

Carinata Disease Management

Ian Small, Rebecca Barocco, Kelly O'Brien, Emily Weedon, Shivendra Kumar, Ted Stansly,
Ramdeo Seepaul, David Wright

University of Florida

Kira Bowen, Austin Hagan
Auburn University

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Objectives

- Characterize the diseases impacting carinata in the Southeast U.S.
- Evaluate disease susceptibility of advanced carinata entries
- Determine yield loss potential and best timing for fungicide application
- Fungicide efficacy testing
- Evaluate Sclerotinia stem rot risk prediction tools for carinata

Bacterial diseases of carinata



Photo credit: Myles Gibson

Bacterial blight caused by *Pseudomonas* spp.



Photo credit: Dr. F. Iriarte

Black rot caused by *Xanthomonas campestris*

Fungal diseases of carinata



Alternaria leaf spot



Photo credit: Dr. F. Iriarte



Alternaria black spot

Fungal diseases of carinata



Photo credit: Myles Gibson

Sclerotinia leaf infection



Sclerotinia stem rot



Photo credit: Dr. F. Iriarte

Black leg

Viral diseases of carinata



Turnip mosaic virus (TuMV)

Evaluation of disease susceptibility of advanced entries – Hybrid Variety Trial

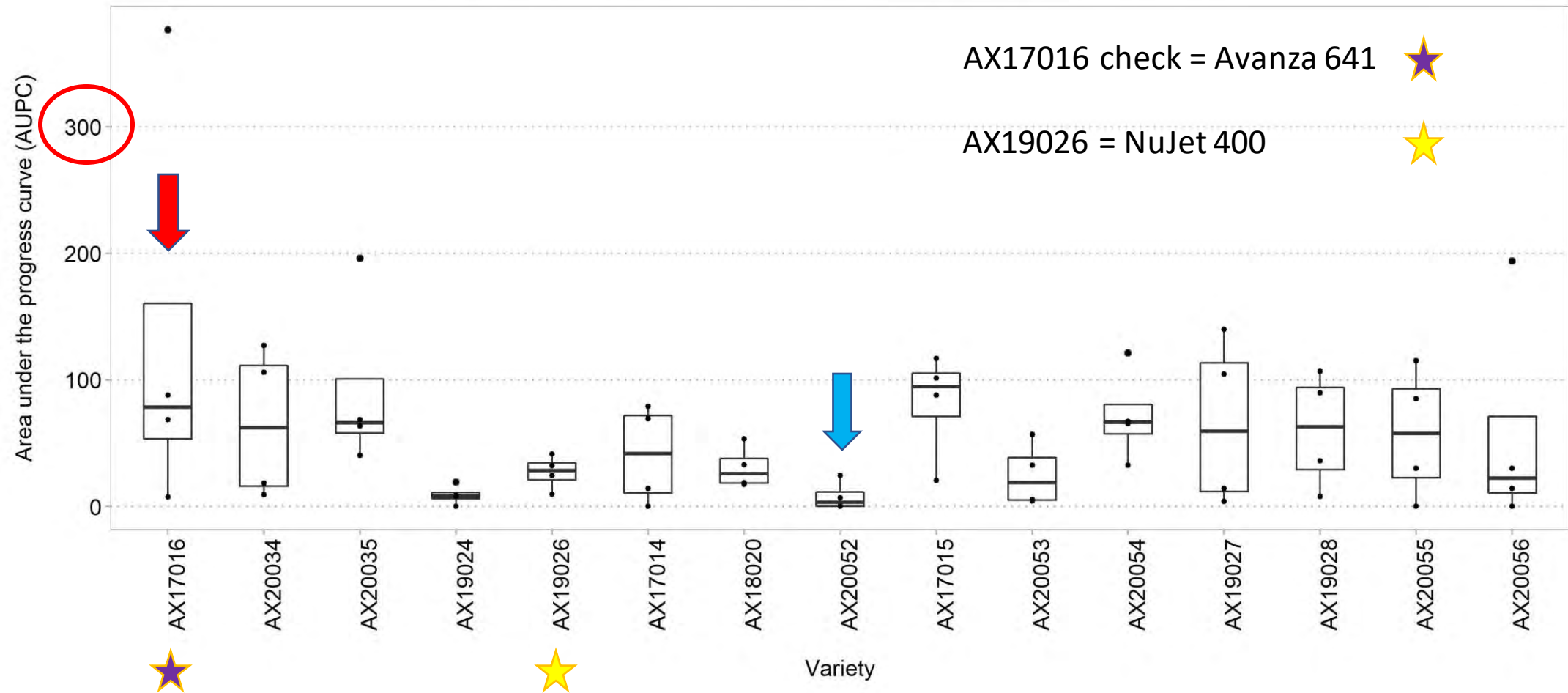
- Variable disease pressure across locations and years
- Significant differences among entries at Quincy location in 2020-21 and 2021-22 seasons
- HVT conducted at multiple locations in AL
- Disease assessment for:
 - Sclerotinia stem rot
 - Alternaria diseases
 - Premature defoliation due to bacterial blight
 - Other noteworthy diseases



2020/21 Quincy HVT trial

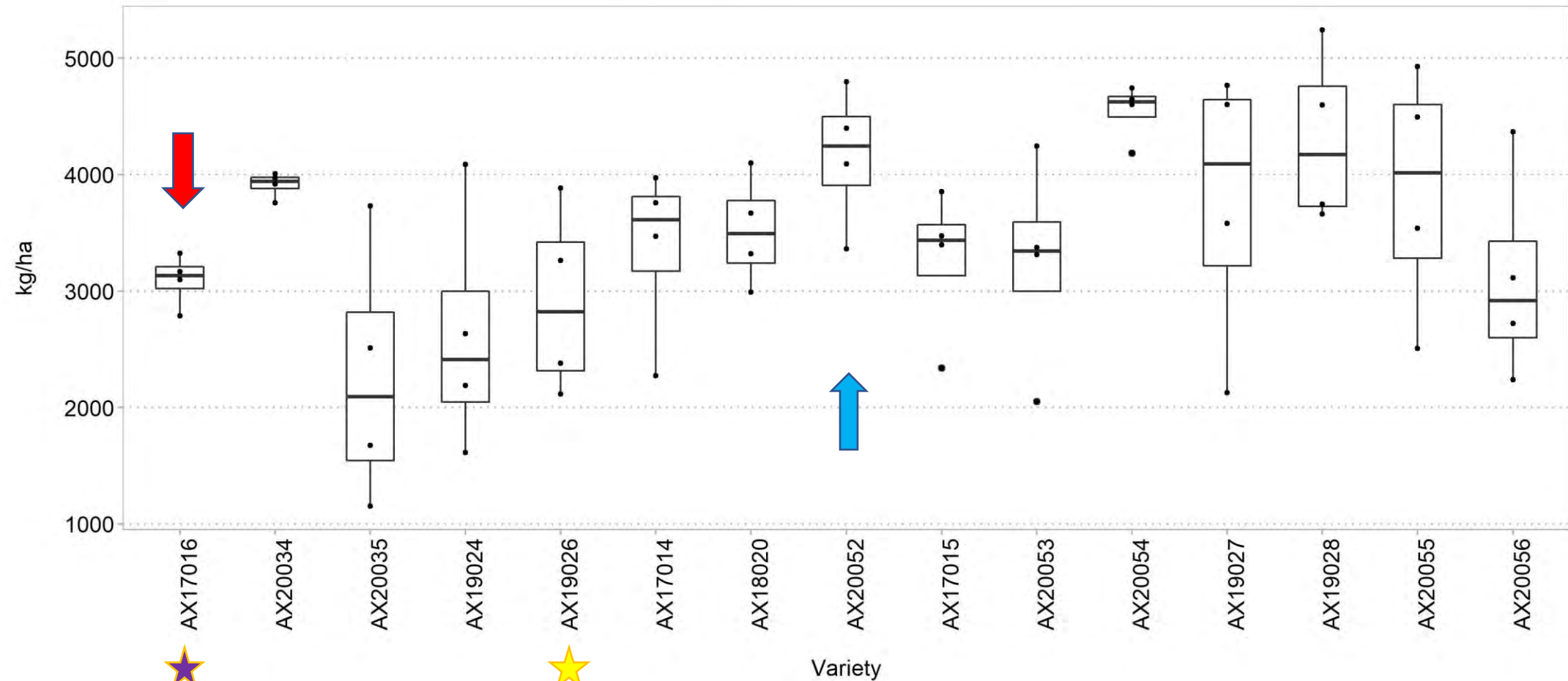
Sclerotinia stem rot DSI AUPC - HVT Live Oak

2020-21 season



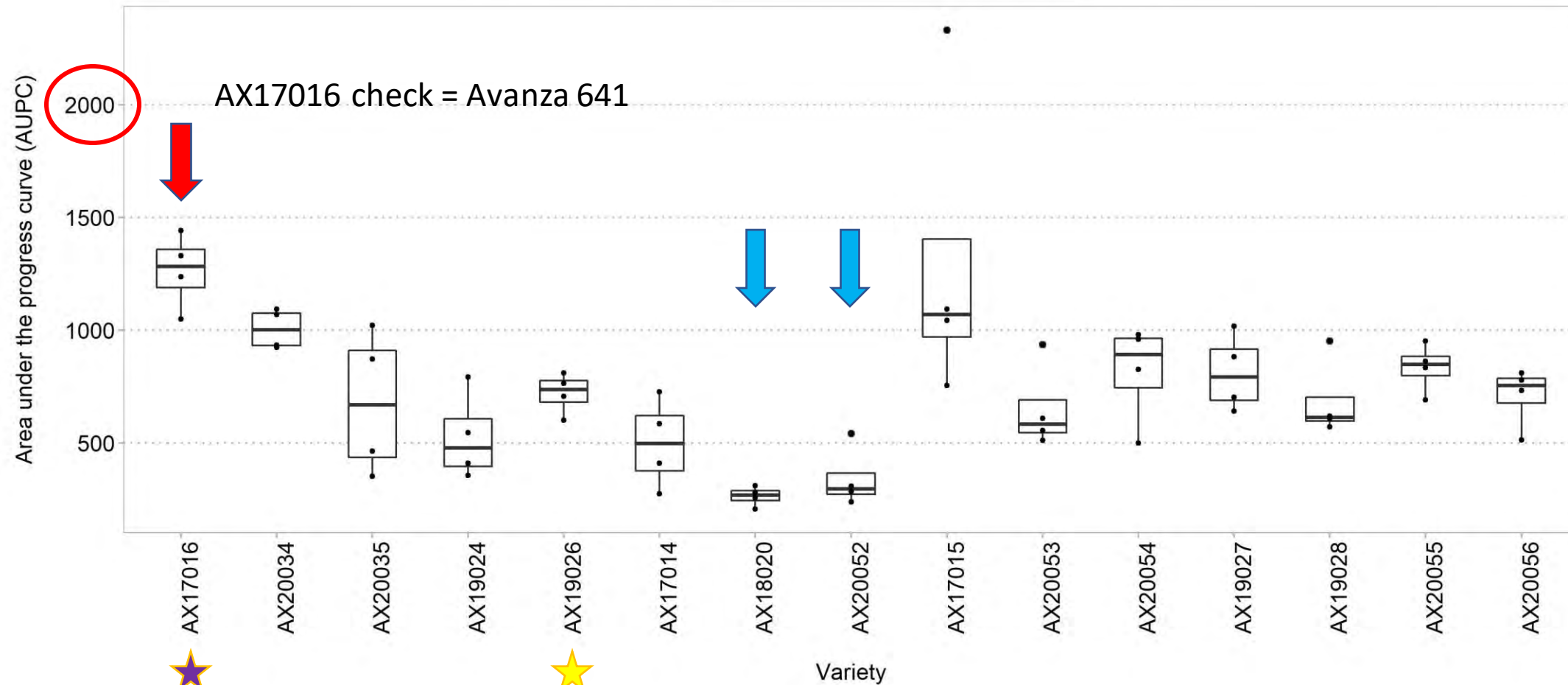
Yield (kg/ha) - HVT Live Oak

2020-21 season



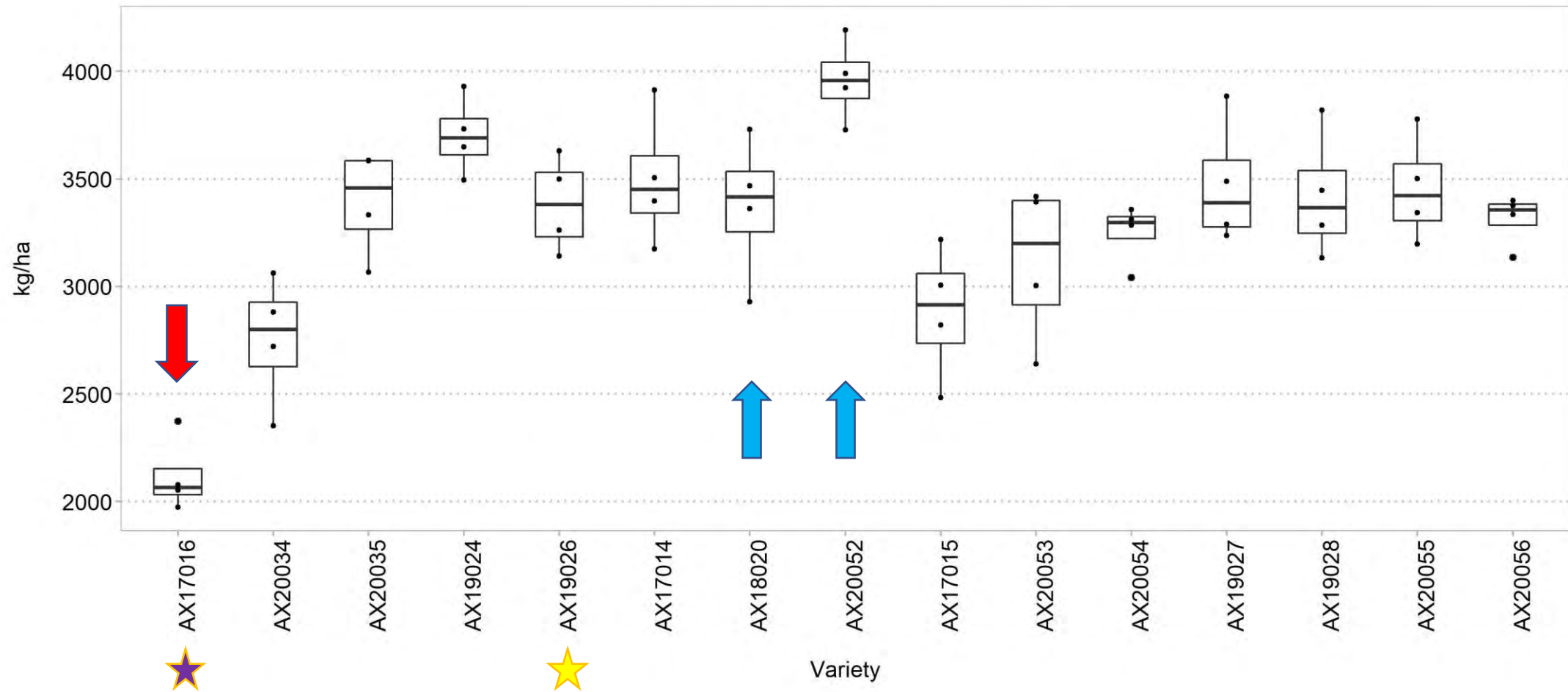
Sclerotinia stem rot DSI AUPC - HVT Quincy

2020-21 season



Yield (kg/ha) - HVT Quincy

2020-21 season



Sclerotinia stem rot inoculation assay

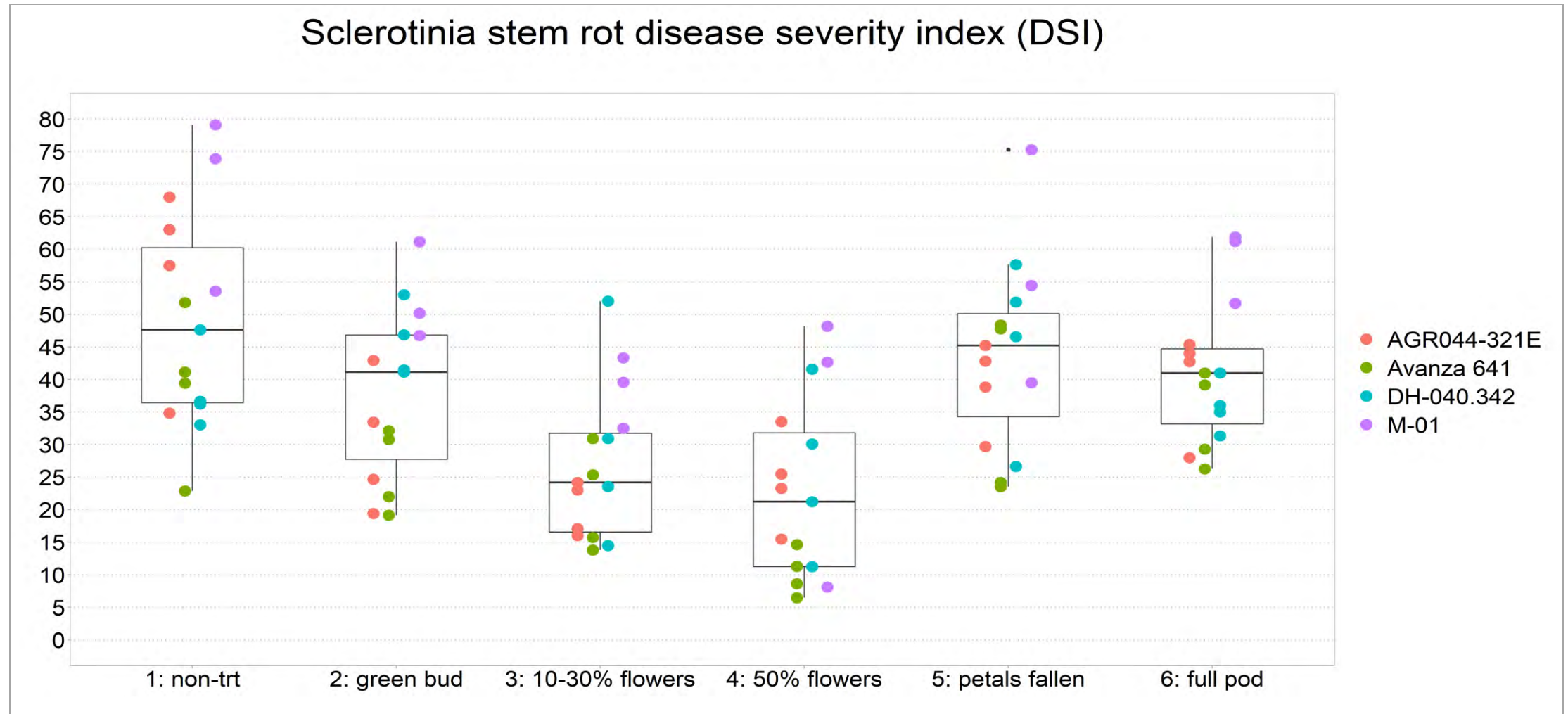
- Greenhouse assay for resistance to SSR
- Two inoculation methods
 - Wounded and non-wounded
- Three *Sclerotinia sclerotiorum* isolates
- Several carinata varieties
- Measured stem lesion expansion rate



How does fungicide timing impact disease severity and yield loss?

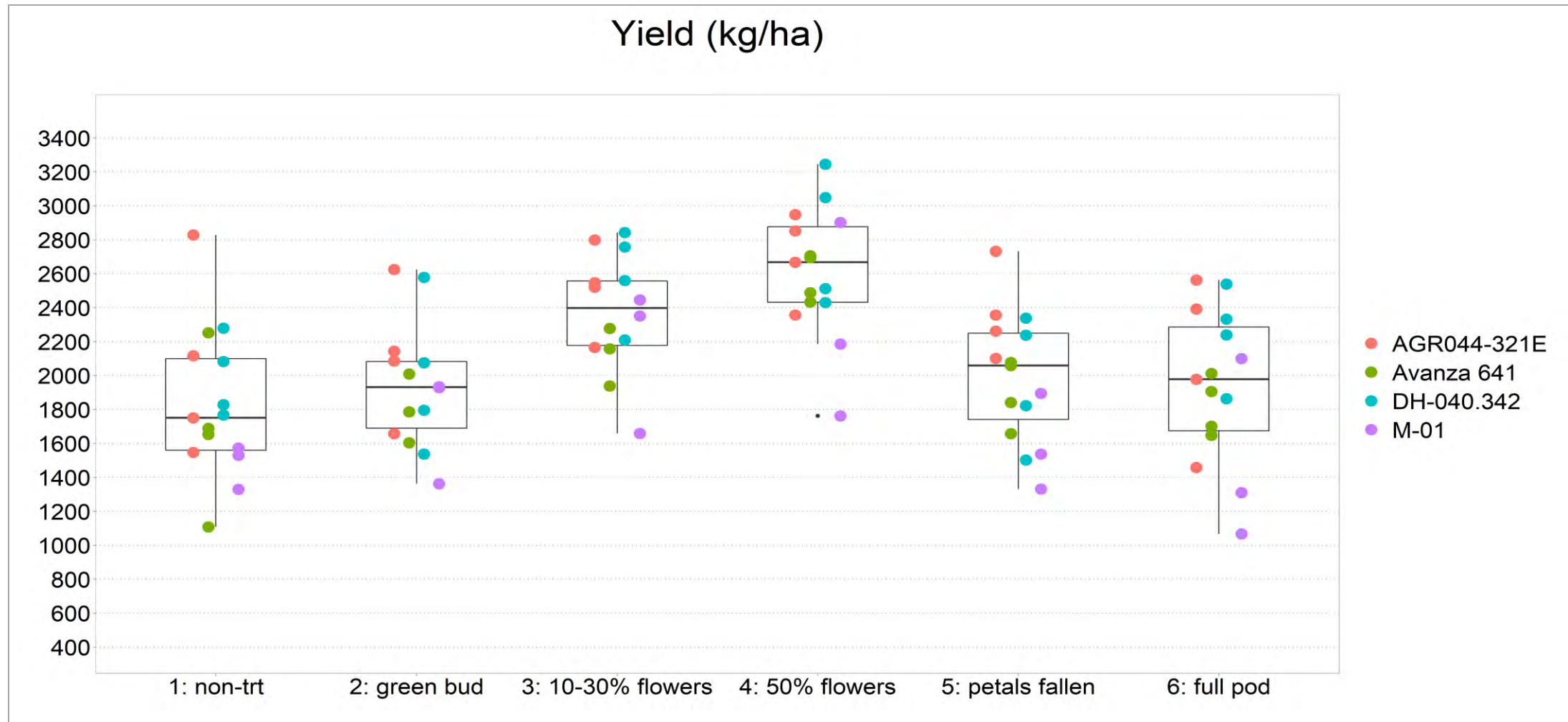
- Randomized complete split plot design with 4 varieties as the whole plots and 4 fungicide application timings as subplots
- Varieties: AGR044-321E, Avanza 641, DH-040.342, M-01
- Proline (5.7 fl oz/A) was applied with 16.8 GPA at the following application timings:
 1. **Early flowering:** GS 61-62 (5-35% flower buds open) - Mar 24 (104 DAP)
 2. **Full to begin flower decline:** GS 65-66 (full flowering to flowers begin declining) - Apr 6 (117 DAP)
 3. **Begin decline to end flowering:** GS 66-69 (flowers begin declining to flowering ends) - Apr 14 (125 DAP)
 4. **Non-treated**

Effect of fungicide timing on sclerotinia stem rot (2020)

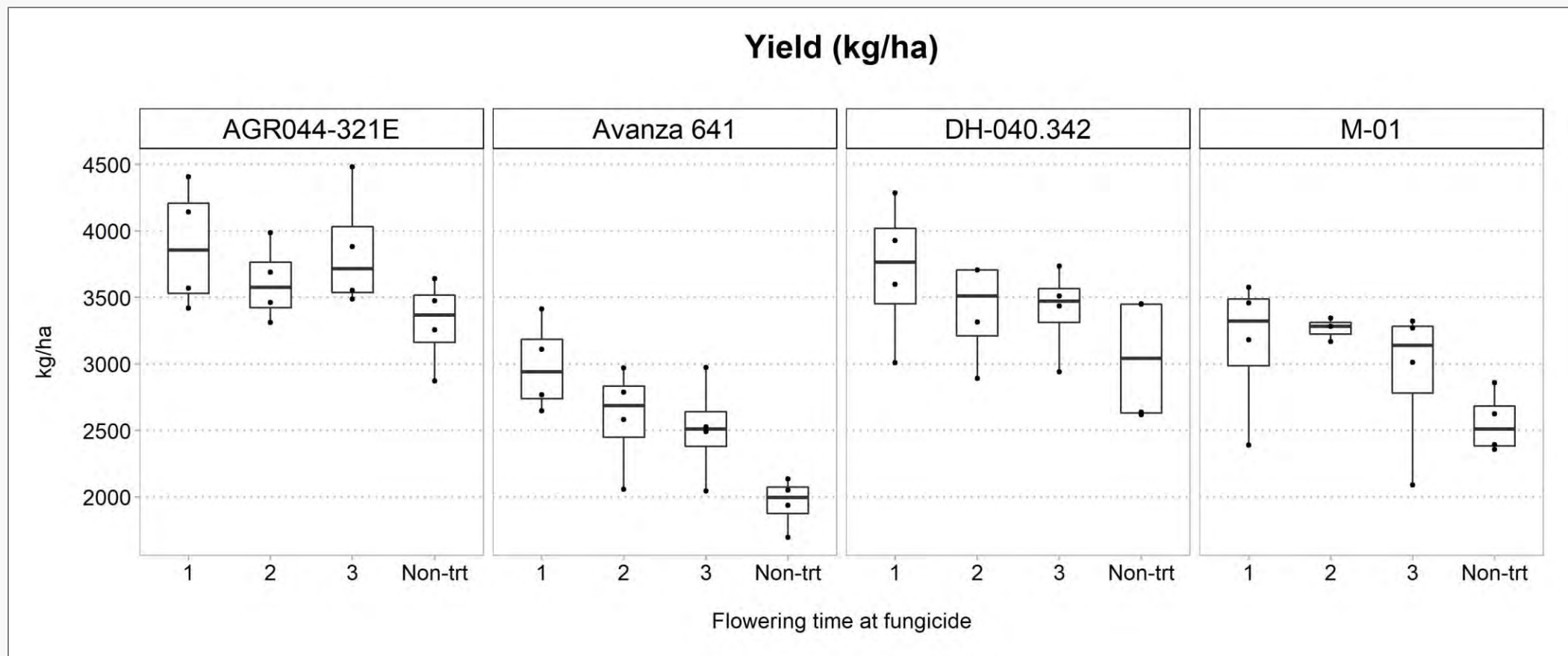


Sclerotinia disease severity index ($DSI = 100 \times \Sigma(\text{severity rating scale from 0-5 per infected plant}) / (5 \times \text{stand count})$) by six fungicide (Proline) application timings as pods are maturing/turning brown and healthy stems are green (155 DAP). The horizontal line in the center of each box plot indicates the mean for the respective fungicide timing. Dots are individual observed values grouped by color for each carinata variety.

Effect of fungicide timing on sclerotinia stem rot (2020)



Yield by six fungicide (Proline) application timings. The horizontal line in the center of each box plot indicates the mean for the respective fungicide timing. Dots are individual observed values grouped by color for each carinata variety.



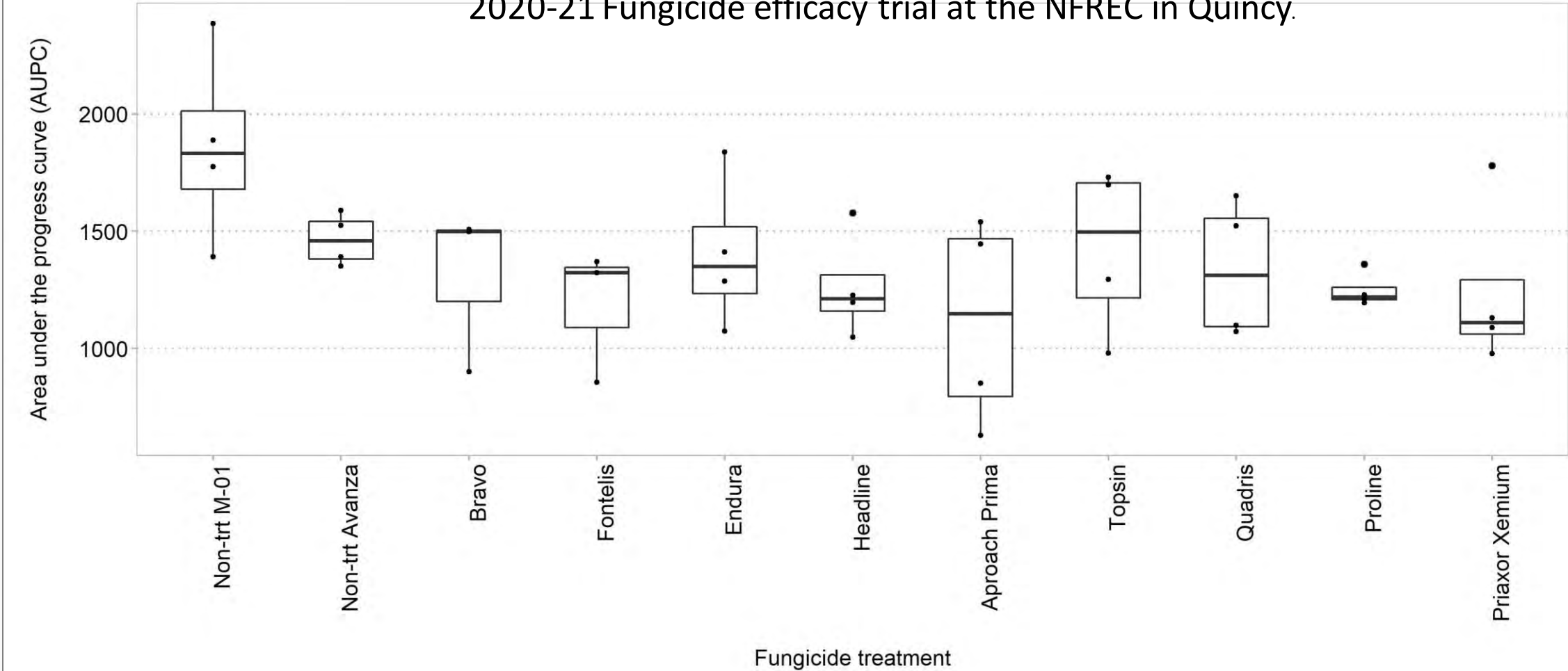
Comparison of yield by variety and the flowering time at fungicide application. The growth stage (GS) ranged by cultivar and block for each of the flowering times at fungicide application as follows: **1: early flowering** = GS 61-62, **2: full to begin flower decline** = GS 65-66, and **3: begin decline to end flowering** = GS 66-69.

Fungicide efficacy

- Studies conducted in Alabama and Florida
- Two trials in Florida (One variety with 10 fungicide treatments)
- Multiple trials in Alabama (Two varieties with 9 fungicide treatments)
- Two trials at Brewton, AL in 2020-21 season
- One trial at Prattville, AL very severely affected by sclerotinia stem rot prior to fungicide treatment applications. Infections at or below soil level.

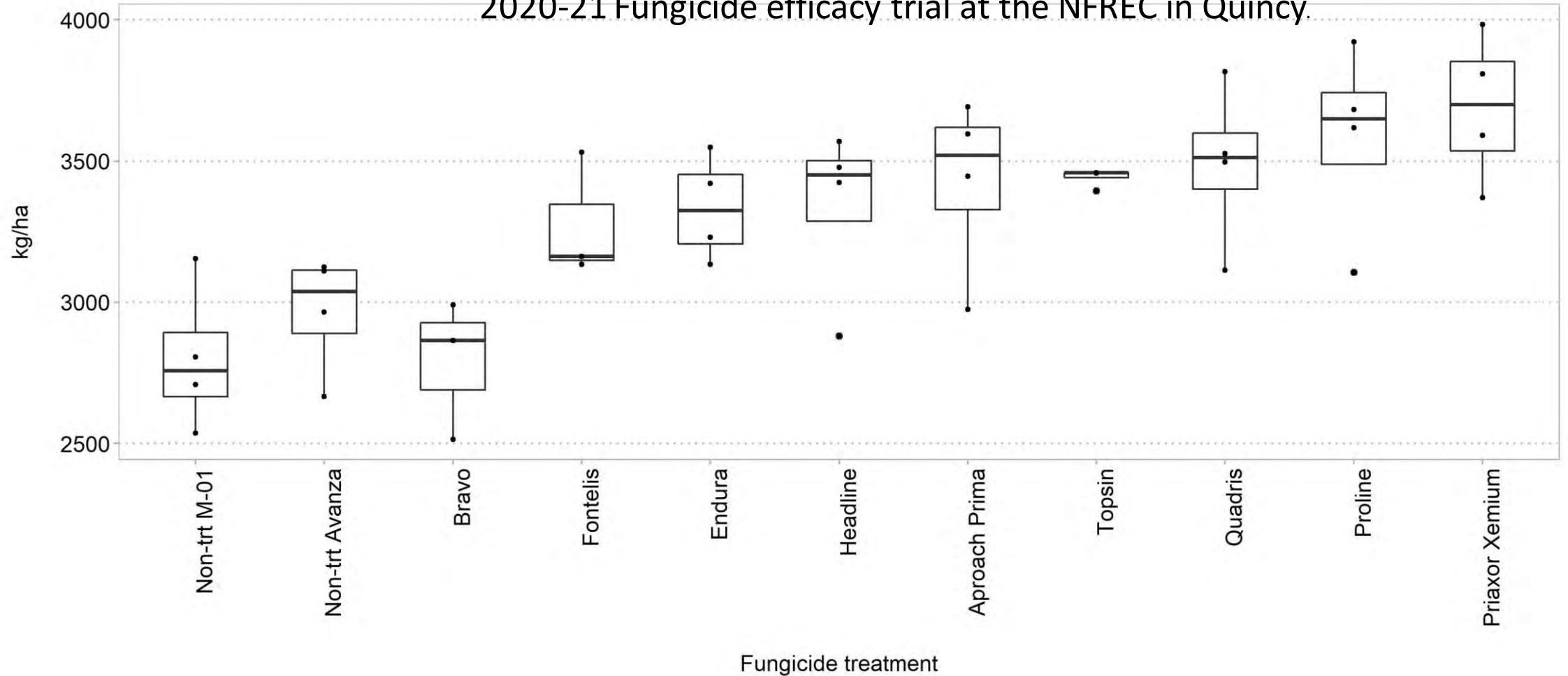
Sclerotinia stem rot DSI AUPC

2020-21 Fungicide efficacy trial at the NFREC in Quincy.



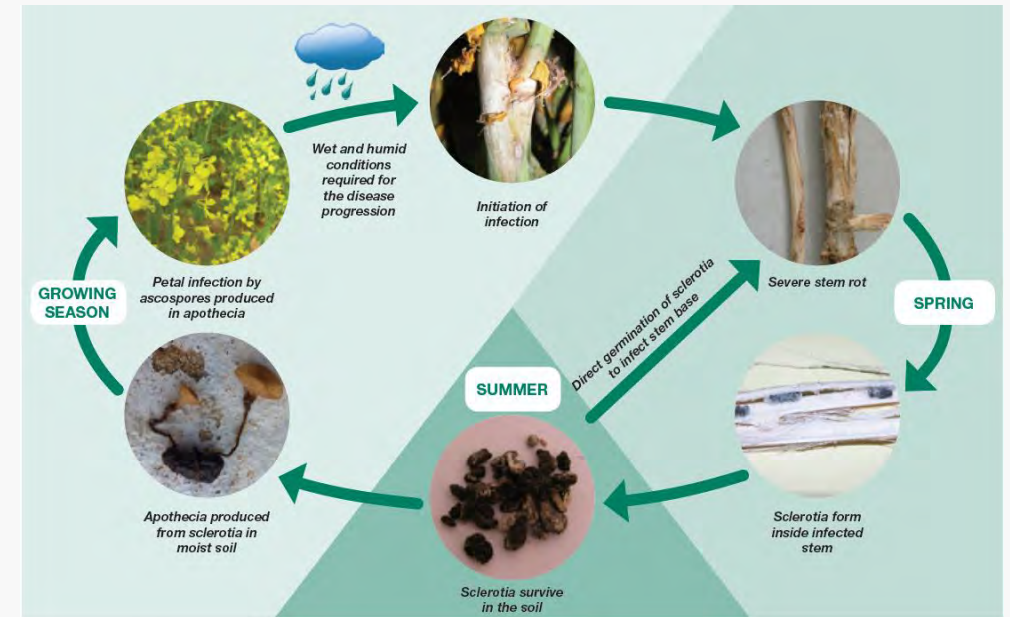
Yield (kg/ha)

2020-21 Fungicide efficacy trial at the NFREC in Quincy.



Managing disease risk

- Sclerotinia stem rot (SSR) is a potential threat to carinata production
- Risk will increase with:
 - Scaling of production
 - Increased frequency of carinata production



Life cycle of *Sclerotinia sclerotiorum*

<https://www.agric.wa.gov.au/canola/managing-sclerotinia-stem-rot-canola>

Sclerotinia stem rot management

- Plant disease resistance should be cornerstone of management plan!
 - Select for disease resistance in advanced variety trials
- Rotate crops!
 - Only plant carinata in the same field once in every three years.
- Fungicides will likely play an important role
 - Efficient and cost-effective use will be important

Efficient fungicide use

- Decision support tools (disease forecasts/prediction models) can provide guidance to ensure efficient use of fungicide
- Examples of tools for canola, rape and soybean:
 - Inoculum prediction (Twengstrijm et al., 1998)
 - Weather-based disease prediction model (Koch et al., 2007)
 - Weather and phenology-based disease prediction model for apothecial presence (Willbur et al., 2017)

Risk prediction and decision support

- Validate/modify a weather-based SSR advisory model for the Southeast U.S.
- Utilize CROPGRO Carinata model to predict carinata growth stages:
 - GS 58 (individual flower buds on the secondary inflorescences visible but still closed)
 - GS 60 (start of flowering period)
- Implement models as web-based risk maps and decision tools

Implementation of risk models

- Agroclimate
 - Carinata Decision Support System
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- Planting date planner
 - Freeze risk probabilities
 - Flowering period predictor
 - Sclerotinia stem rot risk tool



Acknowledgments

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