The Ohio State University, College of Food, Agricultural, and Environmental Science

Corn Planting Dust, and the Potential for Impact on Honey Bee

Harold D. Watters[1], Reed M. Johnson[2] and Douglas B. Sponsler[2]

Abstract:

Three paired sites were identified for 2014 Ohio planter dust trials comparing the Bayer fluency agent to farmer chosen lubricants. In 2015, eight sites were chosen to compare planter types, seed lubricants and field edge composition on the movement of neonicotinoid dust.

Air assisted planters are many, with air assistance applied at the supply end or the delivery end or both. The planters here represent the range found in Ohio. Dust visually seen at planting appeared similar across the planter types, coming from ground engagement of planter units for the most part.

- Dust analysis from the traps determined there were little differences between the Bayer fluency agent and the farmers choice products (talc, graphite or combination product).
- Our attempt to measure accumulated load with a planter frame mounted slide tray shows that we can accumulate large amounts of insecticide on the planter during planting.
- The dust collectors under the planter, with which we hoped to determine the amount of insecticide directly deposited to the soil surface, have higher levels of insecticide as compared to the targets farther away (and above the surface).
- Directly deposited insecticide is higher at the soil surface than that which moves off site in dust.

Dust analysis as insecticide deposited is shown for 2014. The chemical analysis for 2015 has not yet been completed.

Methodology:

- An array of planting equipment and seed lubricants was evaluated in 2014 and 2015 for the release of insecticide-laden dust. Seven total sites were established in 2014; using six of the sites as paired treatments comparing the Bayer fluency agent to the farmer choice. In 2015 eight random sites were located in central to west central Ohio, with two just across the western border into Indiana.
- Planter type, seed origin, and insecticide seed treatment for each site were recorded. During the planting operation local weather conditions were measured at each field.
    - A sample of the seed planted was retained for seed coat appearance evaluation by photo-macrographs or scanning electron microscope.
- Seed treatment dust release and quantity traveled downwind were determined by using a method similar to the Krupke-style dust collection procedure (Figure 1). Collectors were placed in a horizontal orientation 30 cm above the ground to estimate dust deposition on herbaceous flowers, and in a vertical orientation 2m above the ground at right angle to the wind to intercept blowing dust.
- The dust collection slide trays are made up of five microscope glass slides held together by plastic grip strips and glued to a piece of cardboard.
- Collection stations were held in place by a cleated fence post so that the horizontal and vertical dust collectors could be fixed at the correct orientation and height (30 cm and 2 m)
- Slides were treated with aerosol Tangle-Trap Sticky Trap Coating to hold dust particles.
- The stations were placed perpendicular to the orientation of the planting passes. Planting began after station placement and continued until 100 to 150 meter of field was planted perpendicular to the wind direction.
    - In 2014, stations were placed - at the edge of area to be planted (approximately 0.75 m), as well as at 10, 50 and 100 m downwind of the planter passes. Three rows of detectors were set in this configuration and were spaced evenly approximately 30 m apart.
    - Stations in 2015 were placed at 10 m downwind of the planter passes. Four rows of detectors were set and spaced evenly approximately 30 m apart.
        - At two sites planter orientation and wind direction allowed collection of dust as it was blown into a forest/tree protected area.
- An addition made for Ohio in 2014 and repeated in 2015 was the placement of slide trays under the planter. Four dust collection trays were placed under the planter for one pass, so that dust blown downward could be collected.

Figure 1. Five microscope slides coated with Tanglefoot adhesive were placed in a PVC skeleton with a horizontal orientation 30cm above the surface and in a vertical orientation 2m above the surface.

Table 1. Planter manufacturer and type used across trials.

Manufacturer & model	Center fill, air assist	Seed unit
2014		
Kinze 3660	Yes	Mechanical
John Deere 1770NT	Yes	Vacuum
John Deere 1770NT	No	Vacuum
2015		
John Deere 7200	No	Mechanical
John Deere 7200	No	Vacuum
John Deere 1770NT	No	Vacuum
Kinze 3600	Yes	Vacuum
CaseIH 1255 AFS	Yes	Vacuum
White-MF Agco 8800	No	Pressure

Table 2. 2014 test of fixed effects in linear mixed effects model with grower as a random effect.

Effect	Num DF	Den DF	T value	Pr > |T|
Distance	3	138	-4.03	<0.0001
Orientation	1	138	-0.35	0.72
Lubricant	1	138	-1.66	0.09

Figure 2: Insecticide laden dust concentration in ng/cm^2 downwind from planter startup at distances of 1, 10, 50 and 100 meters. Results of 2014.

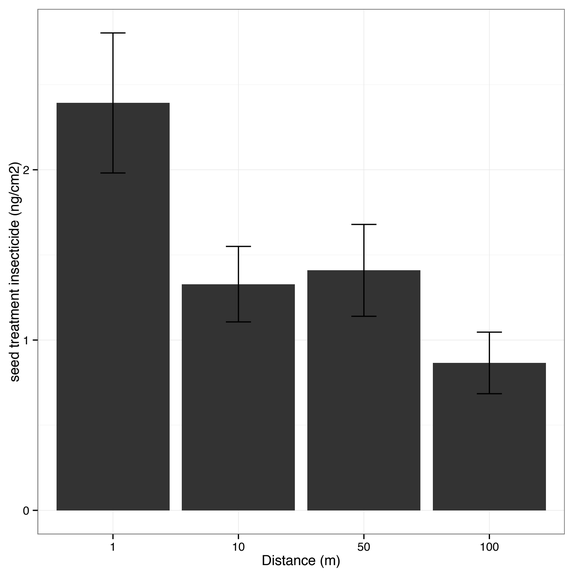


Figure 3: Comparison across three paired sites and all distances for Bayer fluency agent (B) to farmer choice (F) product for reducing pesticide in dust as determined by insecticide level in ng/cm^2. Results of 2014.

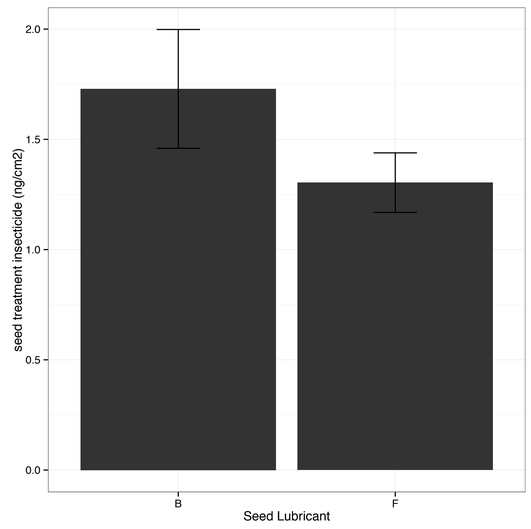
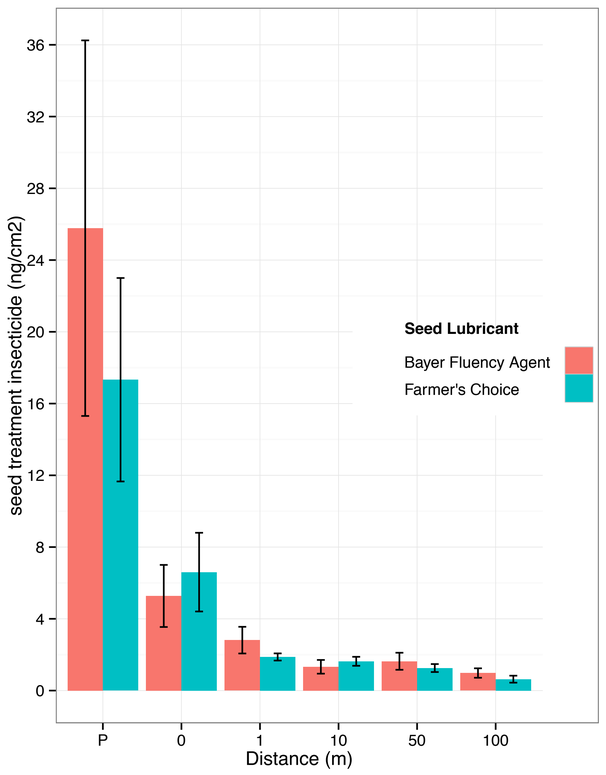


Figure 4. Comparison of effect of lubricant type on insecticide concentrations in ng/cm^2 collected from detectors: planter-mounted (P), directly under the planter (0), and at distances of 1, 10, 50 and 100 meters. Results of 2014.



Lessons learned:

- Air assisted planters are many, with air assistance applied at the supply end or the delivery end or both. The planters used represent the range found in Ohio (Table 1).
- All sites sampled used seed-placed insecticide: either clothianidin or thiamethoxam.
- Dust analysis from the traps determined there were no differences between the Bayer fluency agent and the farmers choice products (Table 2 & Figure 3).
- Collectors under the planter, with which we hoped to determine the amount of insecticide directly deposited to the soil surface, have higher levels of insecticide as compared to the targets farther away (and above the surface).
    - The high levels of insecticide collected beneath the planter indicate that weed control in fields is of critical importance to protect pollinators from seed treatment dust exposure.
- Our attempt to measure accumulated insecticide load with planter-frame mounted collector slides shows that we can accumulate large amounts of insecticide on the planter itself during planting (Figure 4).
    - Improved cleaning practices must be developed to reduce insecticide deposit in fields or around farmsteads.
- Seed placed insecticides have grower value. But from discussions with entomologists, the current practice of all seed corn receiving an insecticide is a case of over-use. We must determine and share best management practices for use of seed placed insecticide for those few times when they provide the most value.

Acknowledgement:

Thanks to the Pollinator Partnership – Corn Dust Research Consortium for the funding for this project. Thanks also to fellow researchers across the United States and Canada for advice and suggestions on how best to conduct the work.

Finally, thanks to the growers of Ohio for the space, time and patience in conducting this work.

UID: 93760

Session title: Crop Ecology, Management & Quality: II
Session date/time: Tuesday, November 17, 2015, 4:00 PM - 6:00 PM
Title: Corn Planting Dust, and the Potential for Impact on Honey Bee.
Location: Minneapolis Convention Center, Exhibit Hall BC

Your Poster Board Number: 816

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

(1) Ohio State University Extension, Raymond, OH
(2) Ohio State University Entomology, Wooster, OH
Presenting author contact information: watters.35@osu.edu, cell 937 604-2415
Contributing authors: johnson.5005@osu.edu, sponsler.18@osu.edu