

Comparison of herbicide spray drift from ground and aerial applications

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*Knoxville, TN
Dec. 5, 2022*

Spray Drift Background

SEC ESPN NETWORK

@weedsARwild

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34	41	2nd & 9
1-1	1-1	4th 40

SEC ESPN NETWORK

BIG 12 | 5 Oklahoma vs UCLA

▶ 8 ET

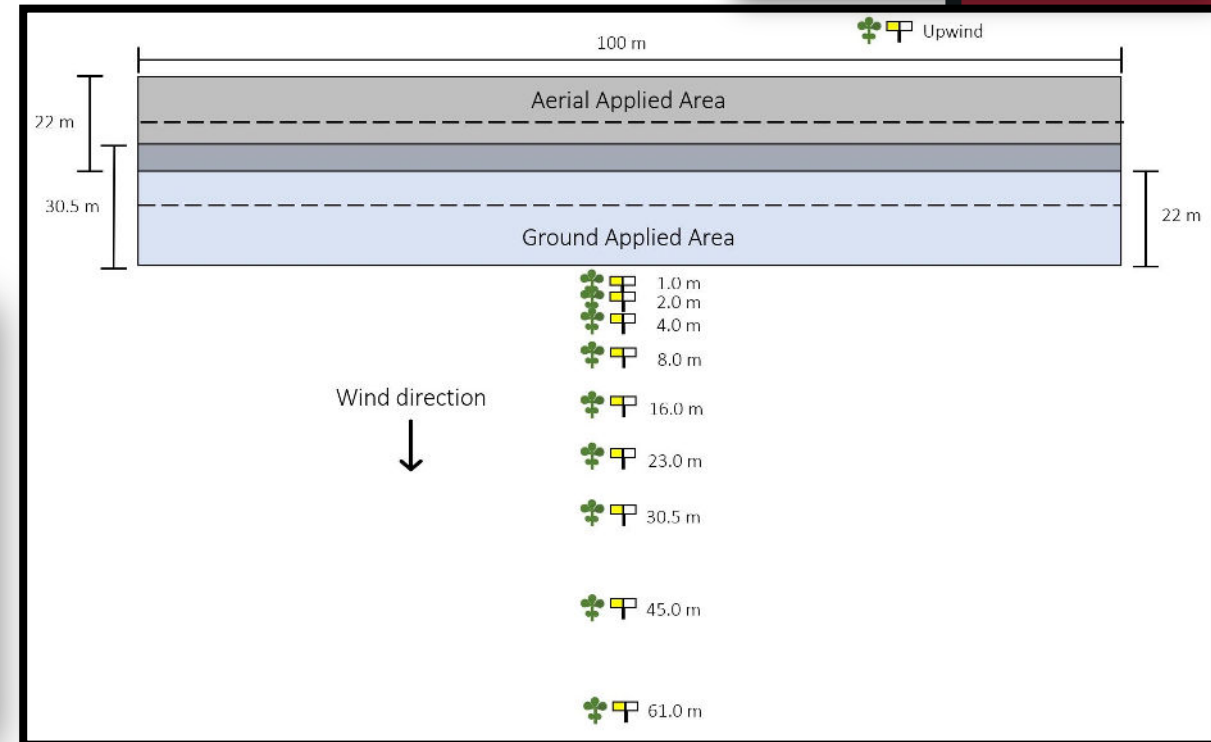
THIS MORNING

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Loyant Drift Study

- Field drift study conducted near Stuttgart, AR
- 9 downwind (1, 2, 4, 8, 16, 23, 30.5, 45, and 61 m) (3.3, 6.6, 13.1, 26.2, 52.5, 75.5, 100.0, 147.6, and 200 ft) and one upwind (nontreated control) collection stations
- Collection stations equipped with one 76.2 x 50.8 mm (2 x 3 in) **water sensitive card**, one 101.6 x 101.6 mm (4 x 4 in) **plastic Mylar card**, and a **soybean plant** (V3-V4 growth stage) as a bioindicator
- To adjust for spray swath displacement from the ag aircraft, a 22 m (72 ft) upwind swath adjustment was utilized





Application Info

- Ground Sprayer:
 - Case 5550 AimPoint
 - 30.6-m (100 ft) boom width
 - 0.9-m (36 in) boom height
 - 276 kPa (40 PSI)
 - ER11010 nozzles (Wilger)
 - 32 kph (20 mph) speed
 - Coarse spray classification
 - 94 LPH (10 GPA)
- Agricultural Aircraft:
 - AirTractor 802A
 - 22-m (72 ft) swath width
 - 4.6-m (15 ft) flight height
 - 0° deflection angle
 - 345 kPa (50 PSI)
 - CP09 straight stream nozzles (CP Nozzles, Transland)
 - Orifice sizes alternated in pattern of 0.78 – 0.78 – 0.125
 - 233 kph (145 mph) airspeed
 - Coarse spray classification
 - 70 LPH (7.5 GPA)
- Florpyrauxifen-benzyl (Loyant) (29.4 g ai ha⁻¹; 16 fl oz/ac) + MSO (0.6 L ha⁻¹; 0.5 pt/ac) + 2 g L⁻¹ PTSA dye tank-mix
- 10 individual replicates (spray passes) each for ground sprayer and ag aircraft

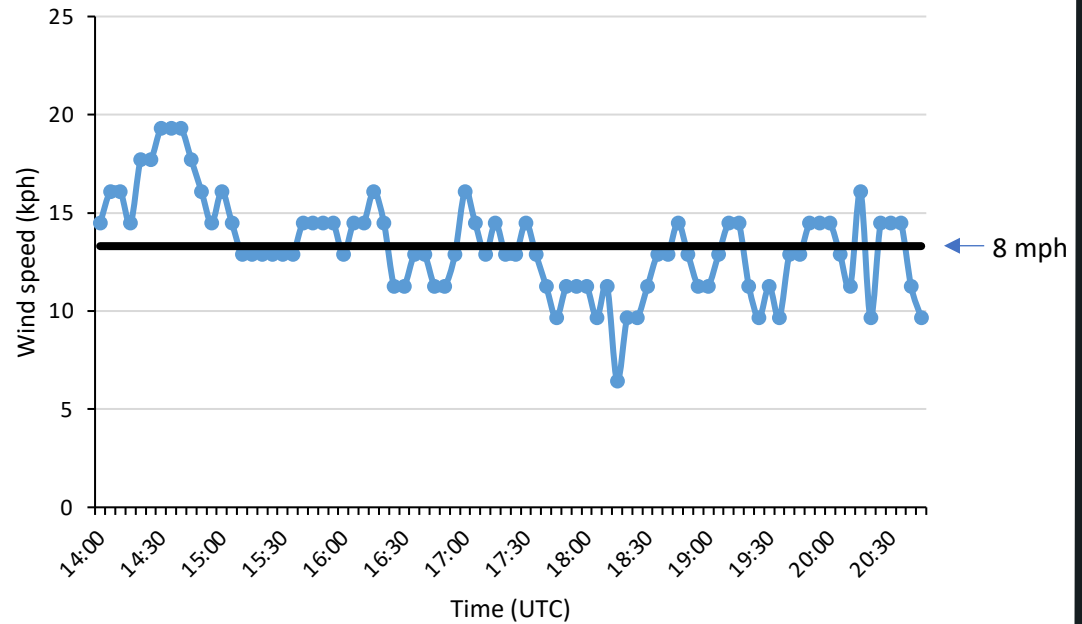
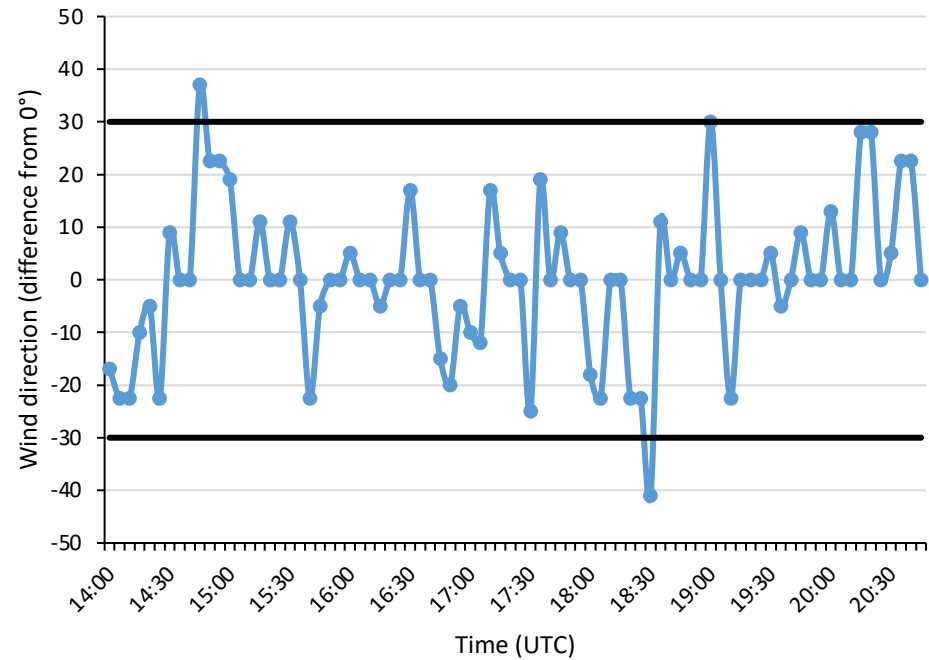
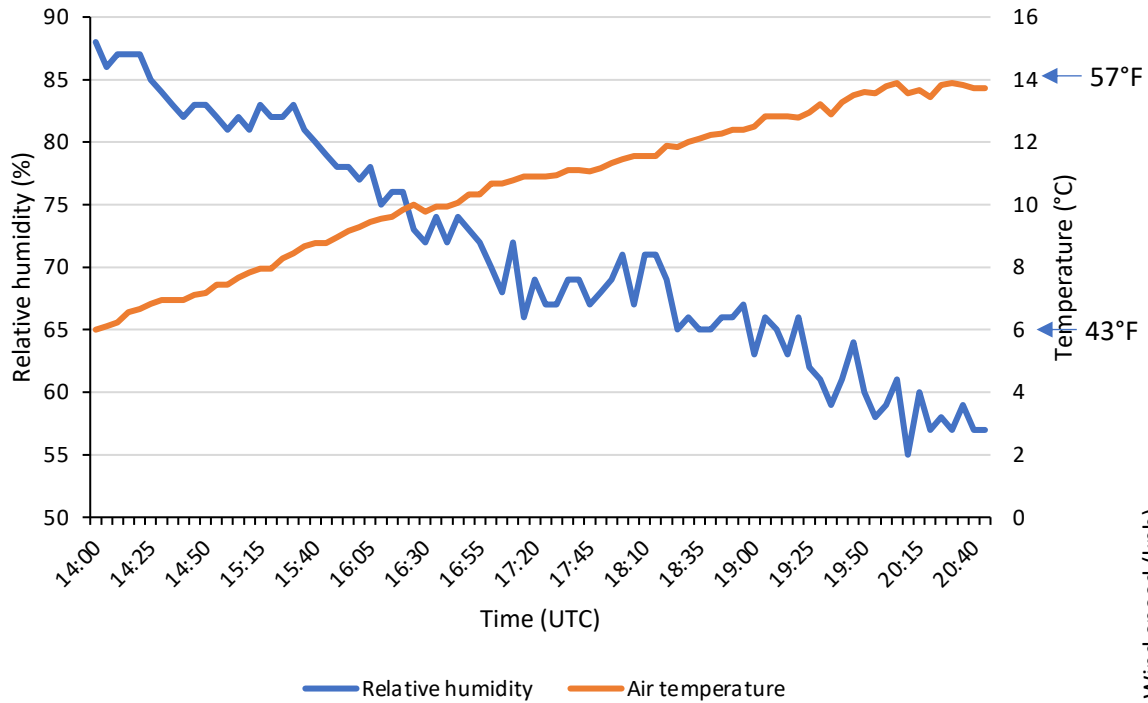


Droplet Size

Nozzle	Orifice	D _{v10} (μm)	D _{v50} (μm)	D _{v90} (μm)	% Volume < 100 μm	Droplet Size Classification
CP 09 Straight Stream	0.078	131	355	666	6.2	Medium
CP 09 Straight Stream	0.125	161	374	647	3.5	Coarse
CP 09 Composite Volume Weighted	n/a	148	366	656	4.7	Coarse
ER110	10	189	369	589	1.4	Coarse

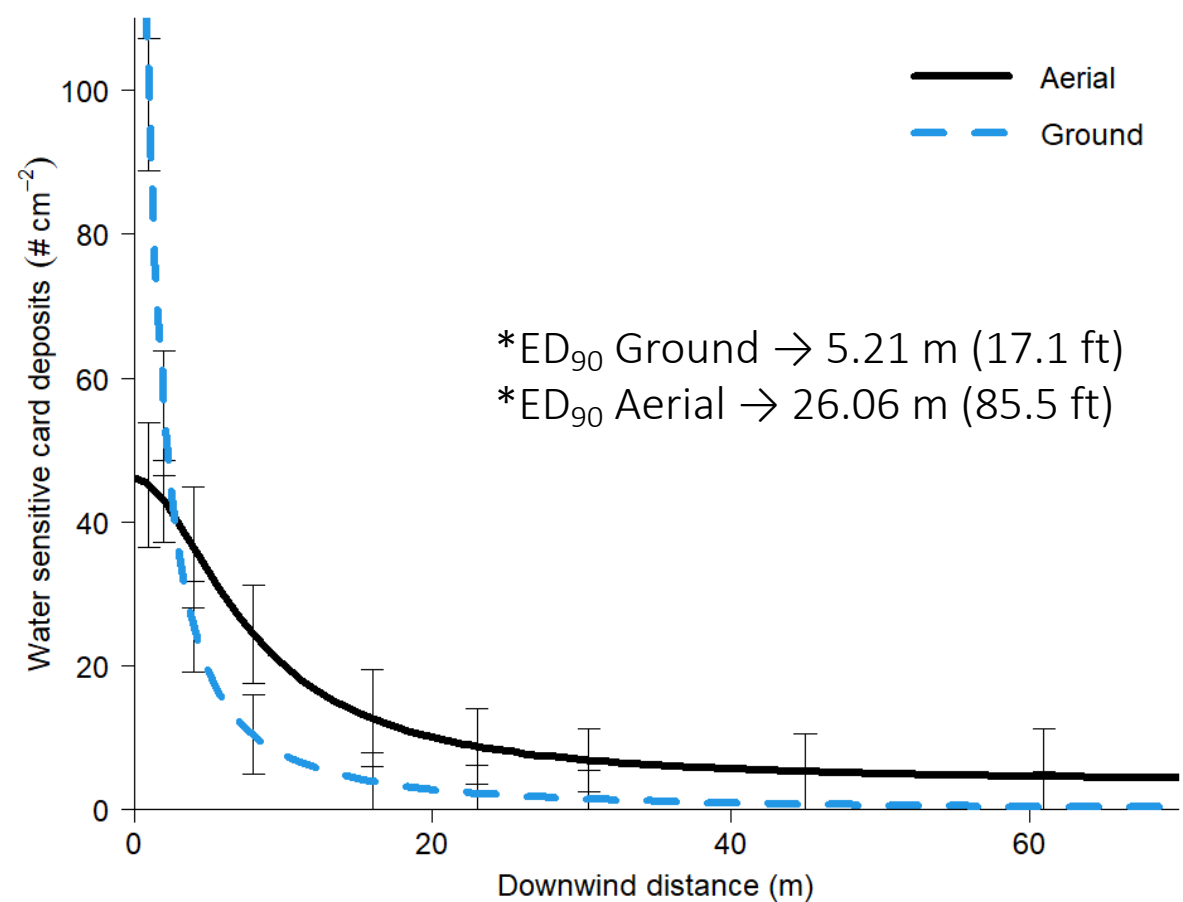
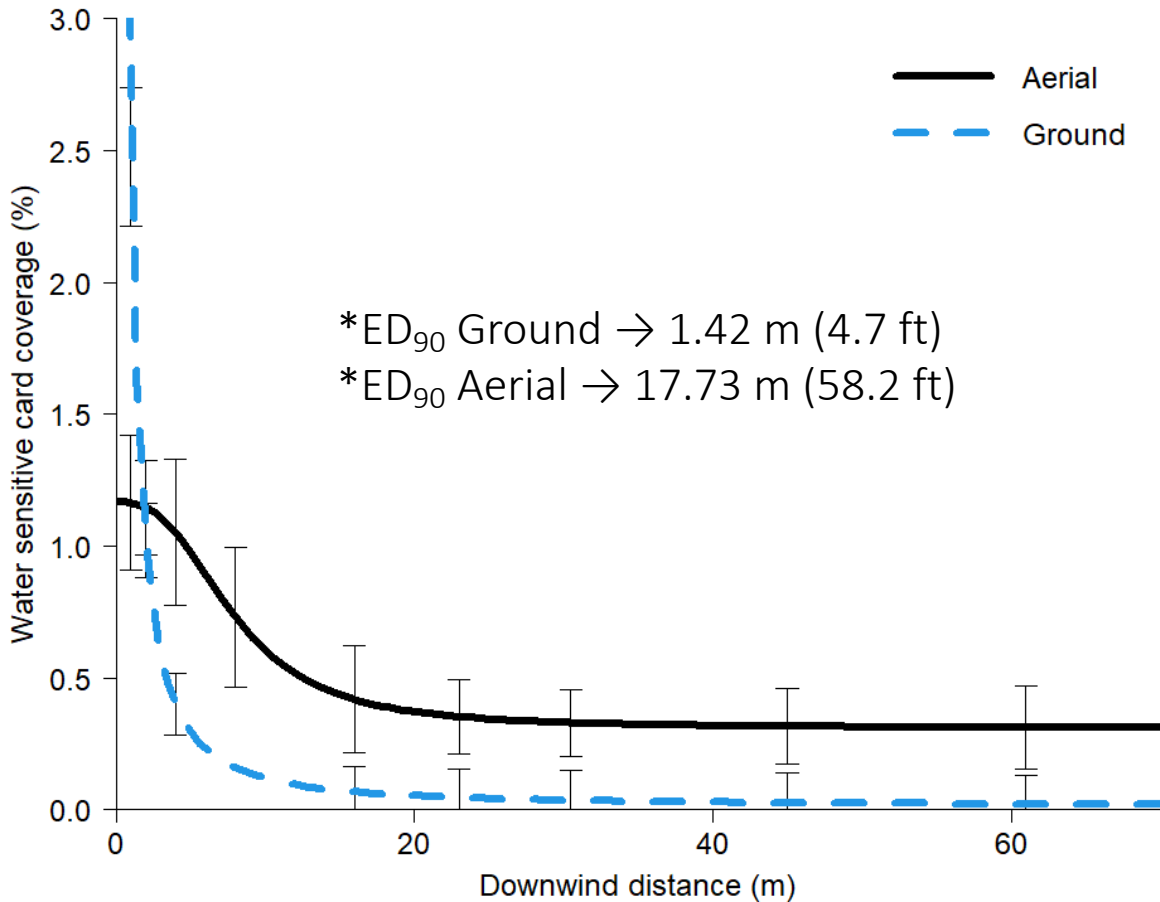


Weather Data





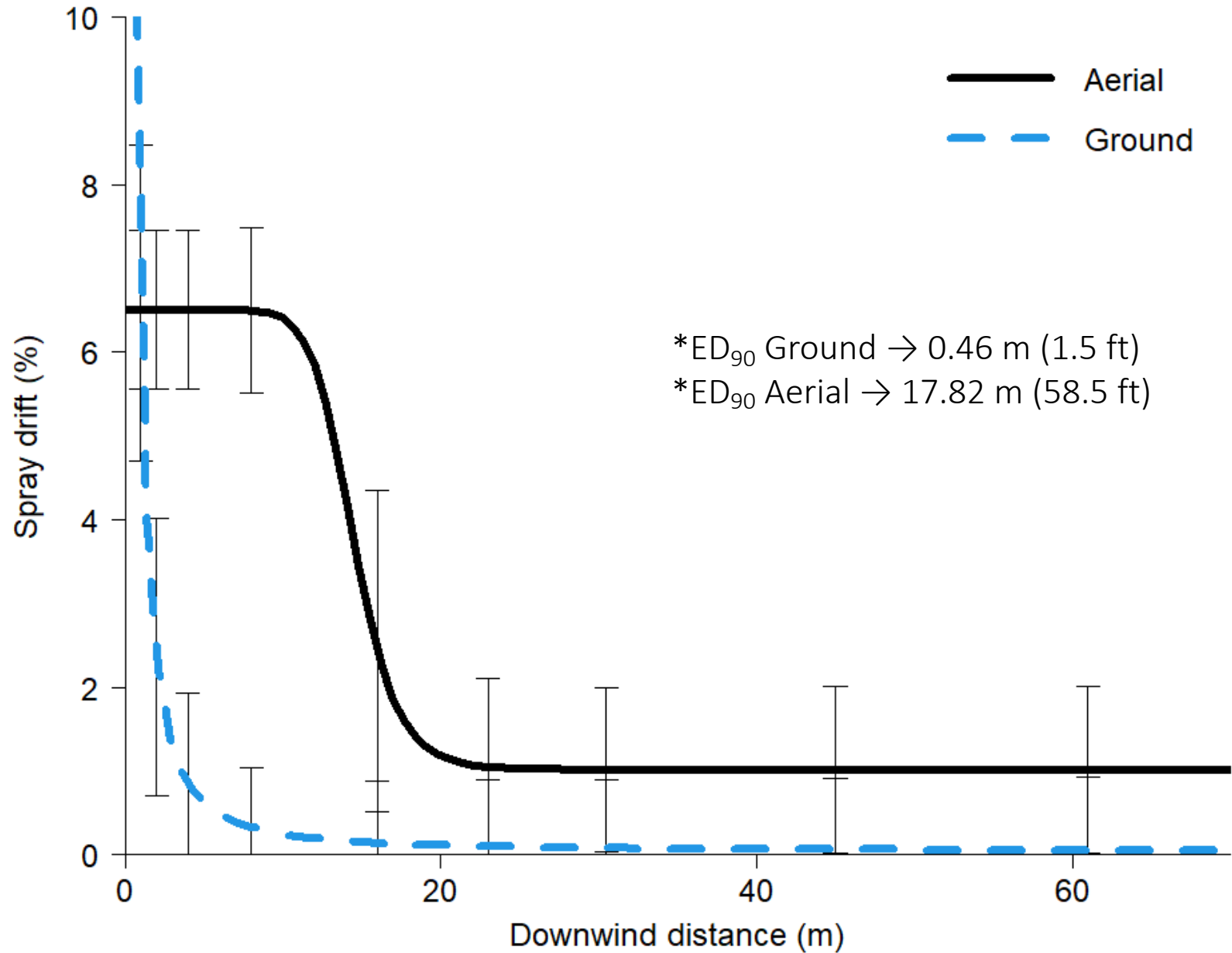
Spray Card Results



*The aerial application included one full swath width adjustment upwind, i.e. a 70-ft buffer.

$$\text{Model} \rightarrow f(x) = c + \frac{d-c}{1+\exp(b(\log(x)-\log(e)))}$$

Mylar Card Results





Aerial



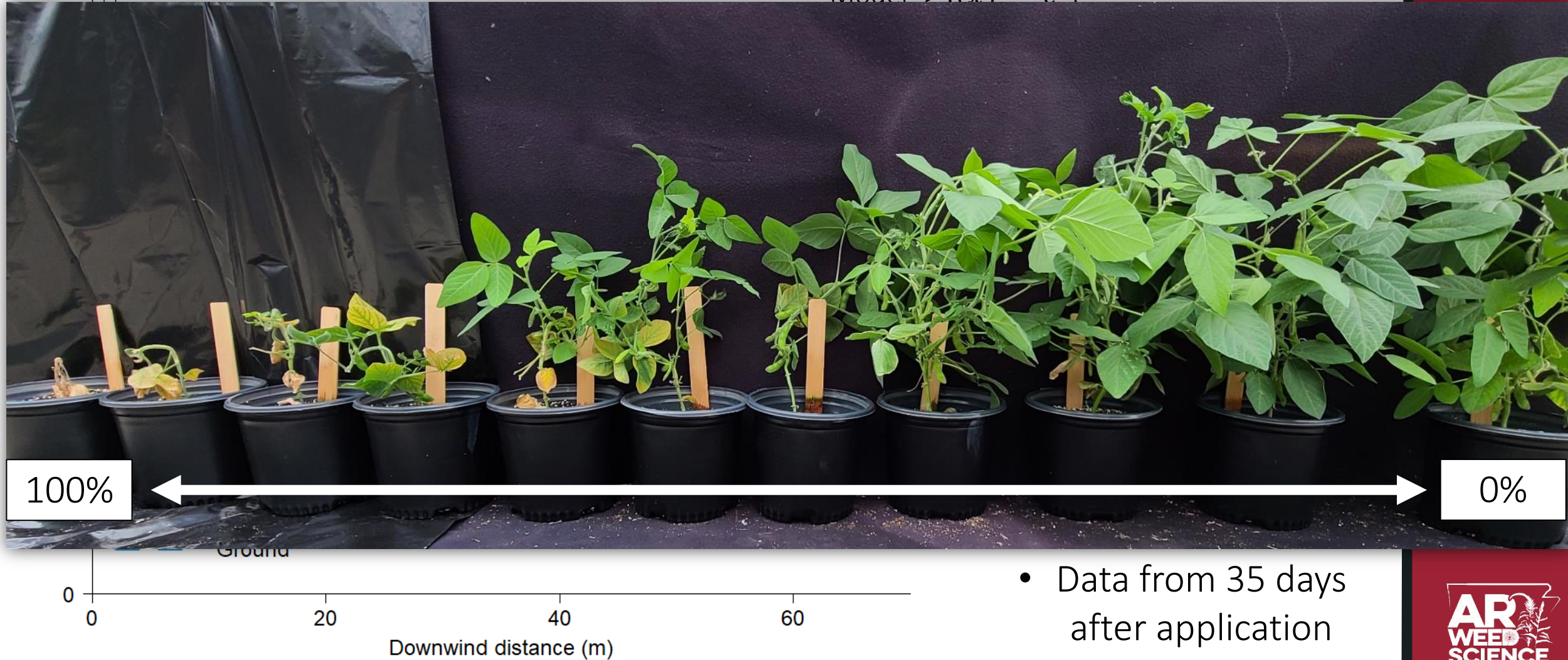
Ground

- Pictures taken 3 days after application
- Florpyrauxifen-benzyl (Loyant) injury already evident from both ground and aerial applications
 - Wilting
 - Flipping trifoliates upside down

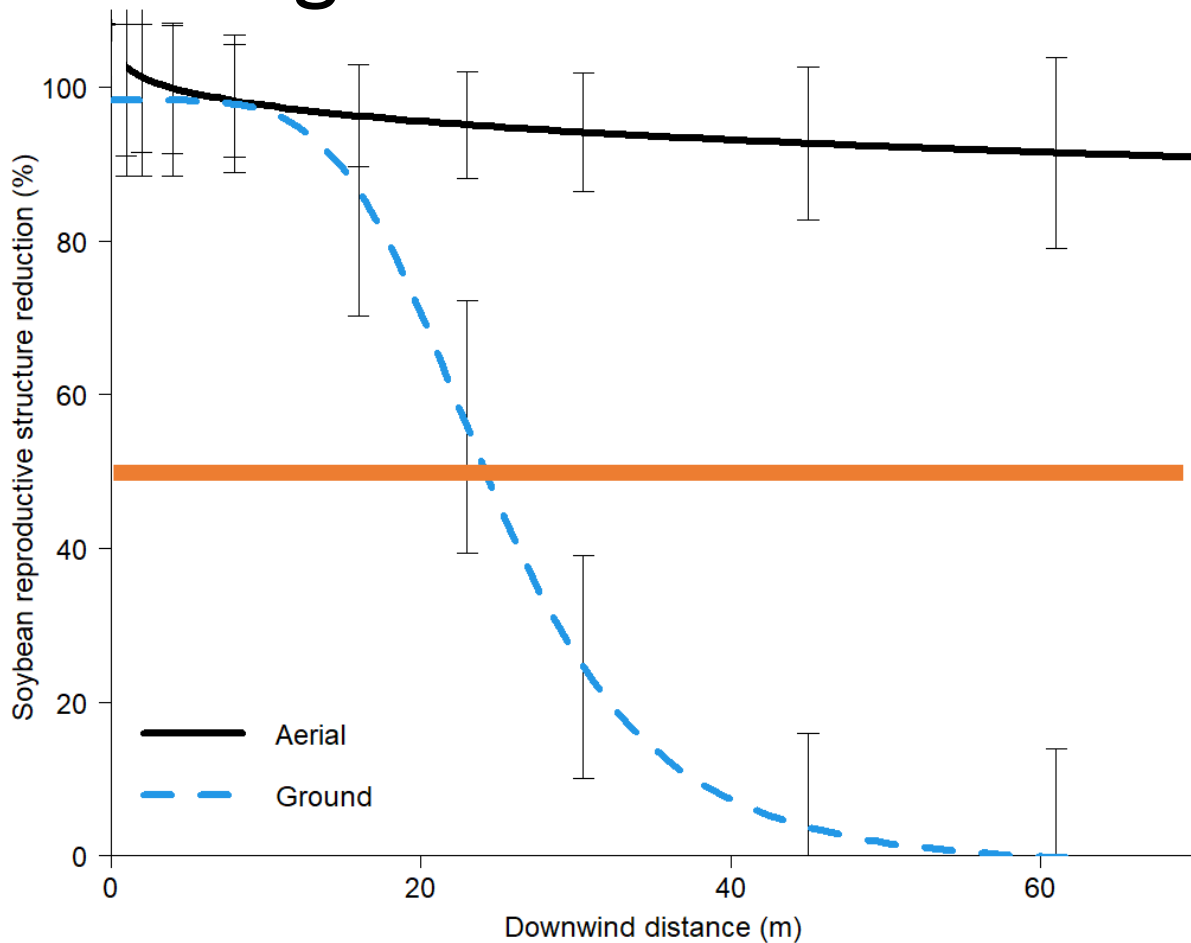


Visual Estimates of Soybean Injury

Model $\rightarrow f(x) = c + \frac{d-c}{x}$



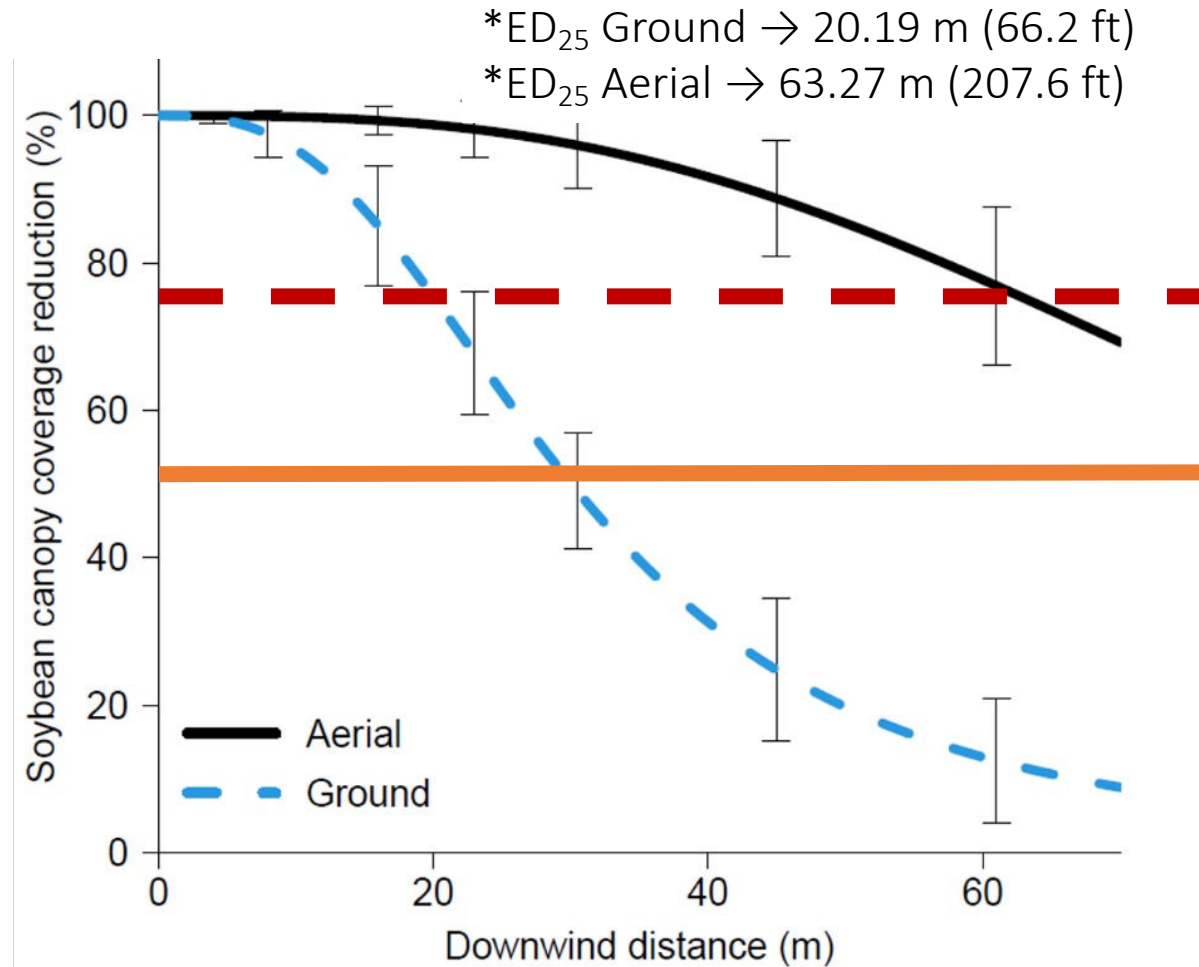
Soybean Reproductive Structures & Canopy Coverage



*ED₅₀ Ground → 24.02 m (78.8 ft)

*ED₅₀ Aerial → NA

Data from 35 days
after application

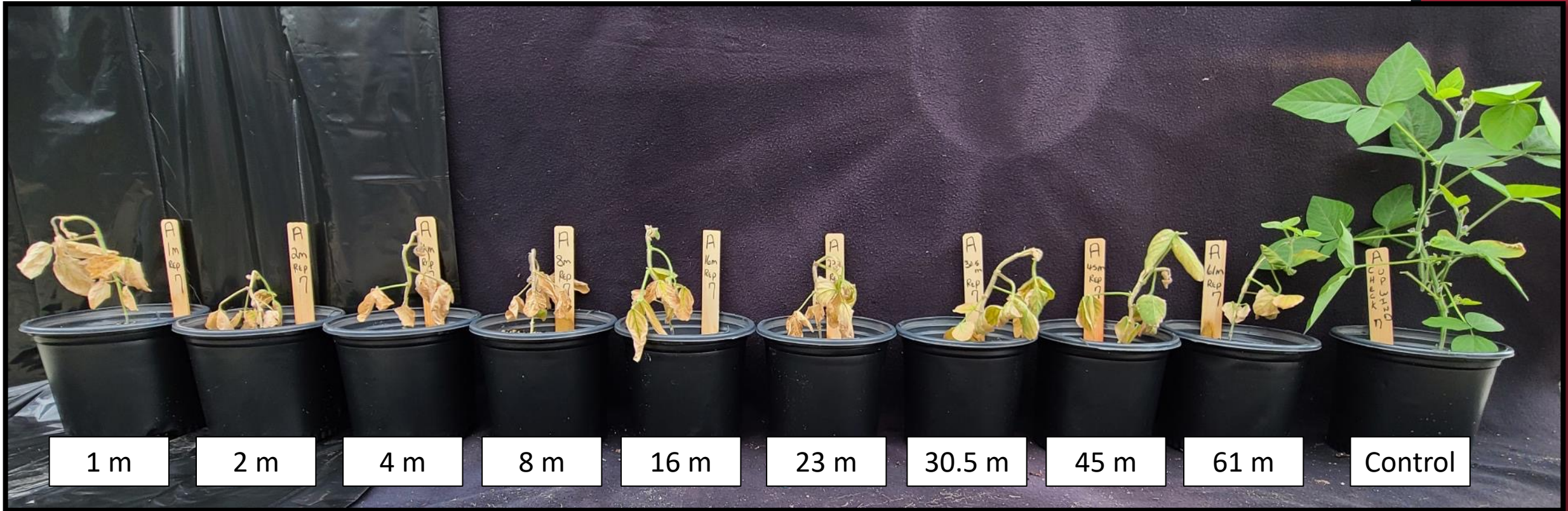


*ED₅₀ Ground → 30.07 m (98.7 ft)

*ED₅₀ Aerial → 93.18 m (305.7 ft)

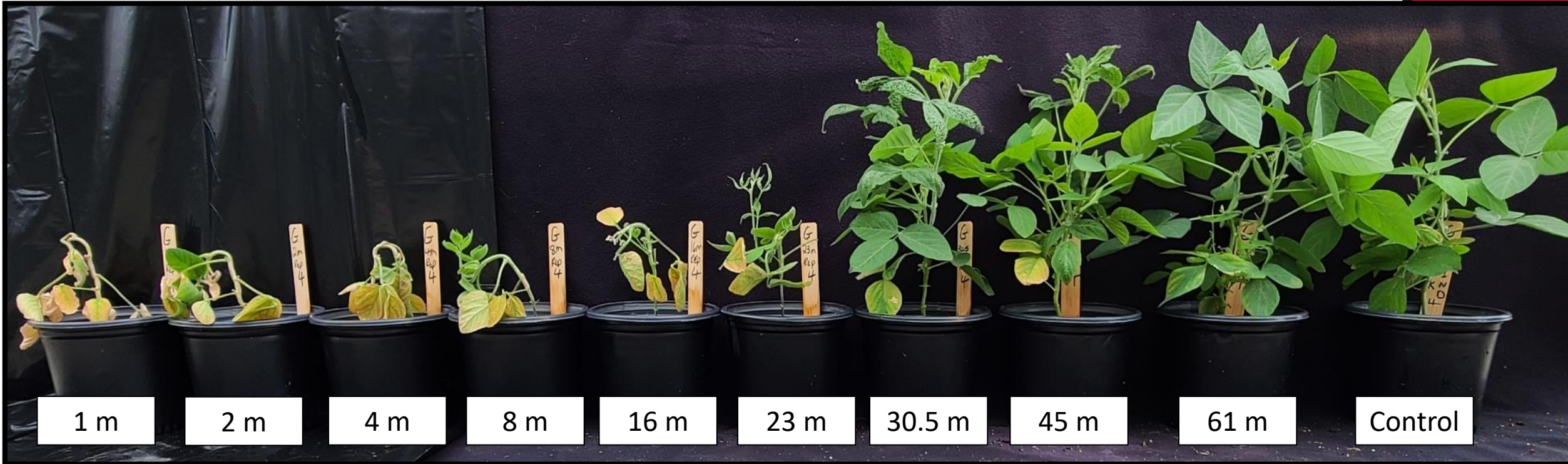
Aerial

- Picture taken 21 days after application



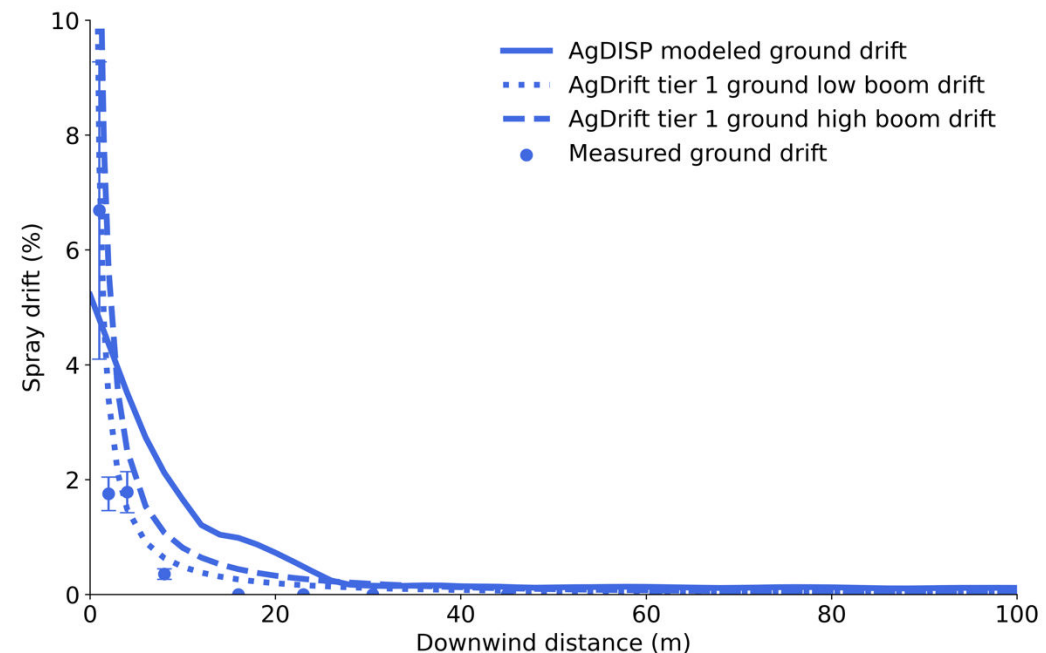
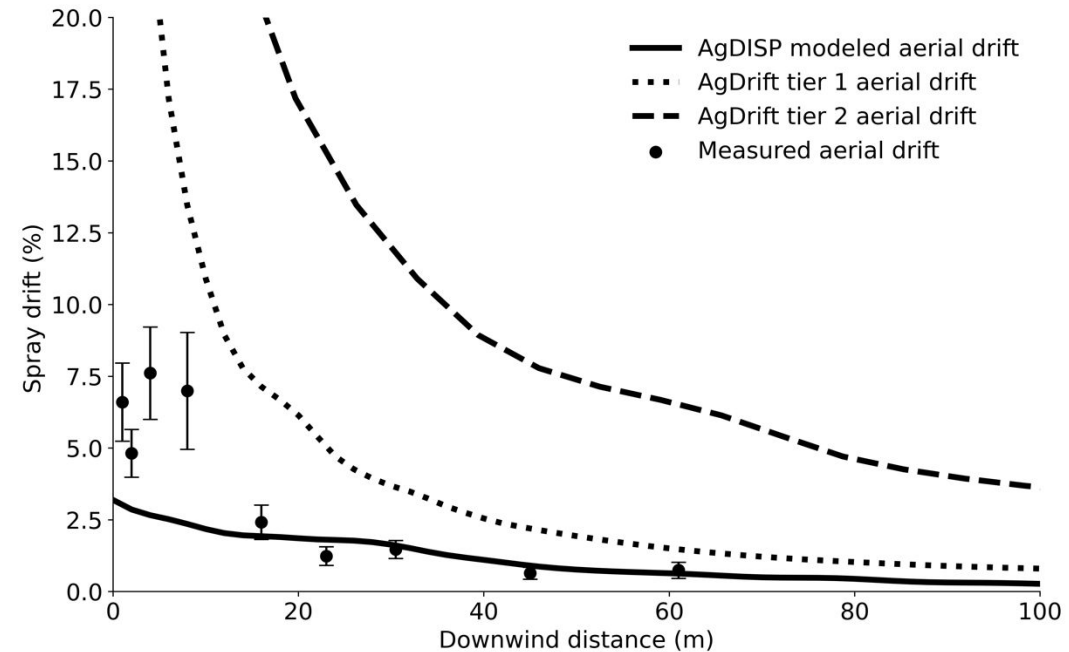
Ground

- Picture taken 21 days after application



Comparison of AgDISP and AgDrift

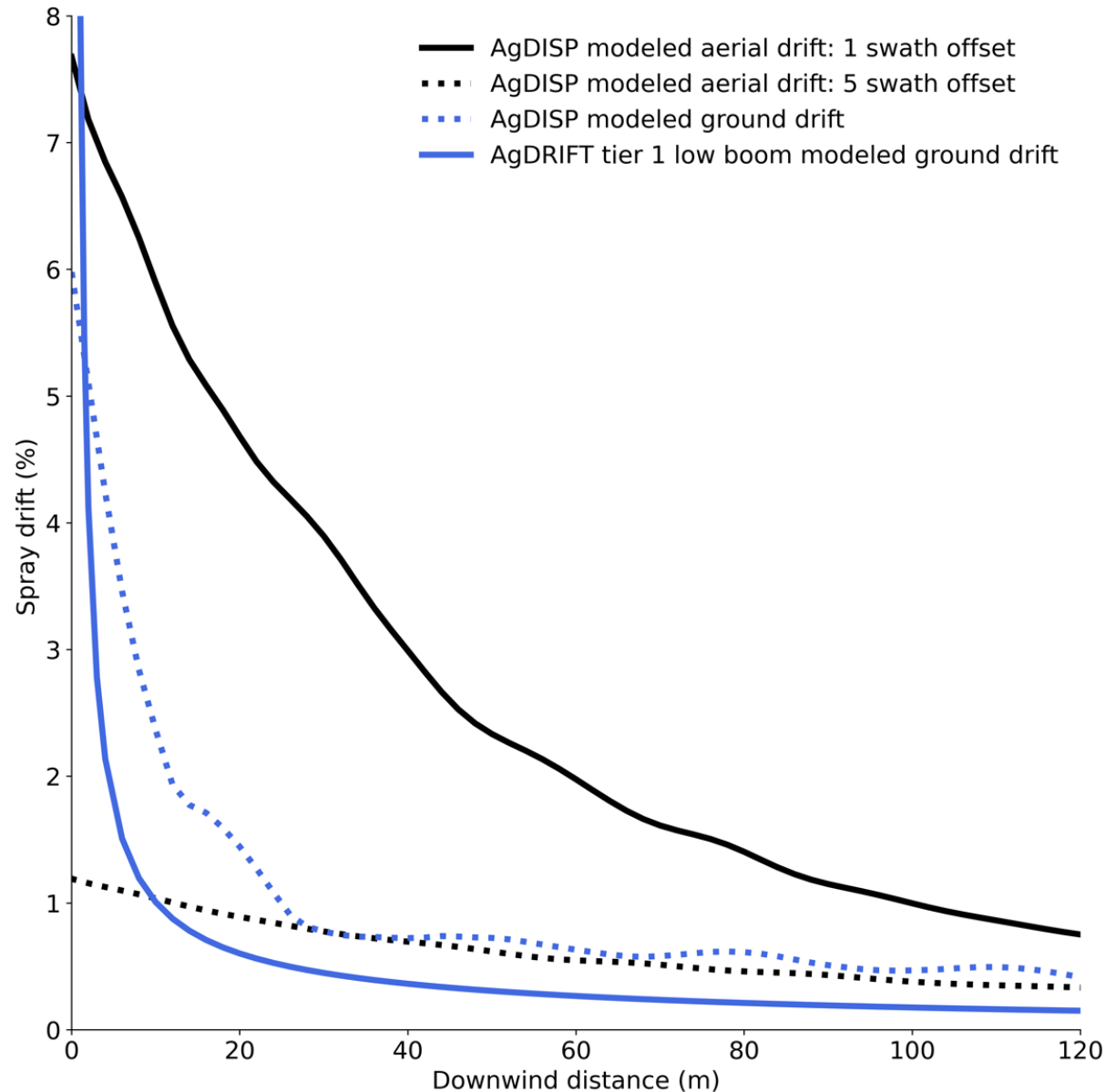
- Aerial
 - AgDrift (both tier 1 & 2) overestimated measured drift
 - AgDISP underestimated measured drift in the near field; but matched measured drift in the far field (16-m, 52.5-ft)
 - **AgDISP is a solid and dependable model for assessing aerial spray drift**
- Ground
 - AgDISP and AgDrift tier 1 high boom overestimated measured drift
 - AgDrift tier 1 low boom very closely matches measured drift
 - **AgDrift model more appropriate for ground apps for assessing spray drift**



Comparison of AgDISP and AgDrift

(following a simulation of 20 consecutive passes and alternative swath offsets)

- Additional spray passes resulted in 2 to 3 times additional predicted downwind spray drift
- With only 1 swath offset, the aerial application would have 1% spray drift potential reaching ~120-m (~400-ft) downwind
- With 5 swath offsets, spray drift from the aerial application very closely resembles the ground application [1% spray drift potential occurring ~10-m (33-ft) downwind]
- 3 to 5 upwind swath adjustments needed for aerial spray drift potential to be similar to ground spray drift potential



Takeaways

- Generally, the aerial application resulted in **approximately a 3- to 10-fold** greater downwind distance for comparable deposition and soybean injury compared to the ground application. (**Only 1 swath width adjustment**)
- Injury from florpyrauxifen-benzyl (Loyant) spray drift occurs quicker than most other auxin-type herbicides (within 3 days following application) - *Issues? Call a weed scientist!*
- US EPA models fit the collected drift data well; predictions from these models should be reasonable for EPA decision-making.
- Demonstrated the potential influence off-target herbicide movement has on **soybean reproductive structures** (generally, if visual injury present/biomass reduction occurred, a reduction in reproductive structures also occurred).
- Both ground and aerial applications have drift risks; implementing mitigation strategies (swath adjustment, coarser sprays, DRA's, avoidance of poor wind conditions, etc.) is crucial to reduce off-target spray movement potential.
- Aerial applications would likely require a **3-5 upwind swath width adjustment** to exhibit similar downwind drift compared to a ground application.



Takeaways

- Generally, the amount of herbicide deposited is 10-fold greater than ground application.
- Injury from aerial application is quicker than ground application following application.
- US EPA models predict that these models overestimate the amount of herbicide deposited.
- Demonstrated that aerial application can reduce reproductive success of weeds in reproduction.
- Both ground and aerial application require adjustment of target spray volume.
- Aerial application can be compared to a ground application.



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Other Information

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MP544

HERBICIDE RESISTANCE TRAITS: Quick Reference Guide

Herbicide-resistant crops have provided more flexibility for postemergence (POST) herbicide applications than ever before for herbicide-resistant tank-mixture applications. However, this abundance of options has led to confusion of which herbicides certain traits confer resistance to and has increased the potential for misapplications to occur.

This quick reference guide was established to provide a direct resource to quickly identify what herbicides each herbicide-resistant trait provides resistance to. Herbicide resistance traits and the respective herbicides that those traits confer resistance to are listed in Table 1 and soybean (Table 2) and rice (Table 3) and grain sorghum (Table 4). A check mark and gray background in the respective column indicates that the herbicide does not injure the respective crop.

CORN HERBICIDE TRAIT	HERBICIDES THAT THOSE TRAITS CONFER RESISTANCE TO	
	GLYPHOSATE	GLUFOSINATE
CONVENTIONAL		
GLYPHOSATE TOLERANT (GT)	✓	
LIBERTYLINK (LL)	✓	✓
GT LL	✓	✓
ROUNDUP READY 2 YIELD (RR2Y)	✓	✓
RR2Y LL	✓	✓
ENLIST	✓	✓

*Trait names in corn (Agrisure, Overture, YieldGuard SmartStax, etc.) often refer to the stacked maize resistance trait within these products, please consult the product information provided by the manufacturer for more information.
 †Only approved 3,6-D choline formulations (Enlist One, Enlist One) are permitted to be applied on corn.

Agriculture and Natural Resources
ESA2188

Distribution and Management of Herbicide-Resistant Palmer Amaranth in Arkansas

Introduction
Palmer amaranth (*Amaranthus palmeri* S. Wats.) is a highly competitive, annual broadleaf weed that has been listed as one of the most troublesome weeds to manage in multiple agricultural production systems in Arkansas (Wychan 2019). The prolific growth characteristics of Palmer amaranth are what make it one of the most adaptable and challenging weed species for farmers to manage.

Seeds are very small (1-2 mm diameter), black, and shiny and are easily dispersed by wind, animals, livestock feed, and equipment (Lagler and Johnson 2013, Lagler et al. 2013). Upwards of 1,500 seeds have been produced by a single Palmer amaranth plant (Figure 1). Palmer amaranth has a high germination rate (Figure 1). Palmer amaranth forms C4 photosynthates, which

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MP44
Arkansas 2022
Recommended Chemicals for Weed and Brush Control



See MP44 online at www.uaex.uada.edu
Cooperative Extension Service, University of Arkansas System, U.S. Department of Agriculture and County Governments Cooperating

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My weed science crew & other research assistants.





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Please feel free to contact me with any questions.

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