



Aerial Pesticide Applications with Drones

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Applying Pesticides via Drone



Applying Pesticides via Drone

Why?

- Interest in applying products in-season
 - Difficult to do in some fields

Interest in Drone Spraying



Unanswered Questions

- Can drones deliver adequate spray coverage?
 - often dealing with very low application volumes
 - drones are not like helicopters or fixed-wing aircraft

2020 Trials

- HSE-TTA Drone
- DJI Drone
- Operated approx. 6'-10' above canopy @ **16 mph**
- Delivering **1.5 gallons/acre**
- TeeJet TXA8002VK nozzles



2020 Trials: Methods

- Spray cards placed in canopy at three heights
- Plots sprayed and cards scanned and read via Deposit Scan[®]



Top: 3rd leaf from tassel

Soybean: uppermost emerged leaf

Middle: Main ear leaf

Soybean: middle of canopy

Bottom: Third leaf from bottom

Soybean: 1' above ground

2020 Trials: Methods

- Application on Aug 27, 2020 at Garden Fence Farm in Harford County, MD
- Corn: 30" rows, R4
- Soybean: 15" rows, R6



2020 Trials



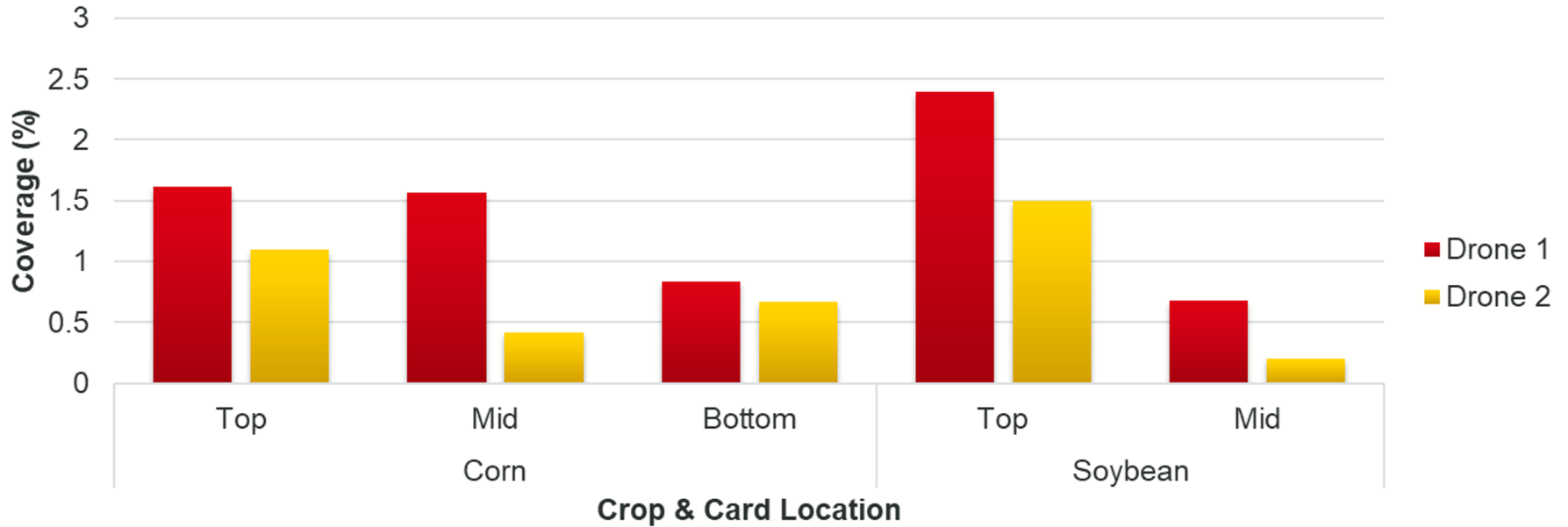
2020 Trials

- Spray cards rated with Deposit Scan
- Droplet size
- Droplet density
- % Coverage



2020 Results

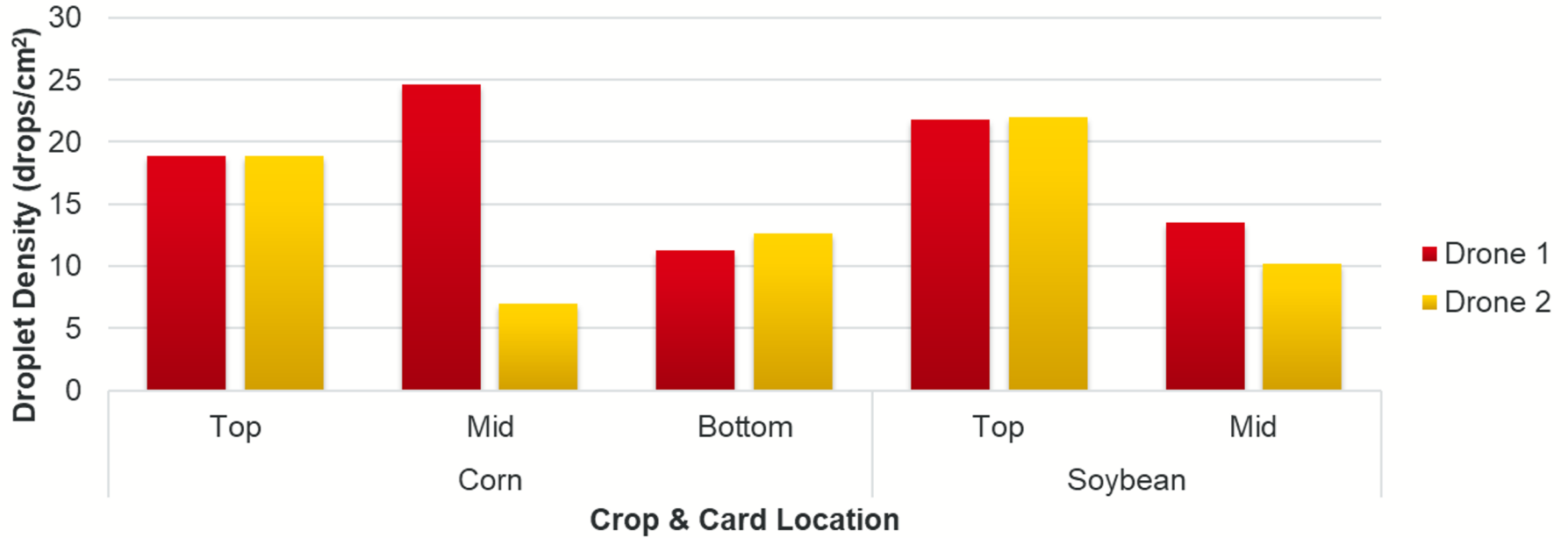
Spray Coverage



2020 Results

- 20-30 droplets per cm²: insecticides
- 30-40 droplets per cm²: contact foliar herbicides
- 50-70 droplets per cm²: fungicides

Droplet Density



2020 Results: Corn

Top



3.75%

34.6
drops/cm²

183 μm

Middle



0.94%

11.5
drops/cm²

162 μm

Bottom



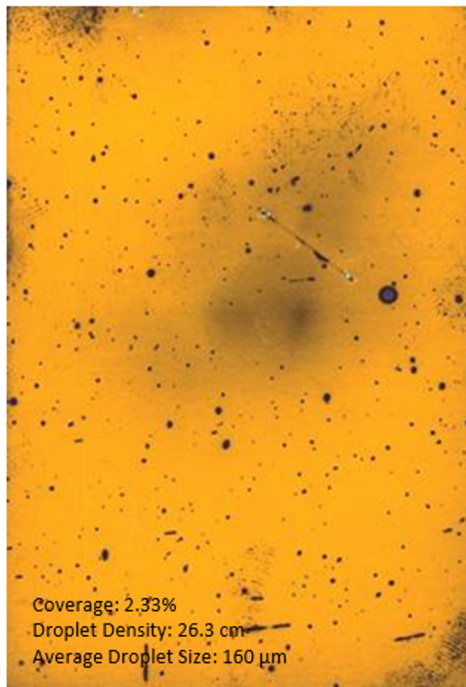
0.96%

15.7
drops/cm²

133 μm

2020 Results: Soybean

Drone 1: HSE-TTA

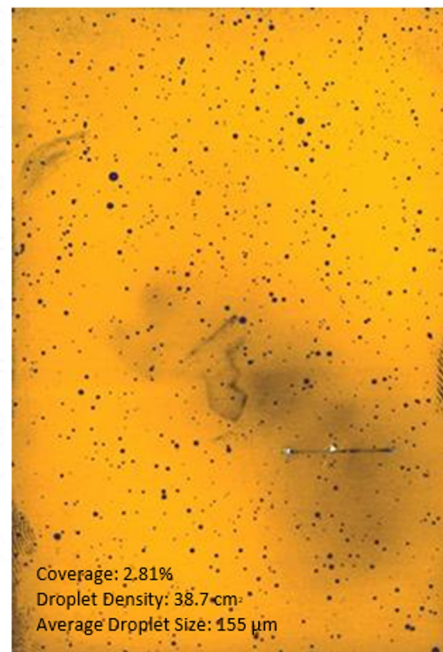


2.33%

26.3
drops/cm²

160μm

Drone 2: DJI



2.81%

38.7 drops/cm²

155μm

2020 Trials

- Drones show promise for spraying agricultural products but more work needs to be done
 - Need to achieve better coverage, especially for fungicides

2021 Trials

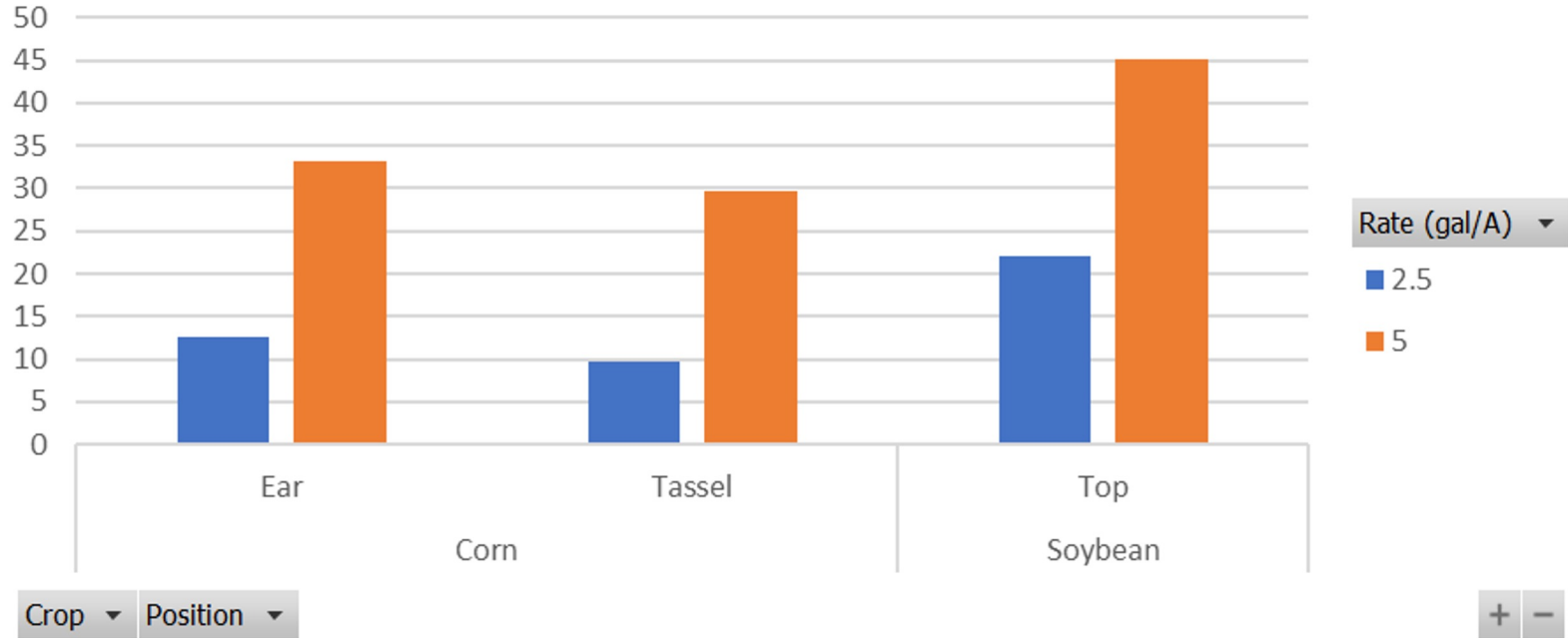
- What could we do to achieve better spray coverage?
 - modify flight speed/application volume
 - 2.5 gal/acre and 5 gal/acre vs. 1.5 gal/acre (2020)



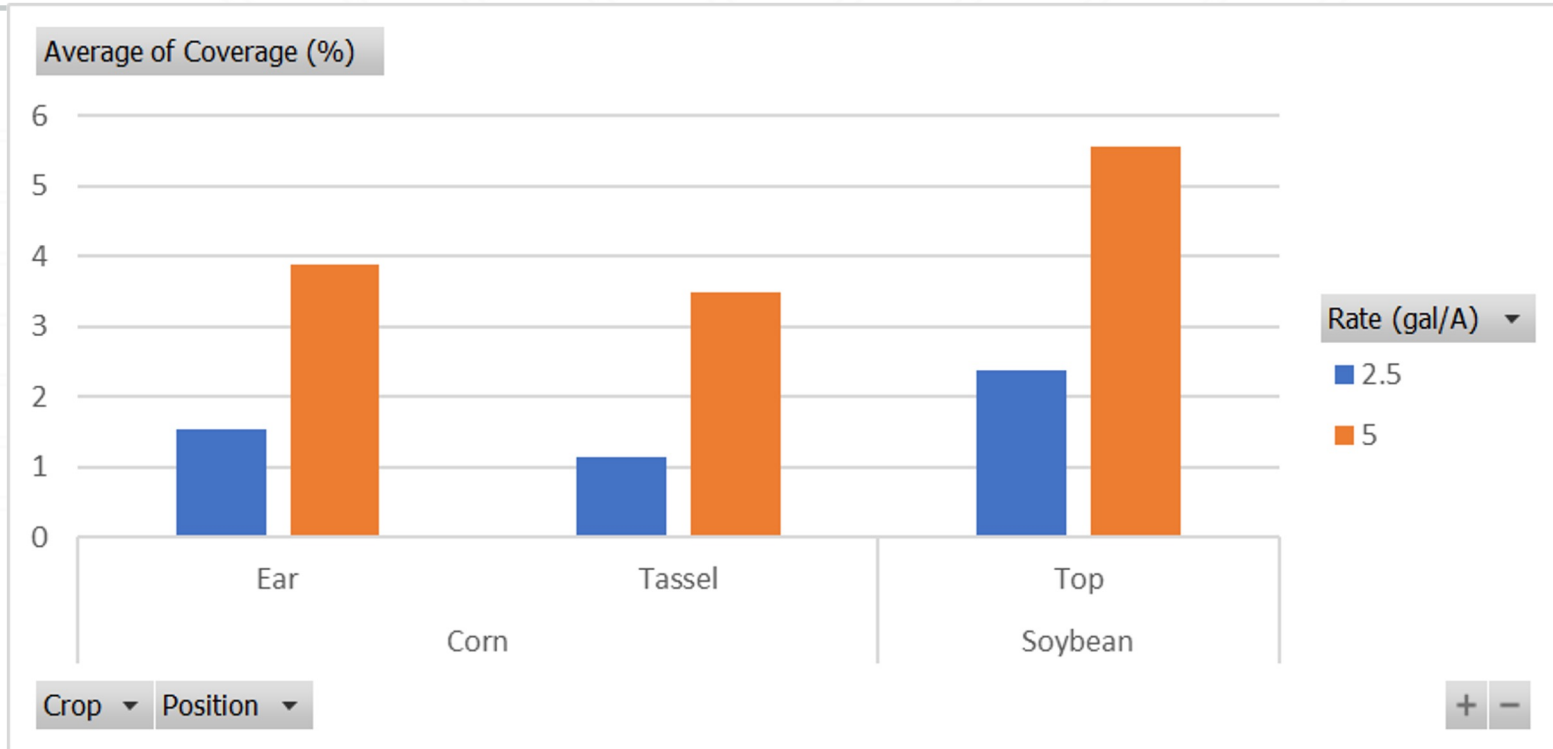
2021 Trials: Droplet Density

A range of 20-70+ droplets/cm² is often a target for most pesticide applications.

Average of Deposits/cm²

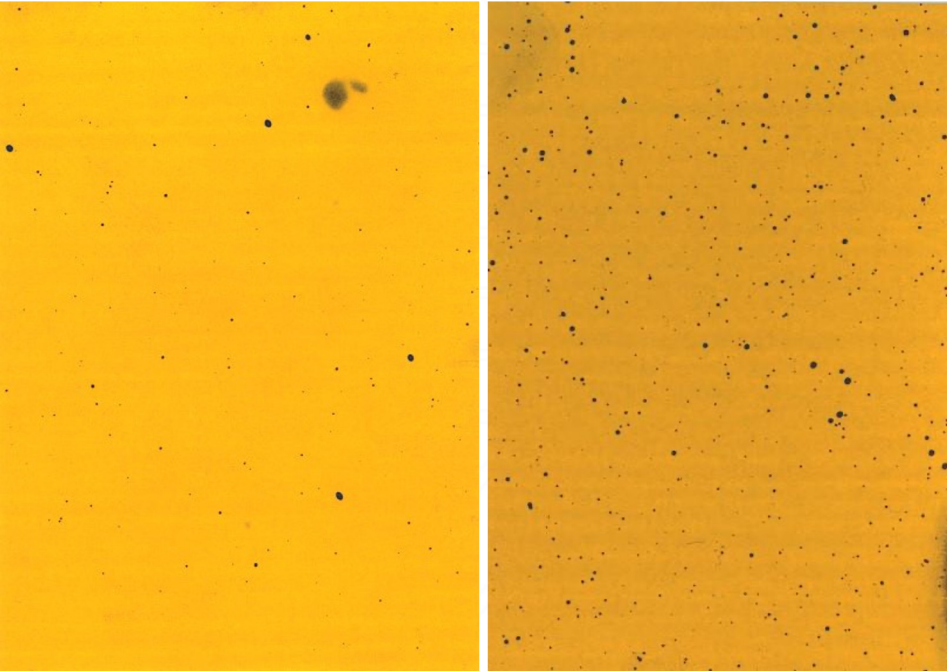


2021 Trials: Spray Coverage

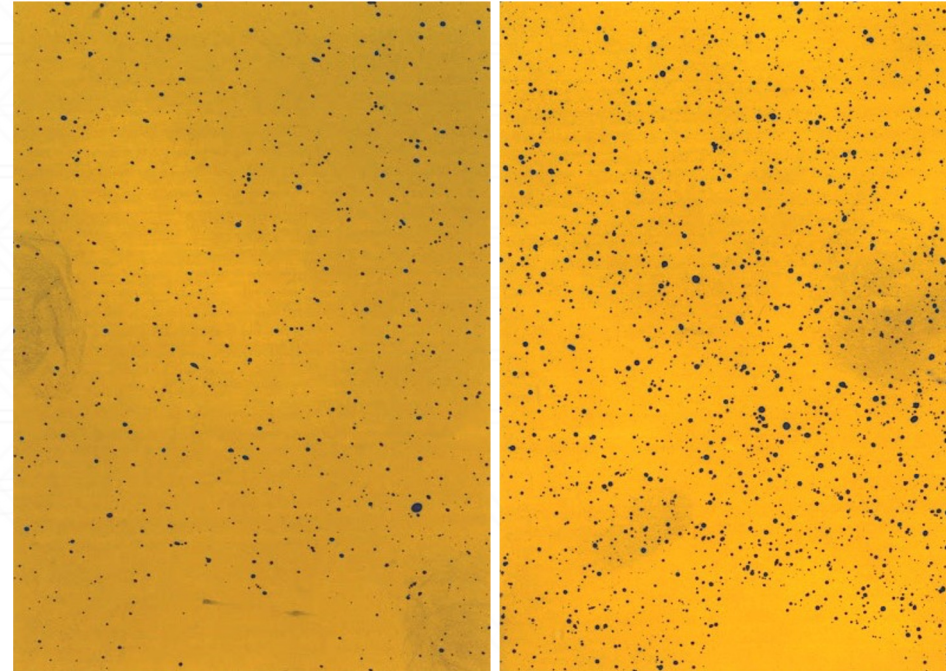


2021 Trials: 2.5 vs. 5.0 gal/A

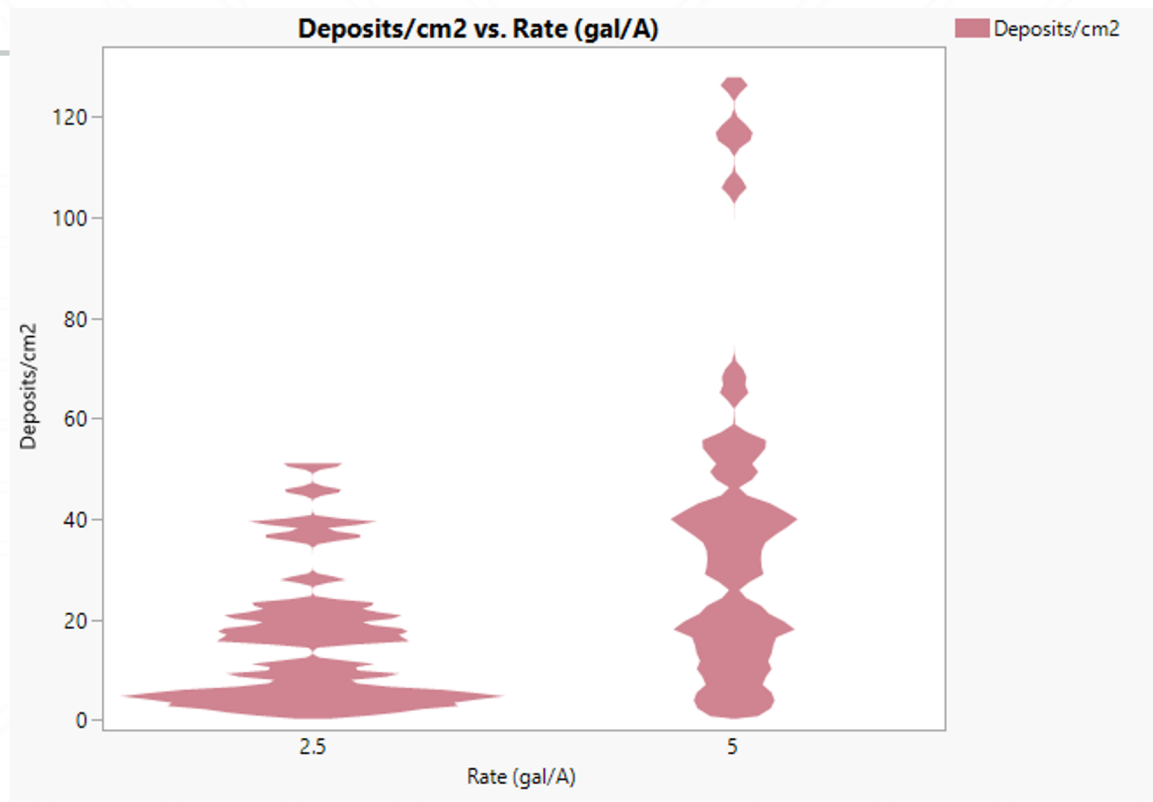
Corn Ear Leaf



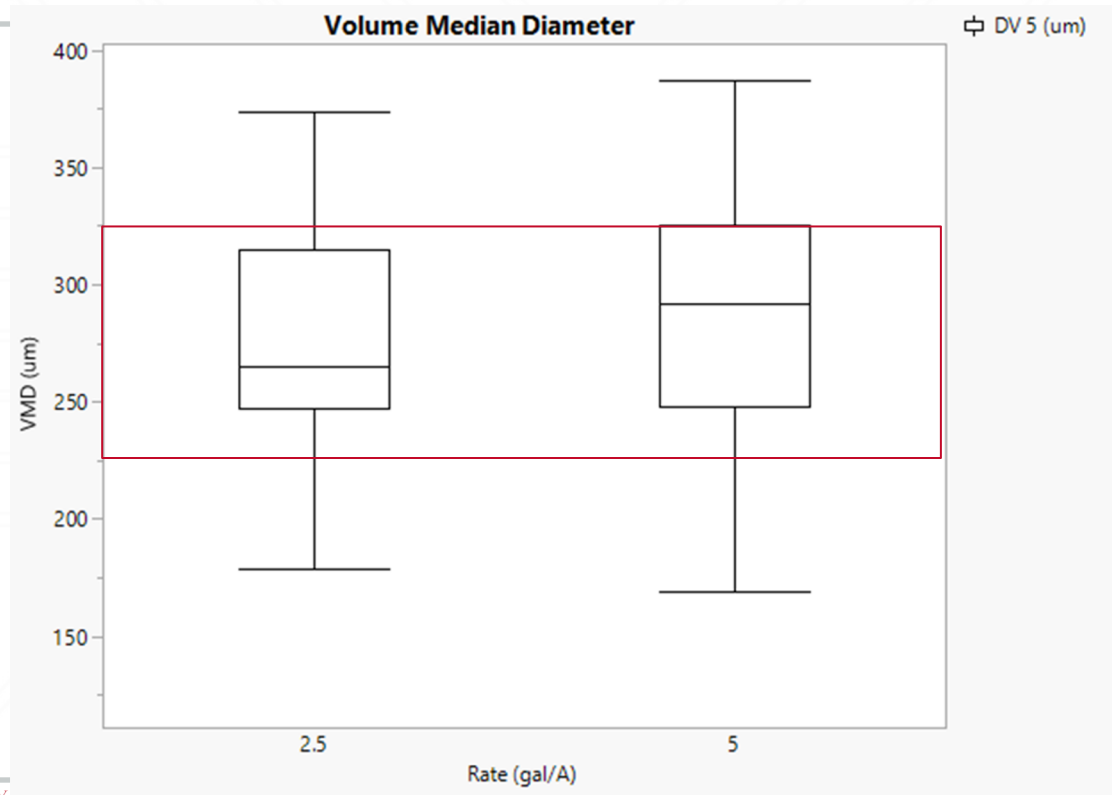
Soybean



2021 Trials



2021 Trials

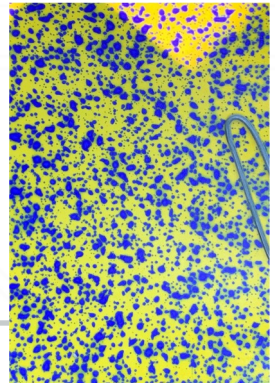


Target VMD: 225-325 (Medium droplets)

2020 vs. 2021

- ~ 50% improvement in spray coverage and droplet density when spraying at 5 gal/A vs 1.5 or 2.5 gal/A
- Average droplet density:
 - 1.5 gal/A = 21
 - 2.5 gal/A = 23
 - 5.0 gal/A = 45

Compared to ground @ 20
gal/A: 35% coverage and
61.4 droplets/cm²
VMD: 1056



Summary

- Applications at 5 gal/A offer superior coverage; especially important for fungicides
- 5 gal/A rate offered better droplet distribution





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