


Spray Drone Research and Lessons Learned



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Spray Drones



Spray Drones

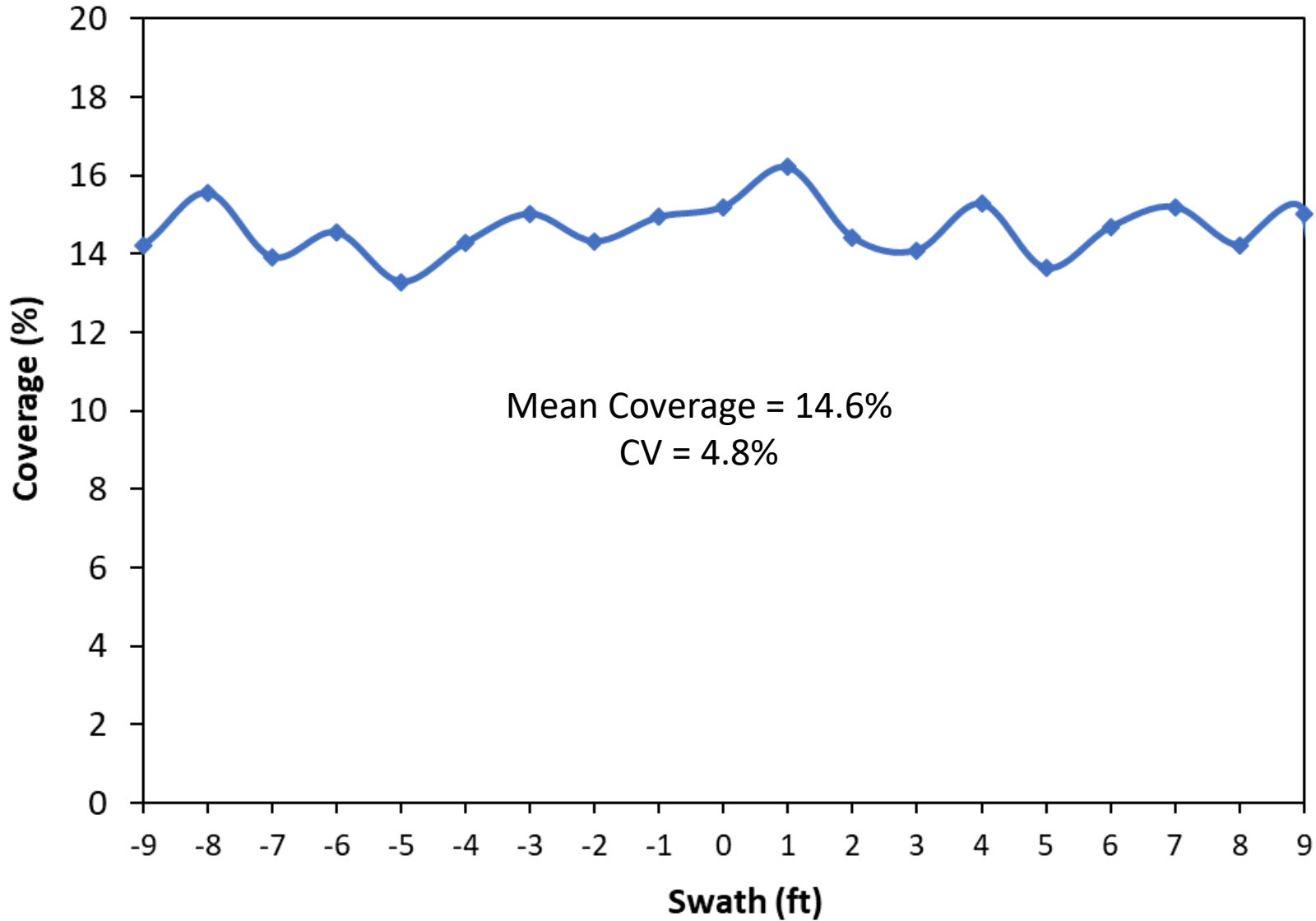
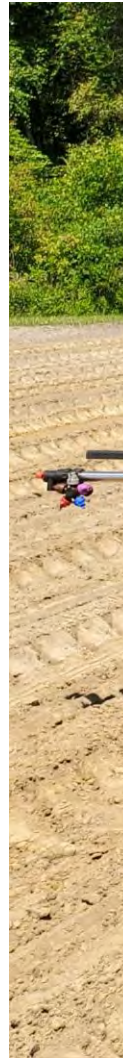
- *How many gallons per acre can it spray? How many acres per hour it can do?*
- *How does application compare to a ground sprayer? Coverage and efficacy?*
- *How wide can it spray? What is the spray swath/width?*



Research Goal: *Spray Drones*

- To answer some of the common grower questions regarding selection of application parameters for spray drones
- Provide information on best management practices for safe and effective application of pesticides

Boom Sprayer Application



Spray Performance

It varies drone by drone and also depends on the type of application

- **Five spray volumes**

- 5.0 GPA
- 4.0 GPA
- 3.0 GPA
- 2.0 GPA
- 1.3 GPA

- **Three Swaths**

- 6.5 ft
- 8.2 ft
- 9.8 ft

- **Three Nozzles**

- XR (Medium)
- AIXR (Very Coarse)
- TTI (Ultra Coarse)

Total of 45 different combinations (volume x height x nozzle)

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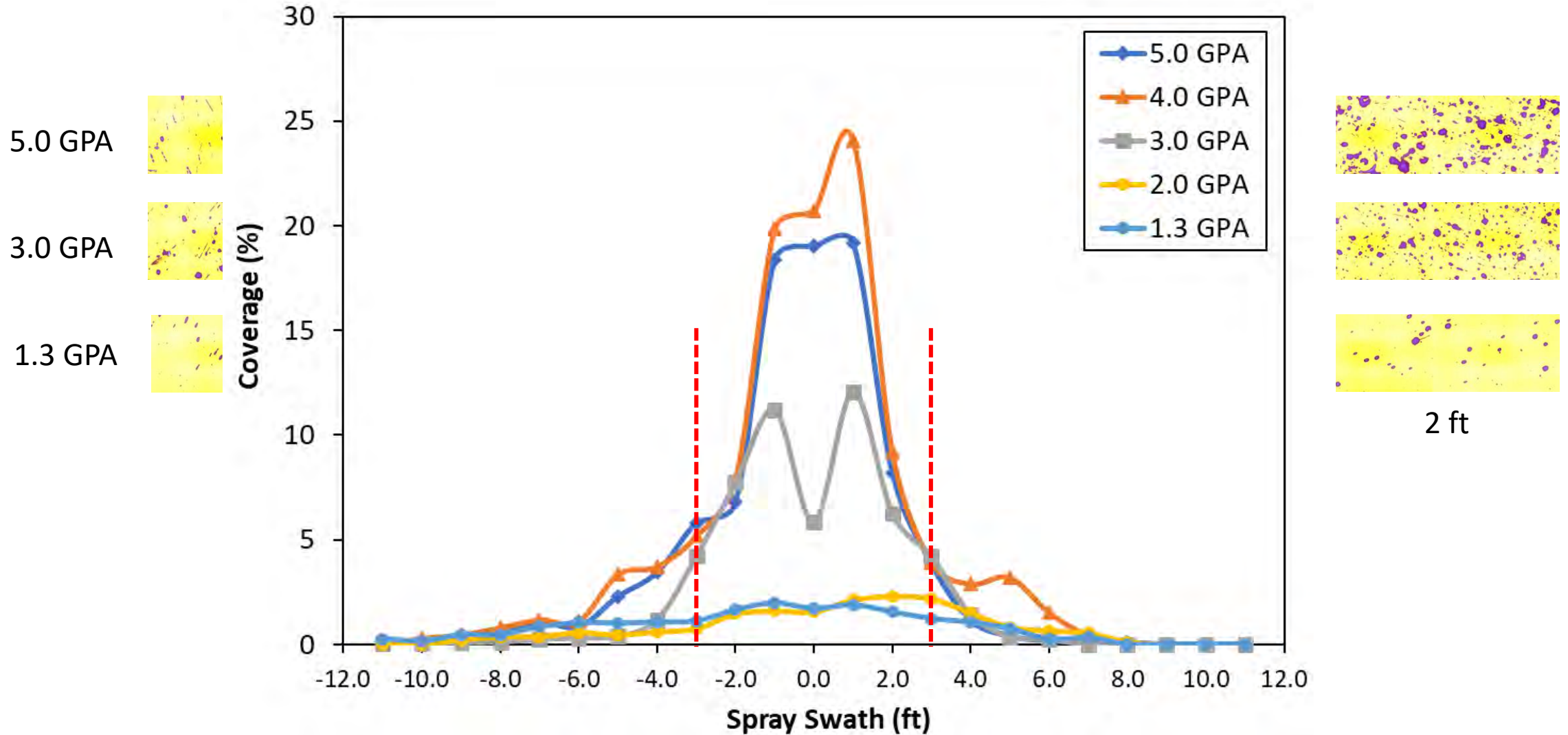
Spray Performance Assessment



Spray Drone Pass

Spray Volume

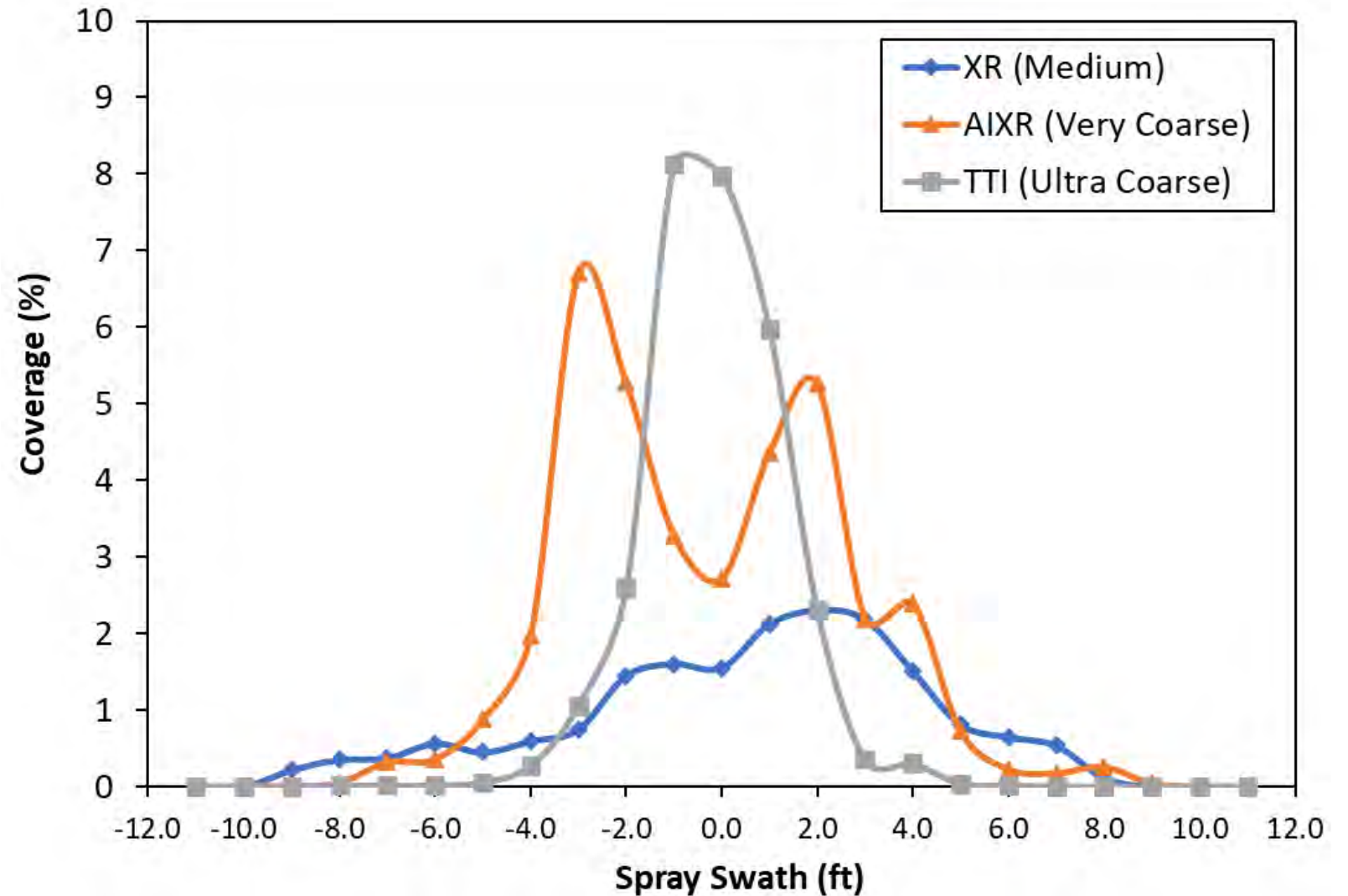
XR (Medium) & spray height 6.5 ft



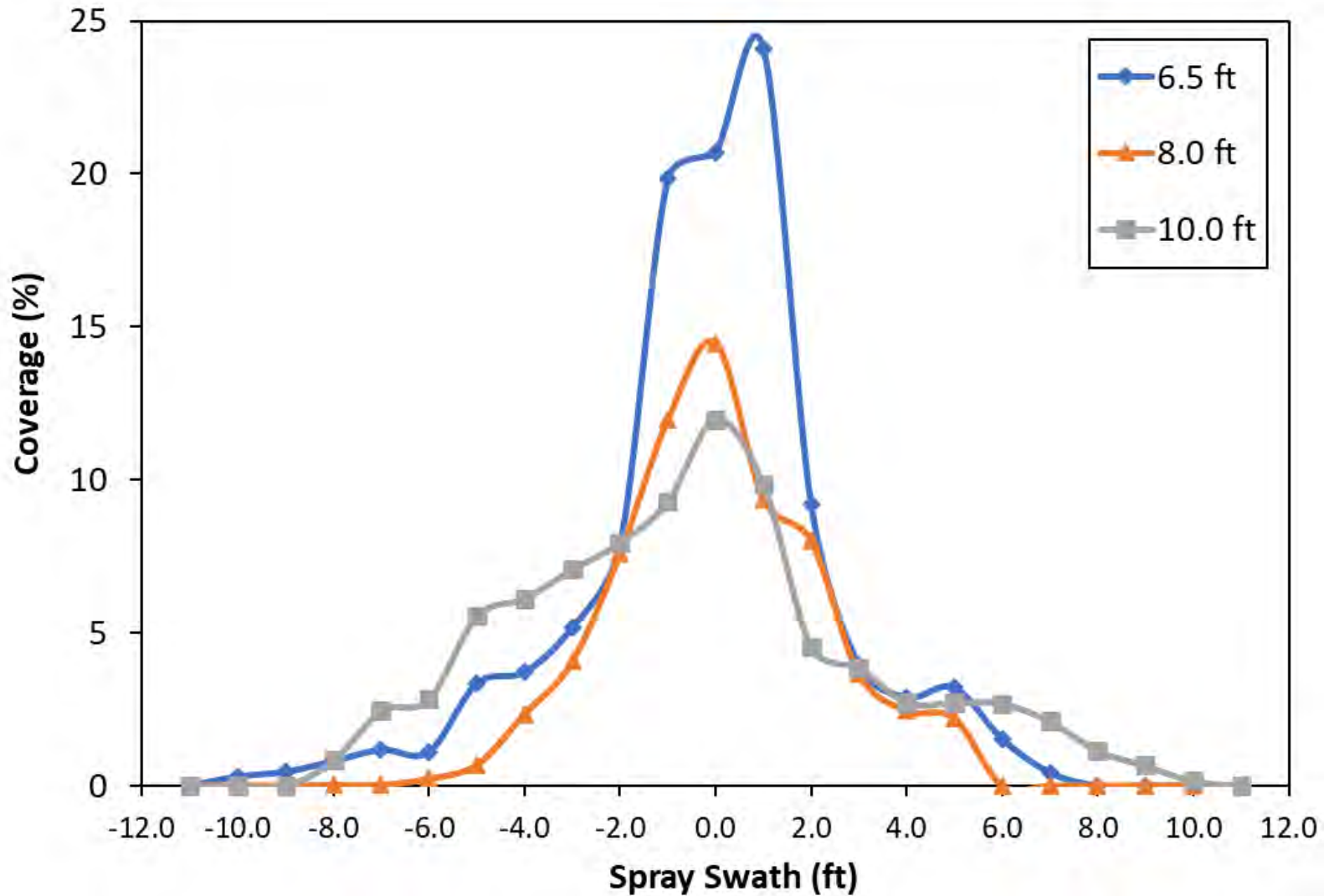
Nozzle Type

Spray volume = 2.0 GPA

Spray height = 7.0 ft



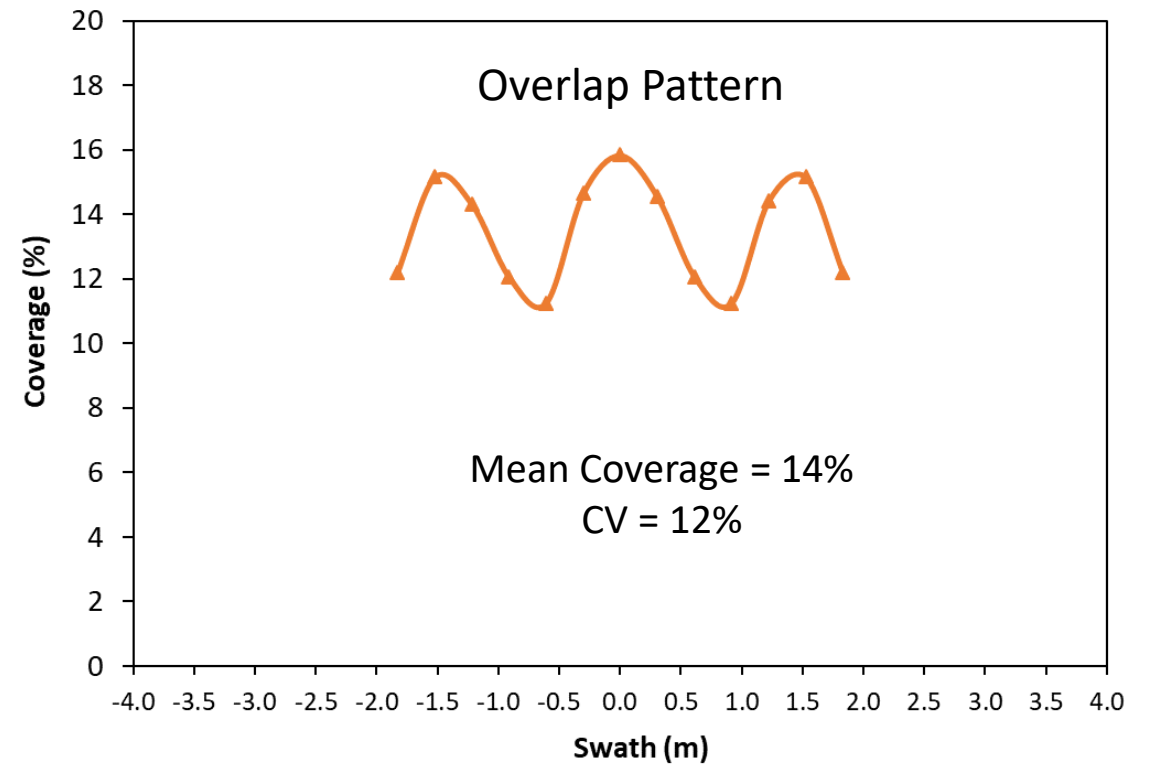
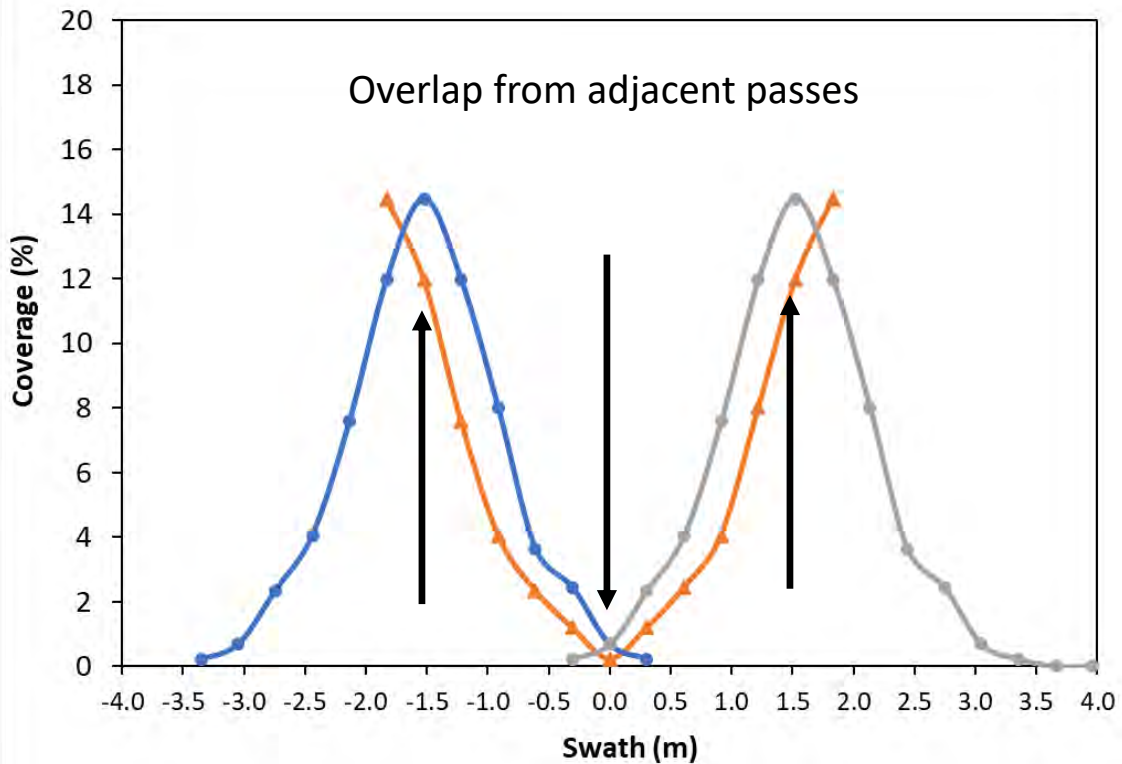
Spray Height



Spray volume = 2.0 GPA

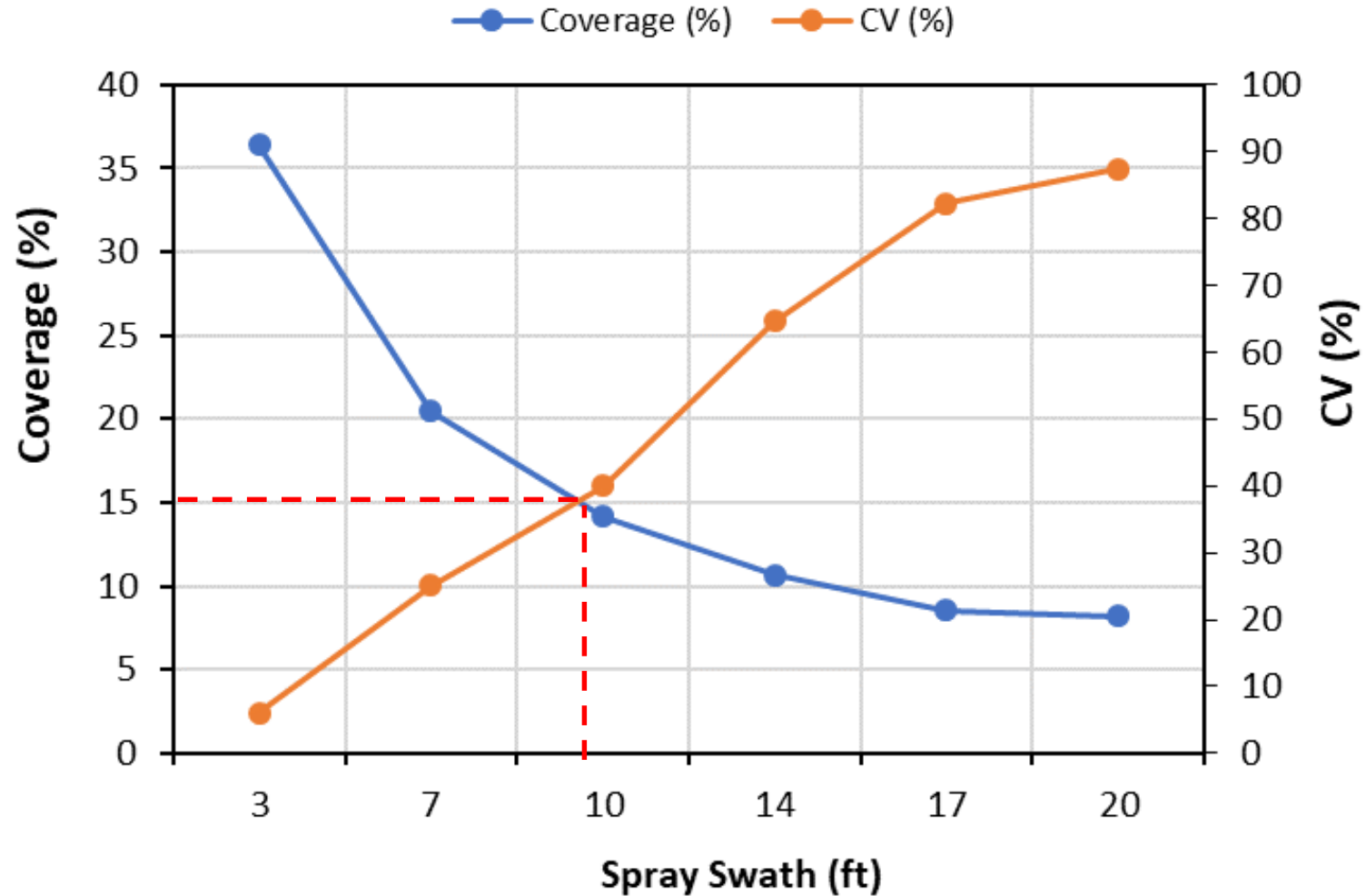
Nozzle = XR (medium)

Spray Drone - Effective Swath Consideration



Optimizing Coverage and Uniformity

2 GPA, 6.5 ft height, XR nozzle



Applications in Crop Production

- **Spot-spray herbicide applications** – where it is efficient and economical to treat with a drone sprayer. *(e.g. treating late-season weed escapes)*
- **Rescue fungicide applications** – when a timely fungicide application with a ground sprayer or crop duster is not feasible. *(e.g. field too wet or crop duster not available)*
- **Awkward acres or small fields** – fields or parts of the fields that makes applications with ground and/or crop duster challenging. *(e.g. parts of the field inaccessible to ground & manned aerial applicator)*



Spot-Spray Herbicide Applications

Targeting weed escapes early or late in the season



Spot-Spray Herbicide Applications

Challenging weeds late in the season/before harvest



Spot-Spray Herbicide Applications

Some situations need a miracle more than a spray drone



Operational Considerations

- Most drone manufacturers provide general specifications (tank size, spray volume, etc.) but it is up to the operator to select application parameters
- Spray volume (GPA) is selected based on battery life and size of the tank
- Short battery life and multiple refills requires to have a system for quick charging on-site and mixing products
- This re-charging and refill system would also need to be moved around to save battery life



Fungicide Application – Drone, Airplane and Ground Sprayer

| Location | Application type | Parameters | Nozzle Type |
|------------------|------------------|----------------------------|-------------------------|
| Blakely, Georgia | Drone | 20 ft swath 12 ft Height | Green Leaf AIRMIX 11001 |
| | Airplane | 70 ft swath 10 ft Height | Standard |
| | Ground Sprayer | 72 ft swath | TeeJet TJ-80 11004 |

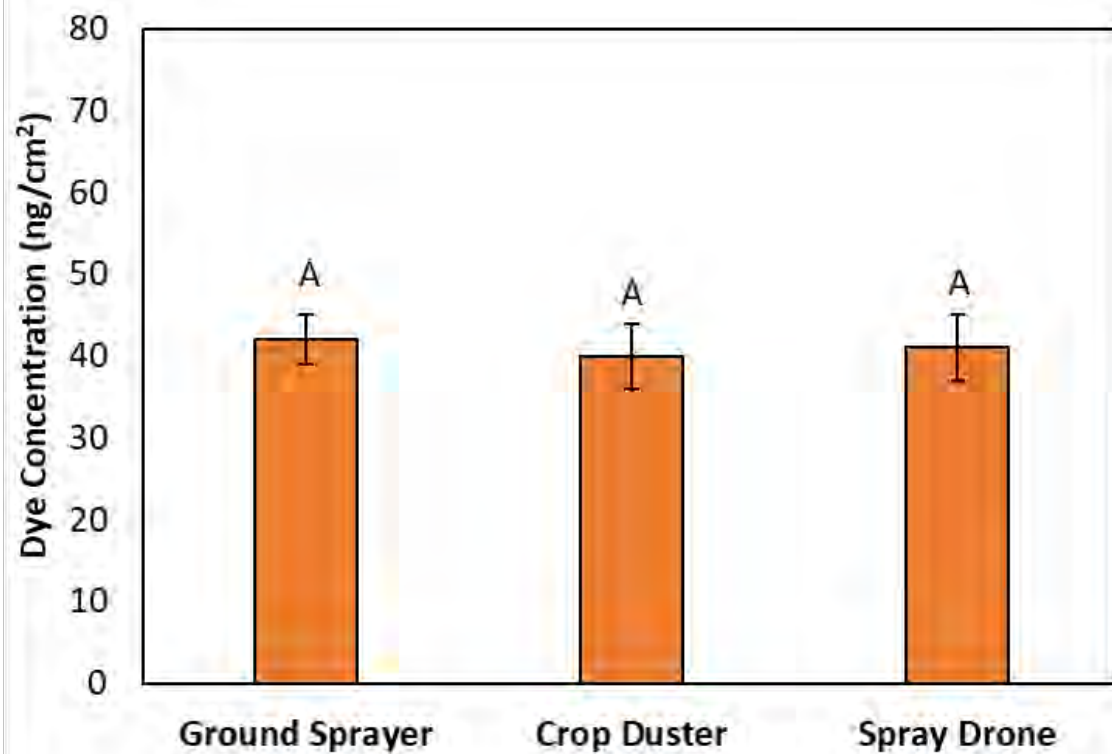


Fungicide Application with Spray Drone

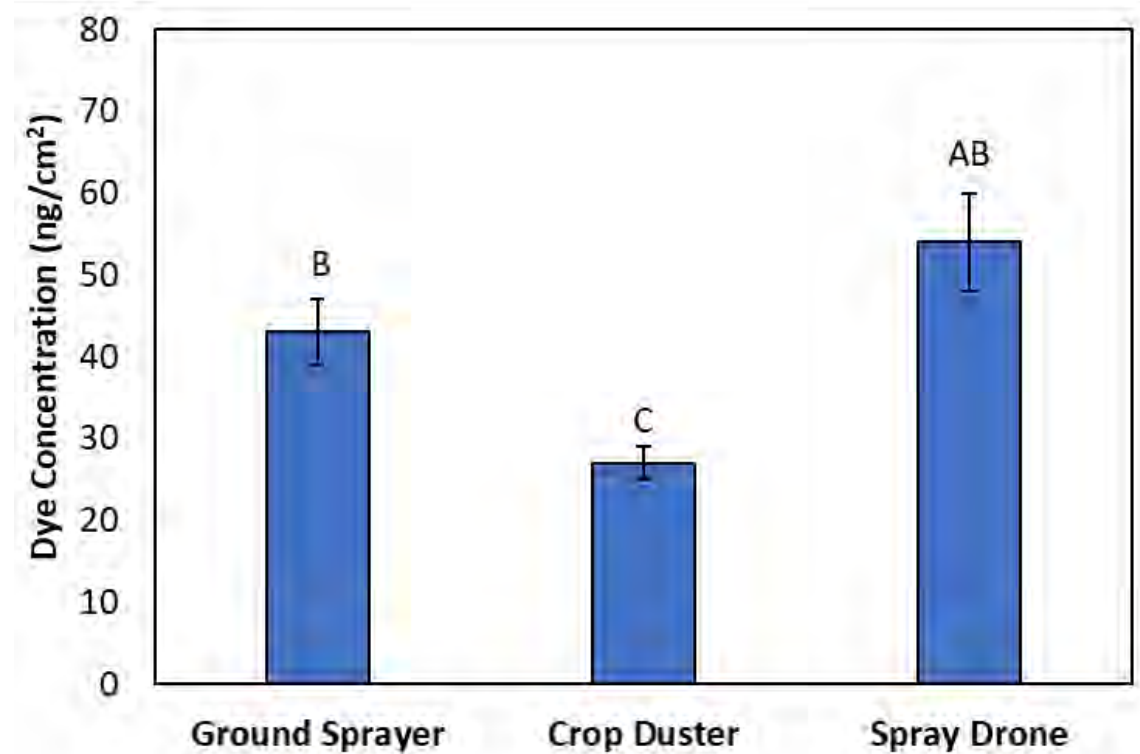


Fungicide Application Comparison (Ground sprayer, airplane and Spray drone)

Upper Leaf

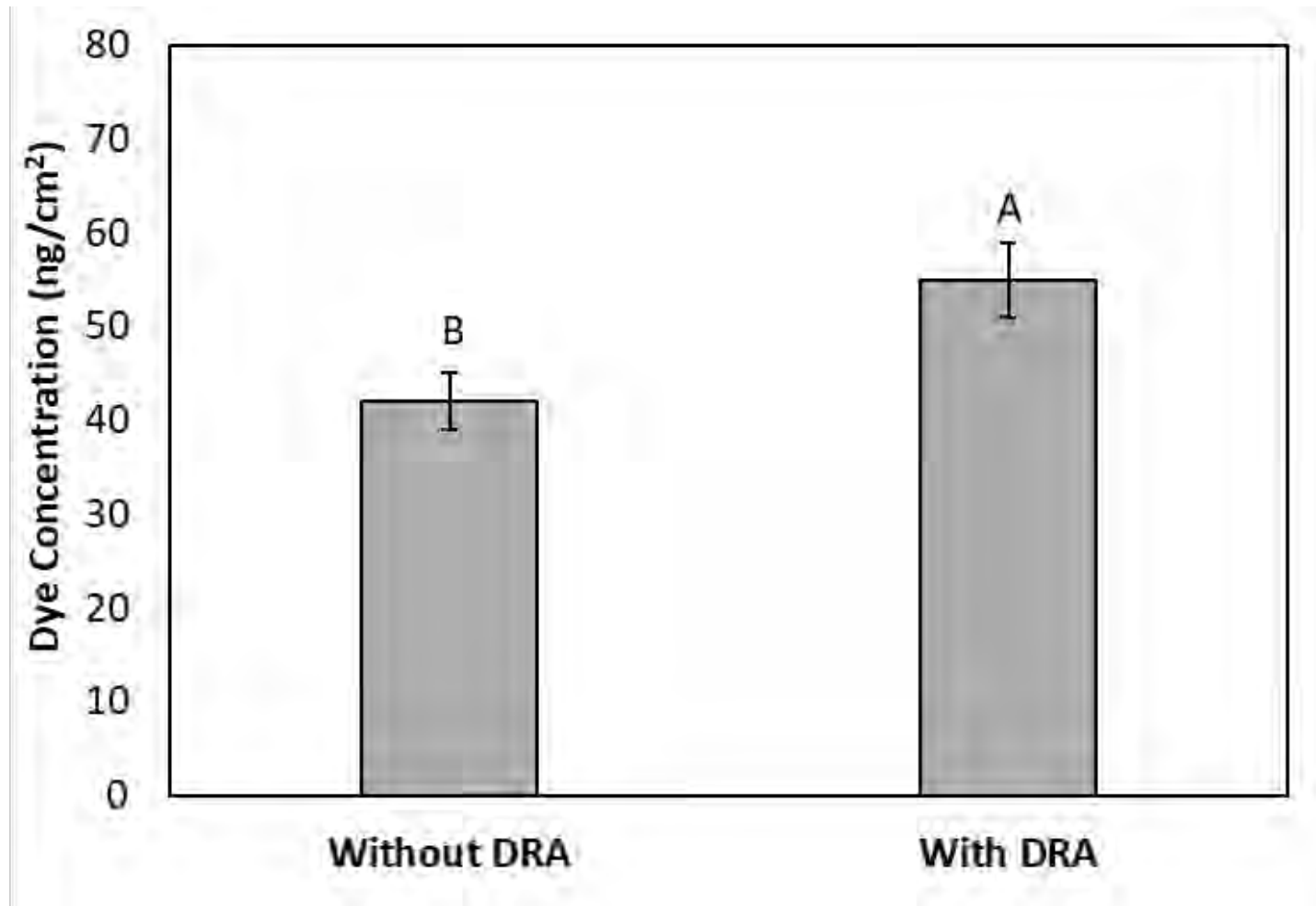


Ear Leaf





Fungicide Application Comparison (Spray drone – DRA vs No DRA)



Application Considerations

- **Good Coverage** – proper flight settings and application under favorable conditions
- **Application parameters** – spray volume ($\geq 2\text{GPA}$) and effective spray swath (determine through testing)
- **Efficacy** – proper product/chemistry selection. Use of surfactants and DRA's to improve efficacy.
- **Follow BMPs** – follow best practices for judicious pesticide and drone usage



Thanks!

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