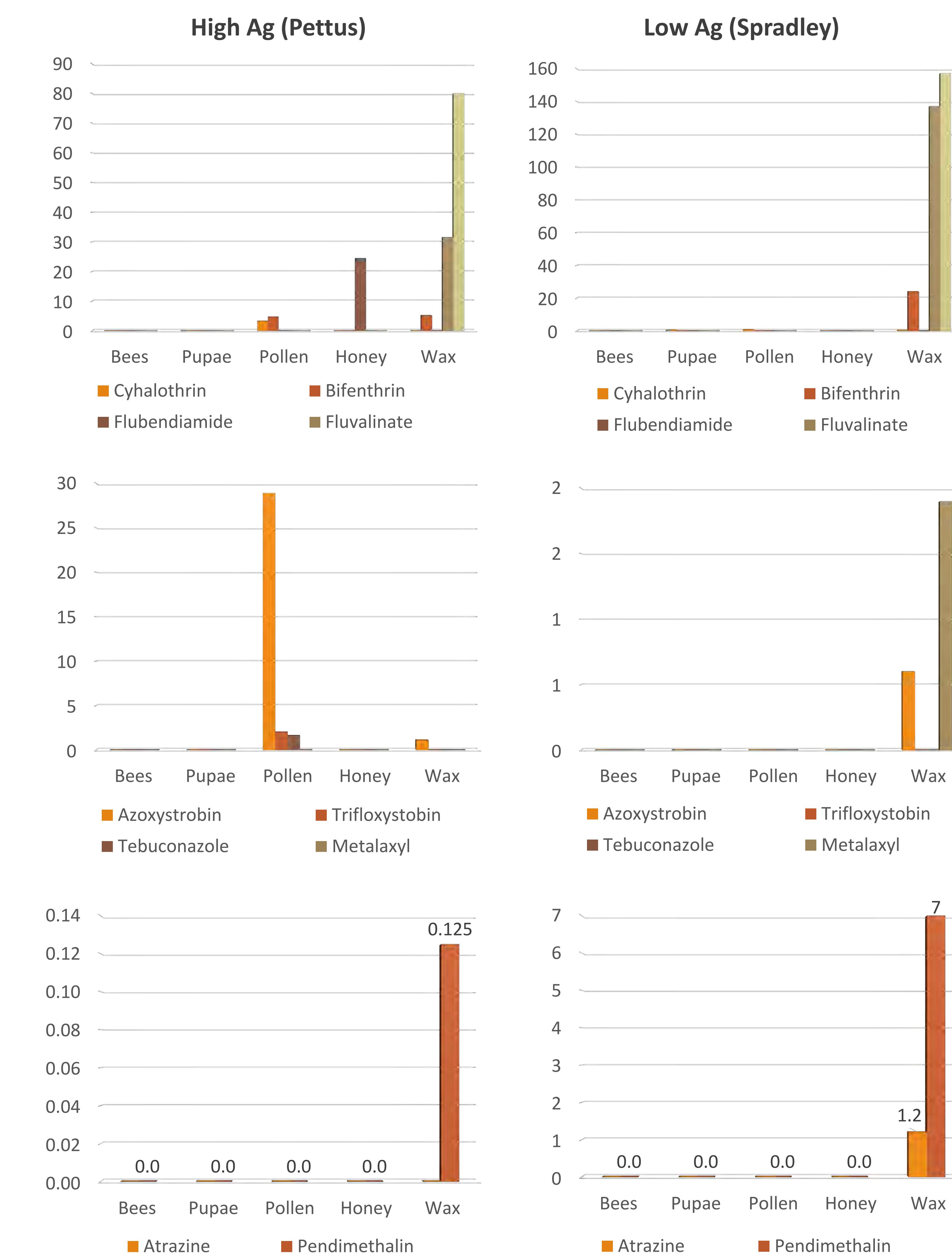
Results

- Insecticide, fungicide, and herbicide contaminants that were found in hives are shown in Figures. 2-6
- Besides contaminants that were introduced in foundation wax and packaged bees that were used to start hives (Fig. 2), flubendiamide and two pyrethroid insecticides were the only insecticides detected at average concentrations of 1 PPB or higher
- Several fungicides were also detected including azoxystrobin, trifloxystrobin, tebuconazole, and metalaxyl
- Low levels of atrazine, also found in the foundation wax and packaged bees, and pendimethalin were the only herbicides detected

Acknowledgements

The authors thank our technical support, beekeepers, grower commodity boards, and the USDA ARS who helped support this project.

Figures 4-6. Average Pesticides Concentrations (PPB) from 8 Honey Bee Hives per Location (Arkansas, September, 2014)



Conclusions

Results from other test locations are pending, and conclusions at this time are very preliminary. Neonicotinoid insecticides were used ubiquitously as seed treatments in the agricultural crops within our test areas. They were also commonly used as foliar sprays in cotton. However, there was a conspicuous lack of neonicotinoid insecticides present in bees, beeswax, bee bread (pollen), or honey collected from bee hives located in Arkansas. Other contaminants were present, especially those introduced via the foundation wax or the packaged bees used to establish hive. With the exception of flubendiamide residues detected in honey, all contaminants were found in beeswax and pollen stores.

