Impacts of neonicotinoid seed treatments in Maryland grain production

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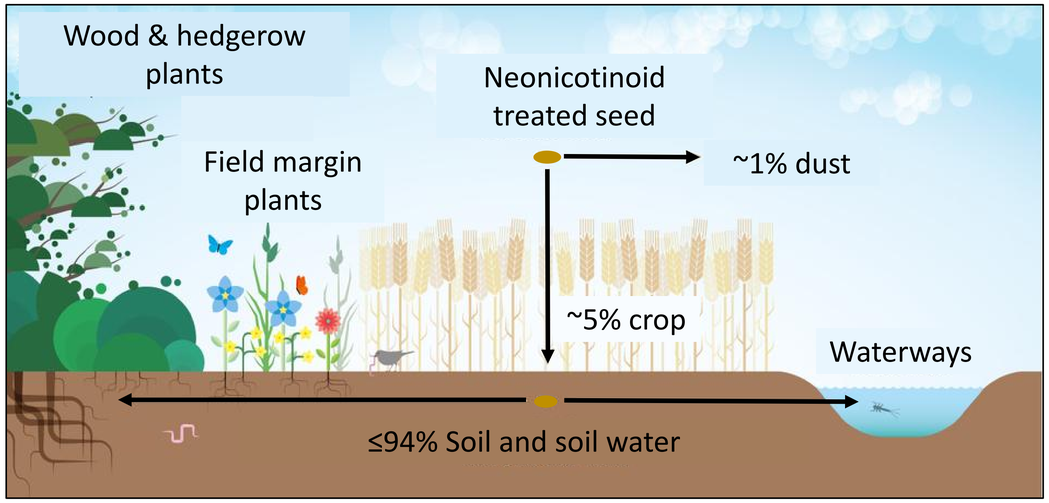
Introduction

- Neonicotinoid insecticide seed treatment (NST) use has been increasing in US grain production
- When neonicotinoids are applied as NSTs, majority of active ingredients remain in the soil where they can break down, persist in the soil, or leach into ground water and run-off into surrounding water bodies
- NSTs can have non-target impacts on beneficial arthropods such as pollinators and natural enemies
- NSTs are most effective against early season soil and seedling insect pests & are not always economically beneficial



Questions

1. Do insecticide residues from NSTs persist and accumulate in the soil?
2. Do NSTs negatively impact beneficial arthropods like predators and parasitoids?
3. How do NSTs impact pest arthropods? Do they provide yield benefits?

Study System

Full Season Soybean 2015 → 2015-2016 Winter Wheat → Double Cropped Soybean 2016 → Corn 2017

Treatments

- Control seeds (no fungicide or insecticide)
- Fungicide seed treatment only
- Cruiser 5FS (thiamethoxam + fungicide)
- Gaucho 600 FL (imidacloprid + fungicide)

Study Sites

Central Maryland Research & Education Center, Beltsville MD

Wye Research & Education Center, Queenstown MD

1. Persistence in the Soil

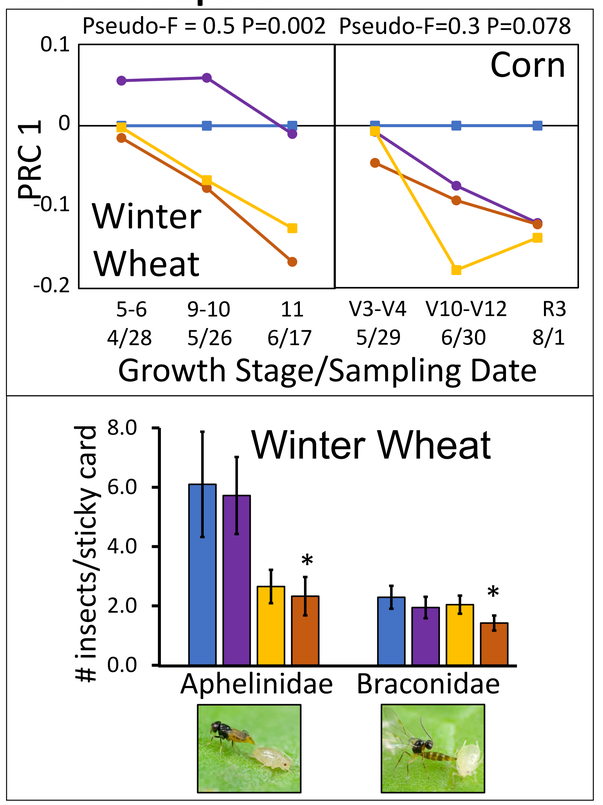
- Insecticide residues were present in the soil at low levels
- Gaucho was more persistent in soil than Cruiser
- Highest insecticide levels found in the third year of the study, suggesting accumulation

2. Impacts on Beneficial Arthropods




- Measured through visual counts, sweep nets, sticky cards, pitfall traps and litter extraction
- Gaucho had greater impacts than Cruiser
- Overall community was disturbed but recovered in most cases, except in wheat and corn sticky cards.
- In wheat, Gaucho significantly reduced Aphelinid and Braconid wasps, which are important natural enemies of aphids
- Other impacted natural enemies include lady beetles, minute pirate bugs, spiders & rove beetles.



Impact of treatments on (top) overall sticky card arthropod community over time and (bottom) abundance of parasitoid wasps in wheat sticky cards.

3. Impacts on Pests & Yield

- Pest levels were very low throughout the study
- Aphids were suppressed in winter wheat in the winter, but not in the spring; flea beetles were suppressed in corn
- Yield was not impacted by insecticides in any crop

Conclusions

- We found low levels of neonicotinoid residues in the soil, suggesting limited persistence
- Some important natural enemies were impacted by NSTs, and communities did not always recover
- NSTs are effective against pests like wireworms & white grubs, but do not provide yield benefits in the absence of pest pressure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