Updated Insights on Efficacy and Timing of Fungicides from Multi-State Efforts

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Management Guidelines/Barriers

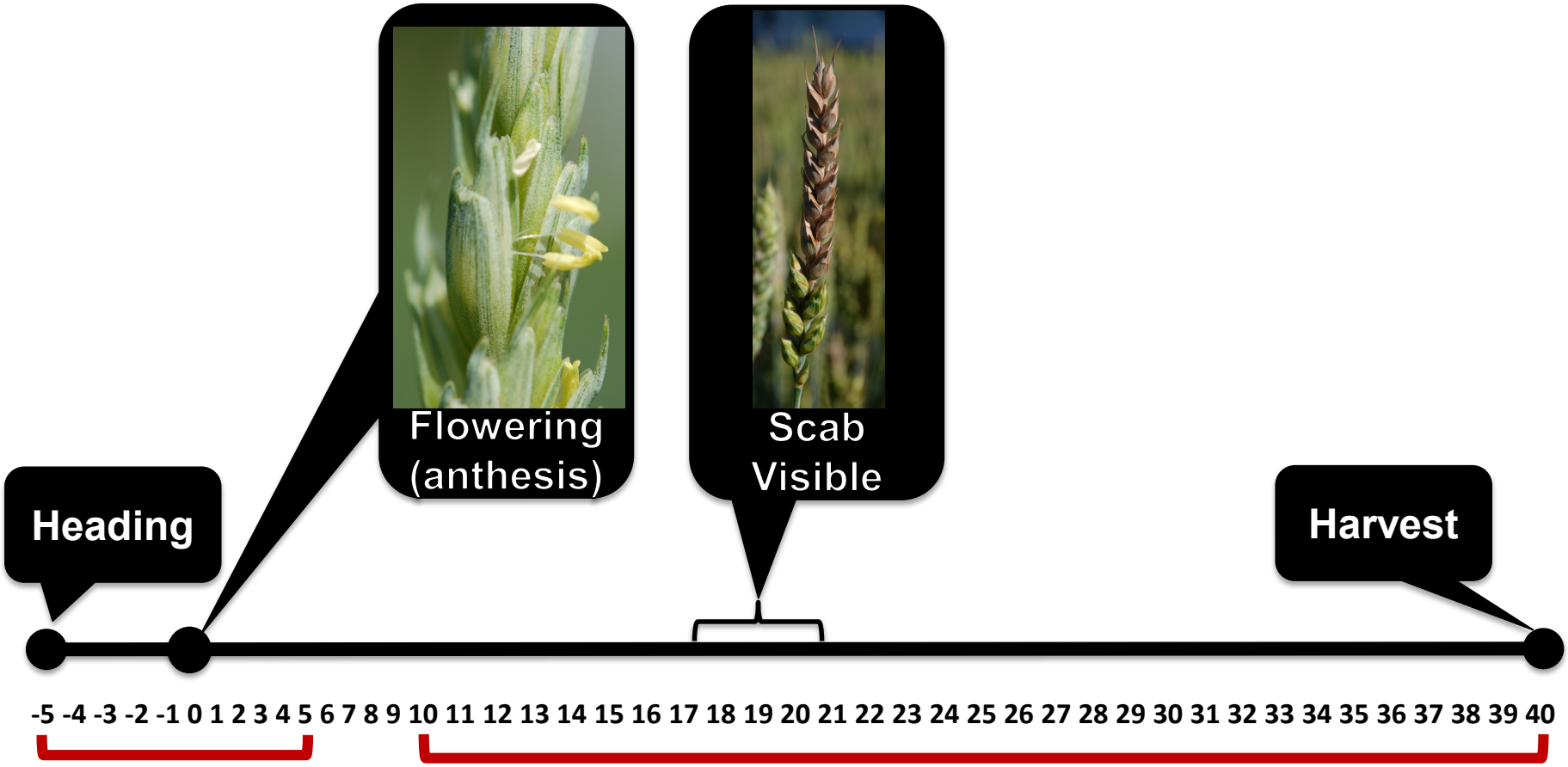
- Guidelines
  - Prosaro/Caramba application at anthesis
  - Genetic resistant
  - Tillage
  - Crop rotation
  - FHB prediction center
- Barriers to adoption
  - Application timing
    - ✓ Adverse weather condition
    - ✓ Lack of flowering uniformity at the field level
    - ✓ Inability to adequately identify anthesis
  - Other limitations

Stakeholder/Research Questions

- **Efficacy of pre/post-anthesis application**
  - **How effective is early/late application?**
    - ✓ **IND**
    - ✓ **DON**
    - ✓ **Yield**
    - ✓ **Test weight**
  - **Is efficacy influenced by fungicide?**
    - ✓ **Prosaro vs Caramba**
  - **Is efficacy influenced by wheat type/region?**
    - ✓ **Spring vs winter wheat**
  - **Is efficacy influenced by cultivar resistance?**
    - ✓ **Integrated management**

Fungicide Timing:

Pre- and post-anthesis applications



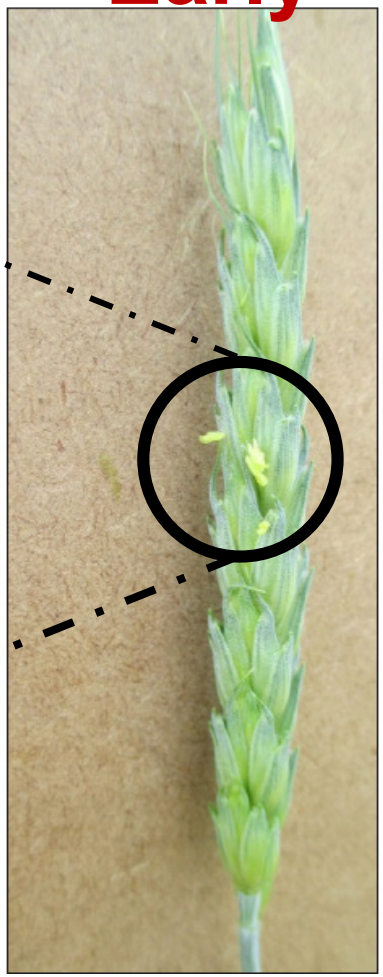
Heading: Feekes 10.1-10.5

Warrick Texas A&M - https://soilcropandmore.info/Newsletter/nl042005.htm
Knott UK - https://mccracken.ca.uky.edu/files/identifying_wheat_growth_stages_agr224.pdf

Early Anthesis/Flowering: Feekes 10.5.1

Wheat head Flowering (anthesis). Notice the anthers sticking out

Early



Feekes 10.5.1

Mid

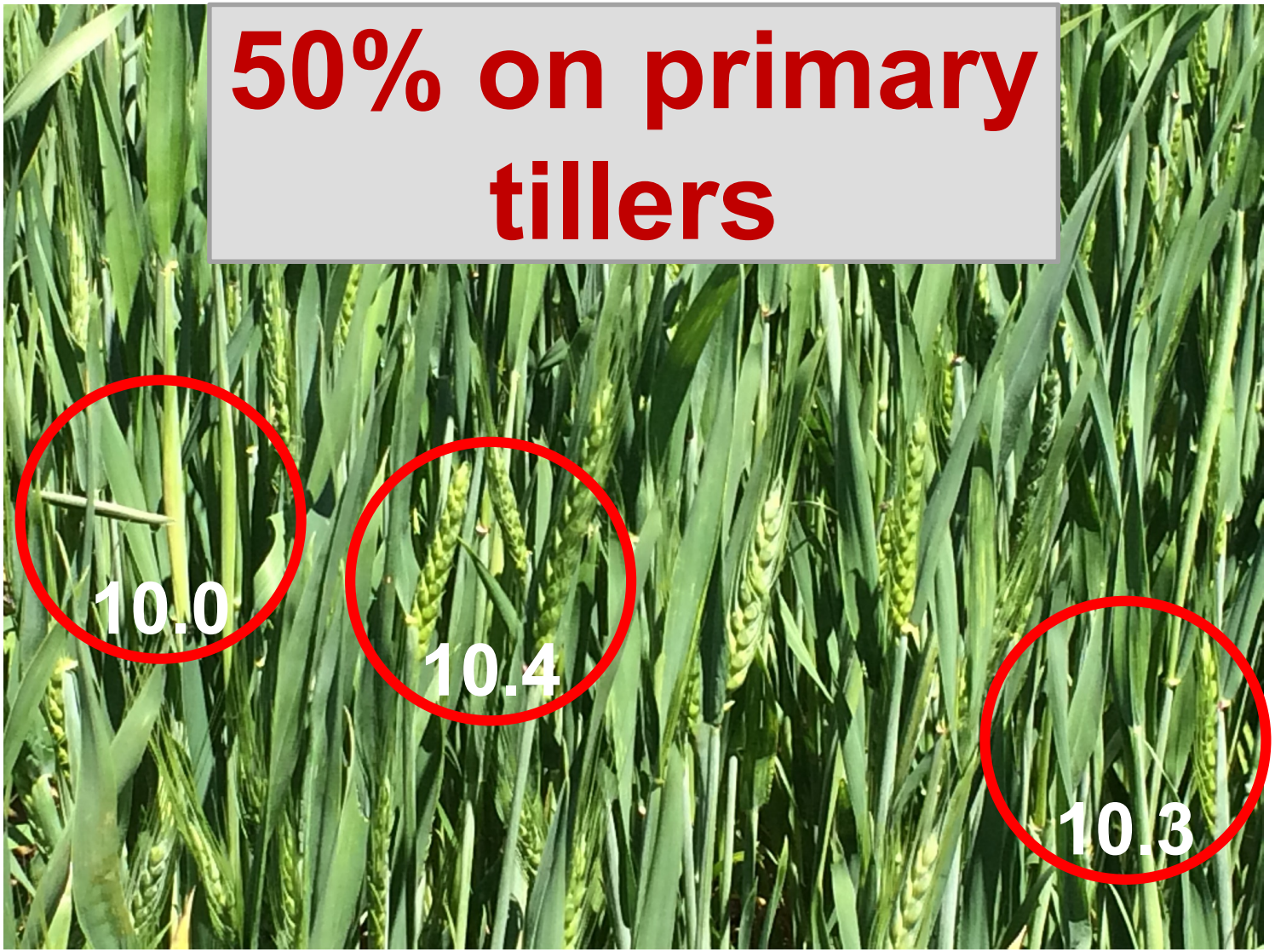
Feekes 10.5.2

Late

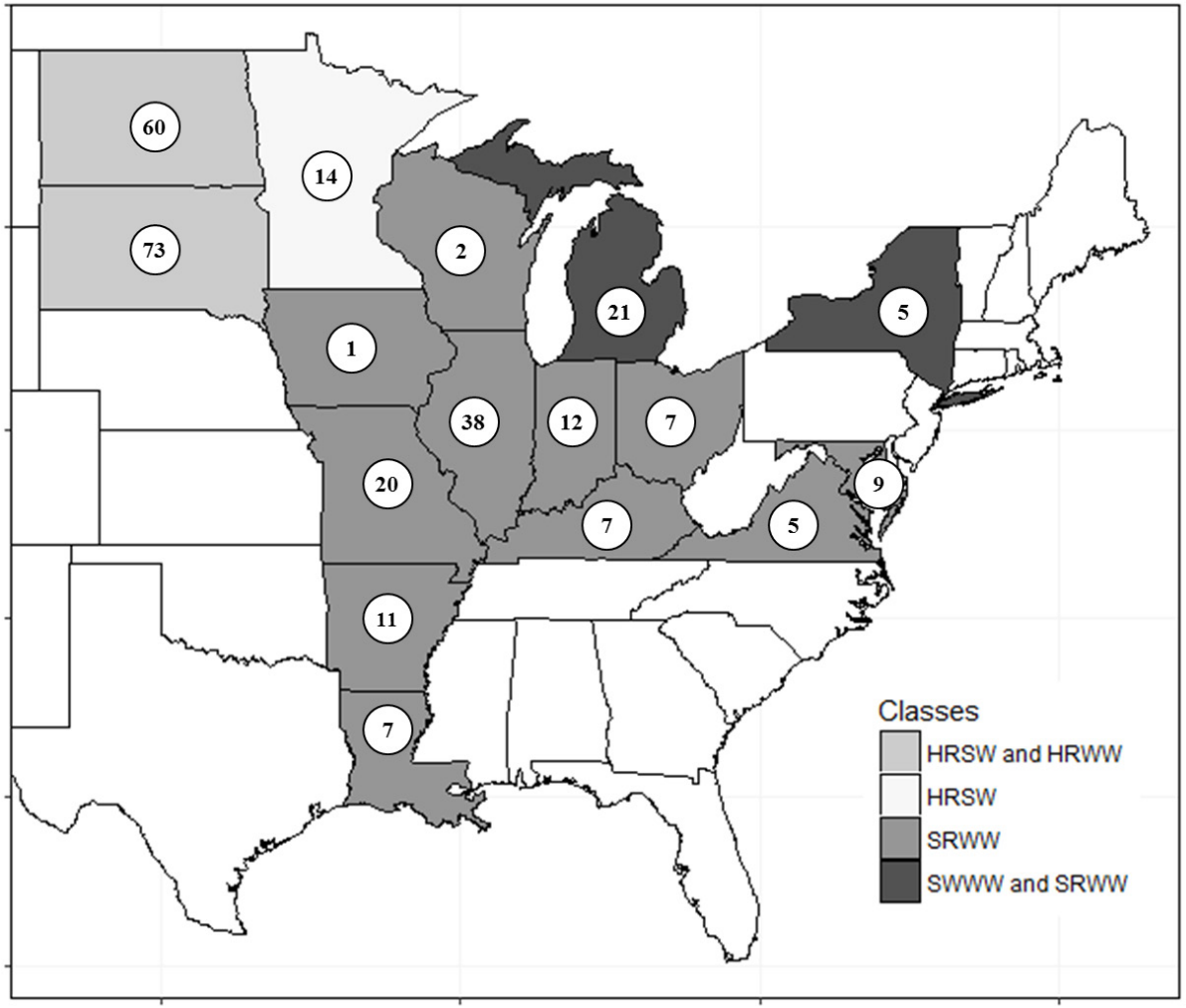
Feekes 10.5.3

Knott UK - https://mccracken.ca.uky.edu/files/identifying_wheat_growth_stages_agr224.pdf

Variable heading and flowering



Uniform Fungicide Trials



TREATMENTS

1. Nontreated check (CK)
2. Caramba early (CE)
3. Caramba at anthesis (CA)
4. Caramba late (CL)
5. Prosaro early (PE)
6. Prosaro at anthesis (PA)
7. Prosaro late (PL)

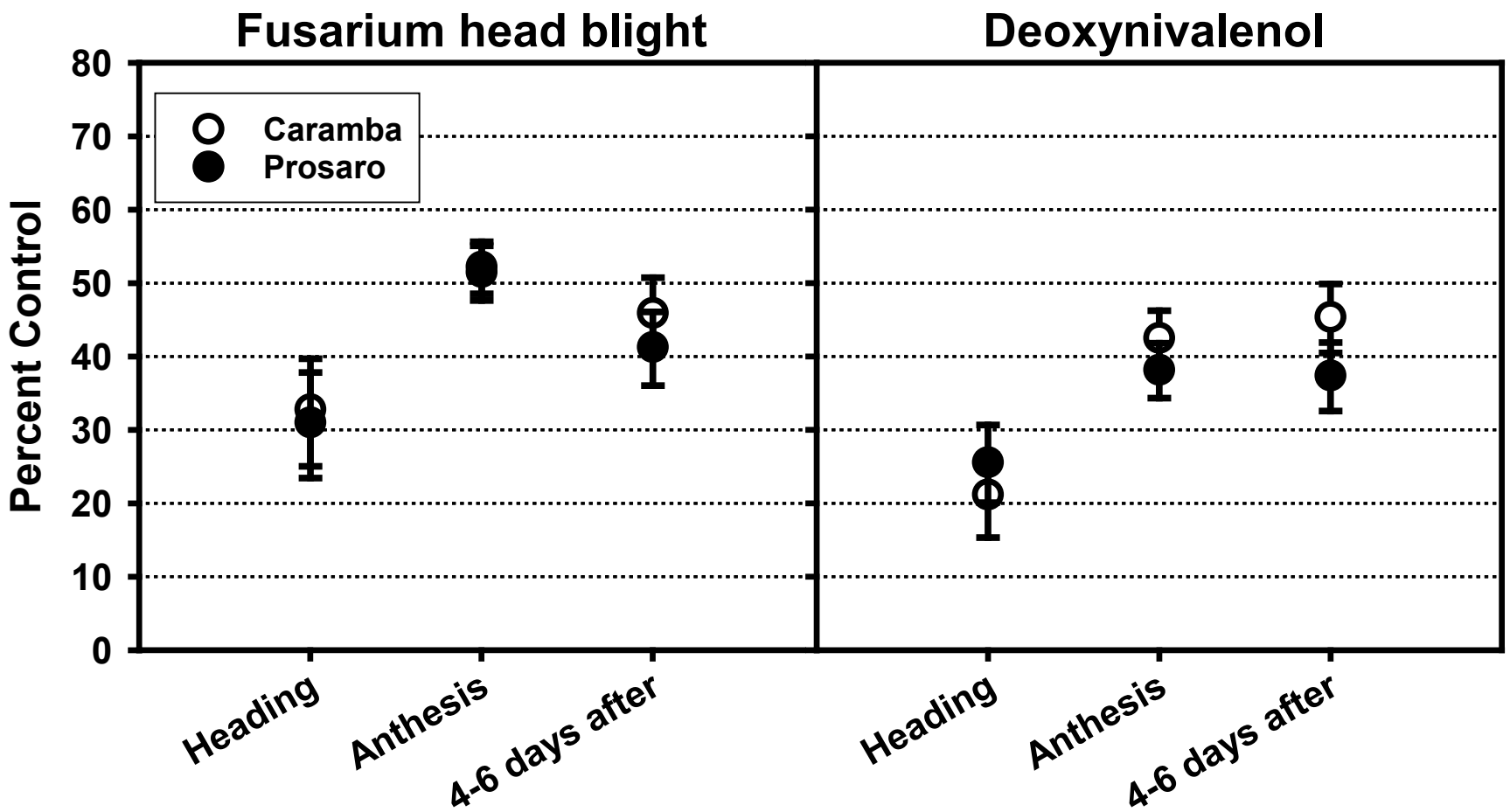
META-ANALYSIS

- Log response ratio (L)
- Percent control (C)
- Wheat type as moderator
- Predictions

$$\bar{C} = [1-\exp(\bar{L})]\times 100$$

Fungicide Timing:

Pre- and post-anthesis applications of Prosaro and Caramba

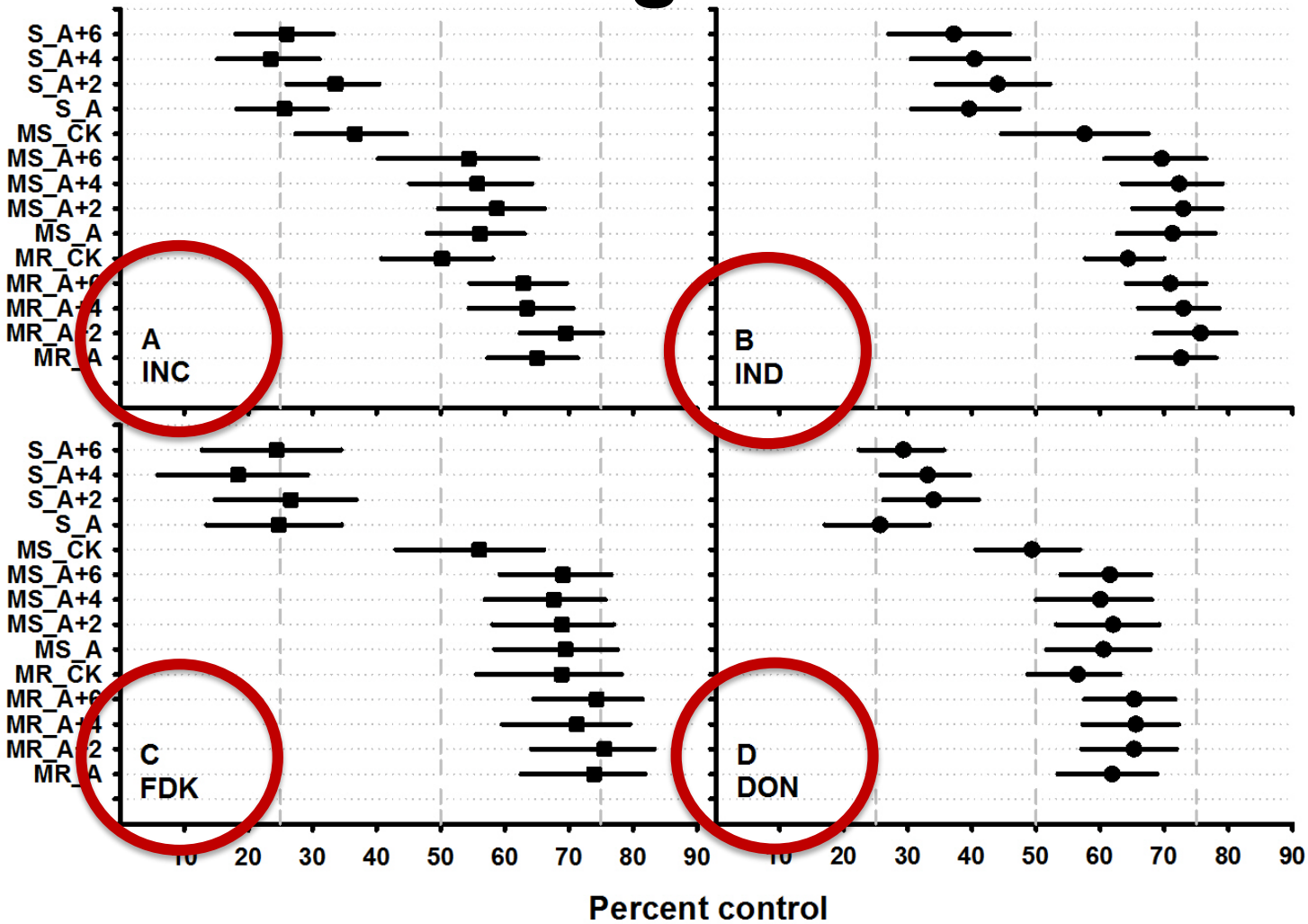


Paul et al. 2018a, 2018b, 2019 – Plant Disease

Late application in integrated management

Combination	Description
MR_A	Moderately resistant, treated at anthesis
MR_A+2	Moderately resistant, treated at 2 days after anthesis
MR_A+4	Moderately resistant, treated at 4 days after anthesis
MR_A+6	Moderately resistant, treated at 6 days after anthesis
MR_CK	Moderately resistant, nontreated
MS_A	Moderately susceptible, treated at anthesis
MS_A+2	Moderately susceptible, treated at 2 days after anthesis
MS_A+4	Moderately susceptible, treated at 4 days after anthesis
MS_A+6	Moderately susceptible, treated at 6 days after anthesis
MS_CK	Moderately susceptible, nontreated
S_A	Susceptible, treated at anthesis
S_A+2	Susceptible, treated at 2 days after anthesis
S_A+4	Susceptible, treated at 4 days after anthesis
S_A+6	Susceptible, treated at 6 days after anthesis
S_CK	Susceptible, nontreated

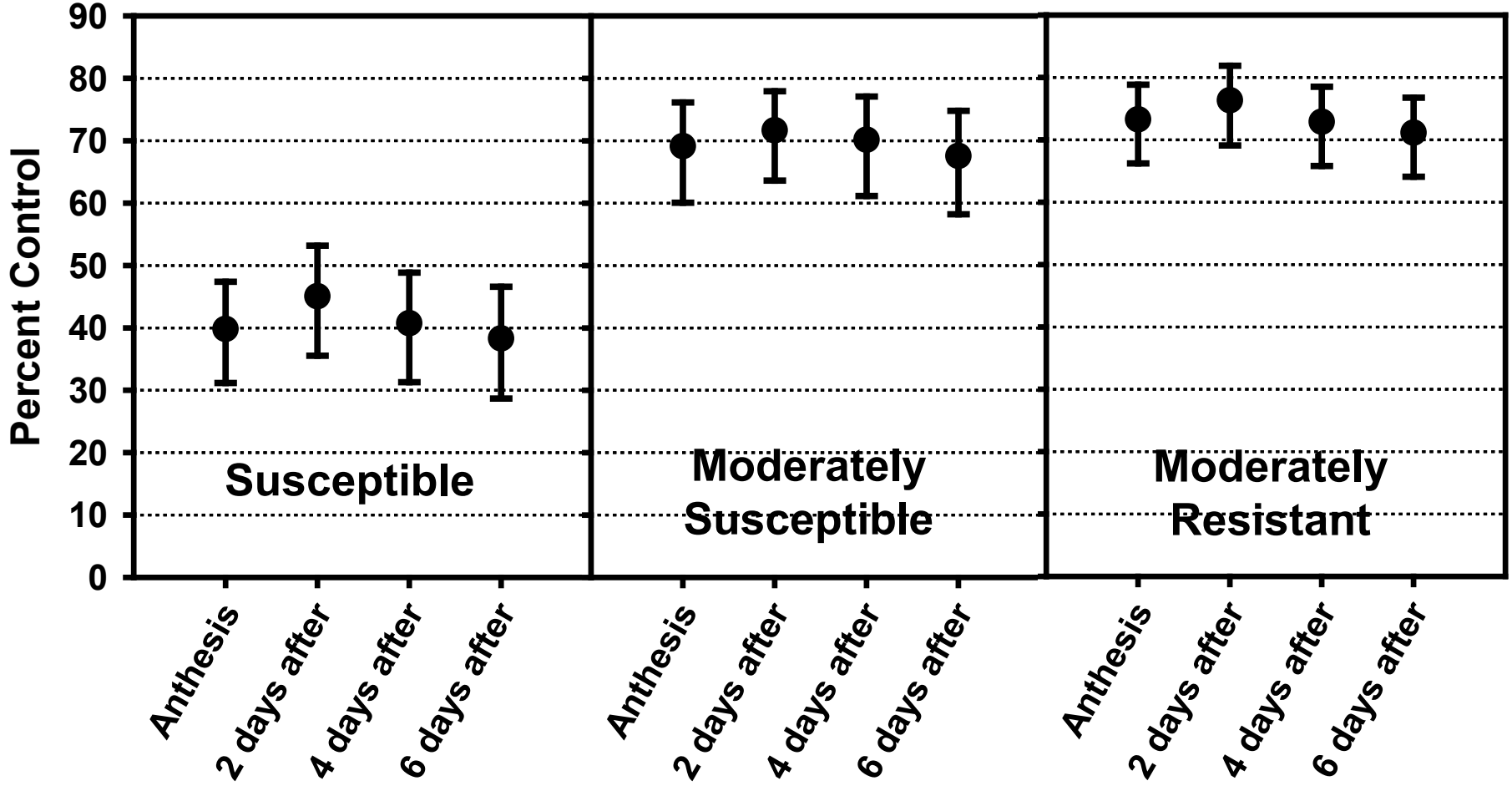
Late application in integrated management



Fungicide Timing:

Late application and cultivar resistance on FHB

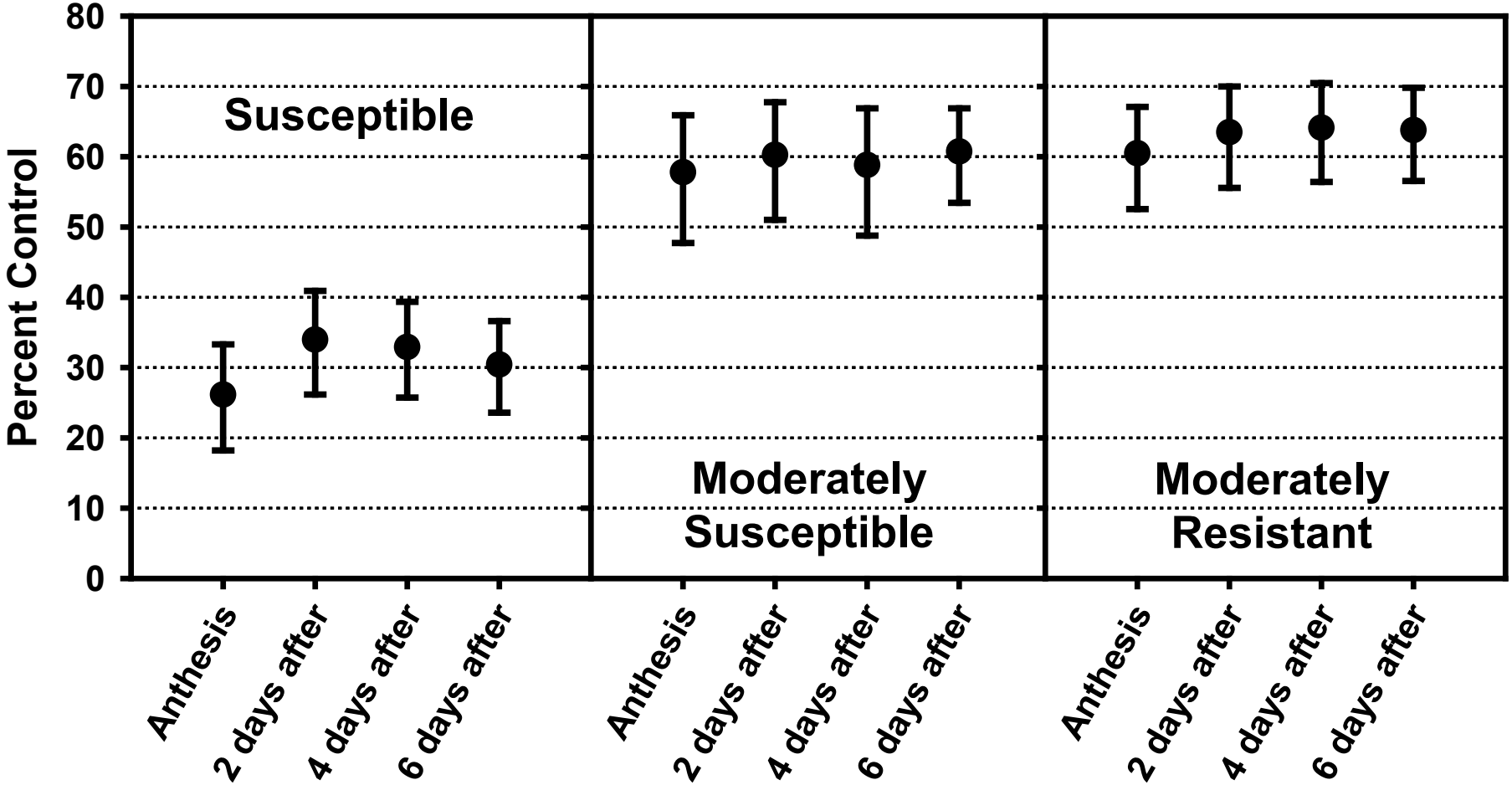
Fusarium head blight



Fungicide Timing:

Late application and cultivar resistance on DON

Deoxynivalenol



Miravis® Ace:

A new fungicide for head scab and vomitoxin management

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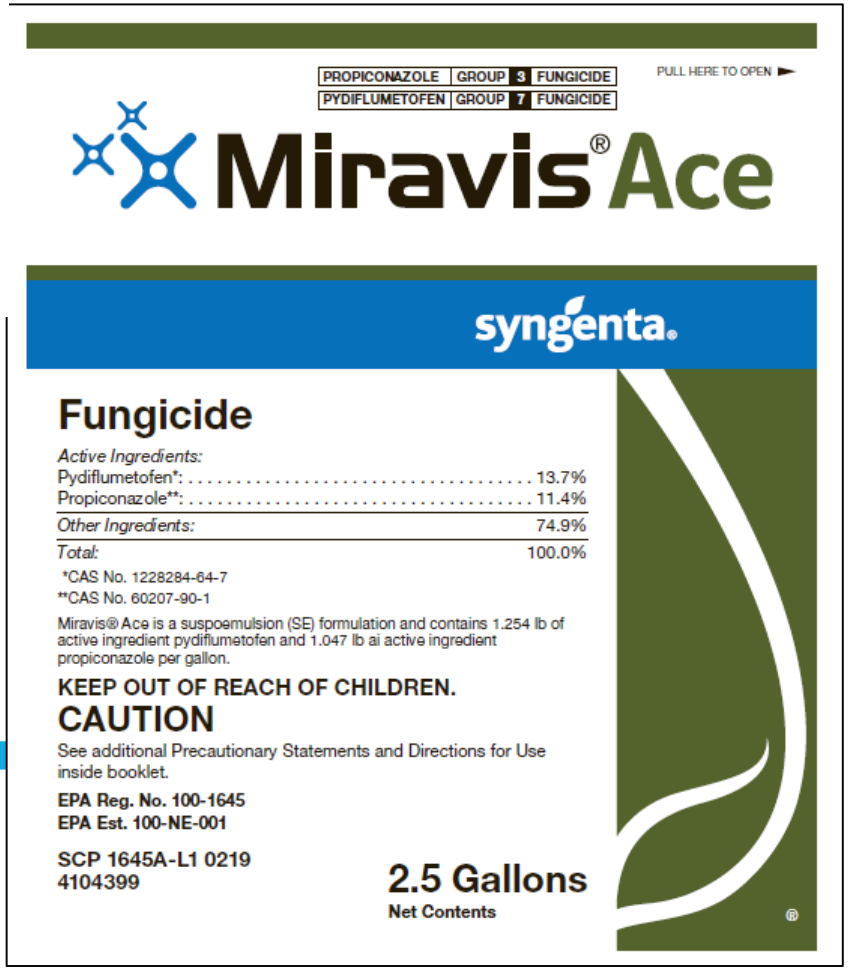
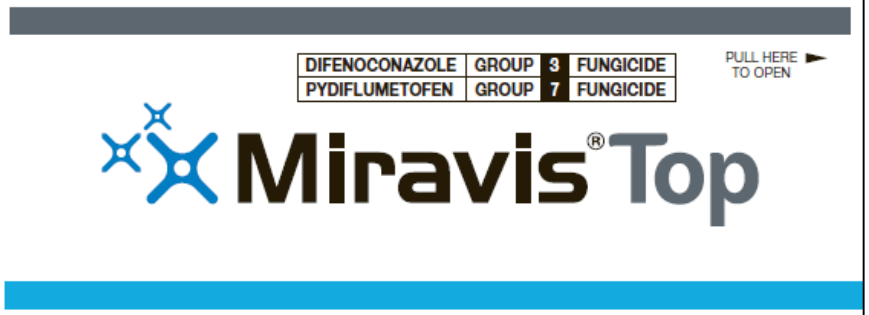
Miravis Ace

State	Status
AL,CO,IA,ID,KS,KY,LA,MI,MN,MO,MT,NC,NE,NV,OH,OK,SC,TN,WA,WI,WV,WY	Approved
AR,AZ,CT,DE,FL,GA,IL,IN,MA,MD,ME,MS,ND,NH,NJ,NM,OR,PA,RI,SD,TX,UT,VA,VT	Submitted
CA,NY	Pending

Legend
Approved = Latest Version approved in state(s), but may not yet be on container
Cancelled = Latest no longer available for use in state(s)-e.g 24(c), Section 18, 2(ee), supplemental
Disapproved = Label version not approved by state
Submitted = Label version awaiting state approval
Pending = Preparation of submission package to state in progress

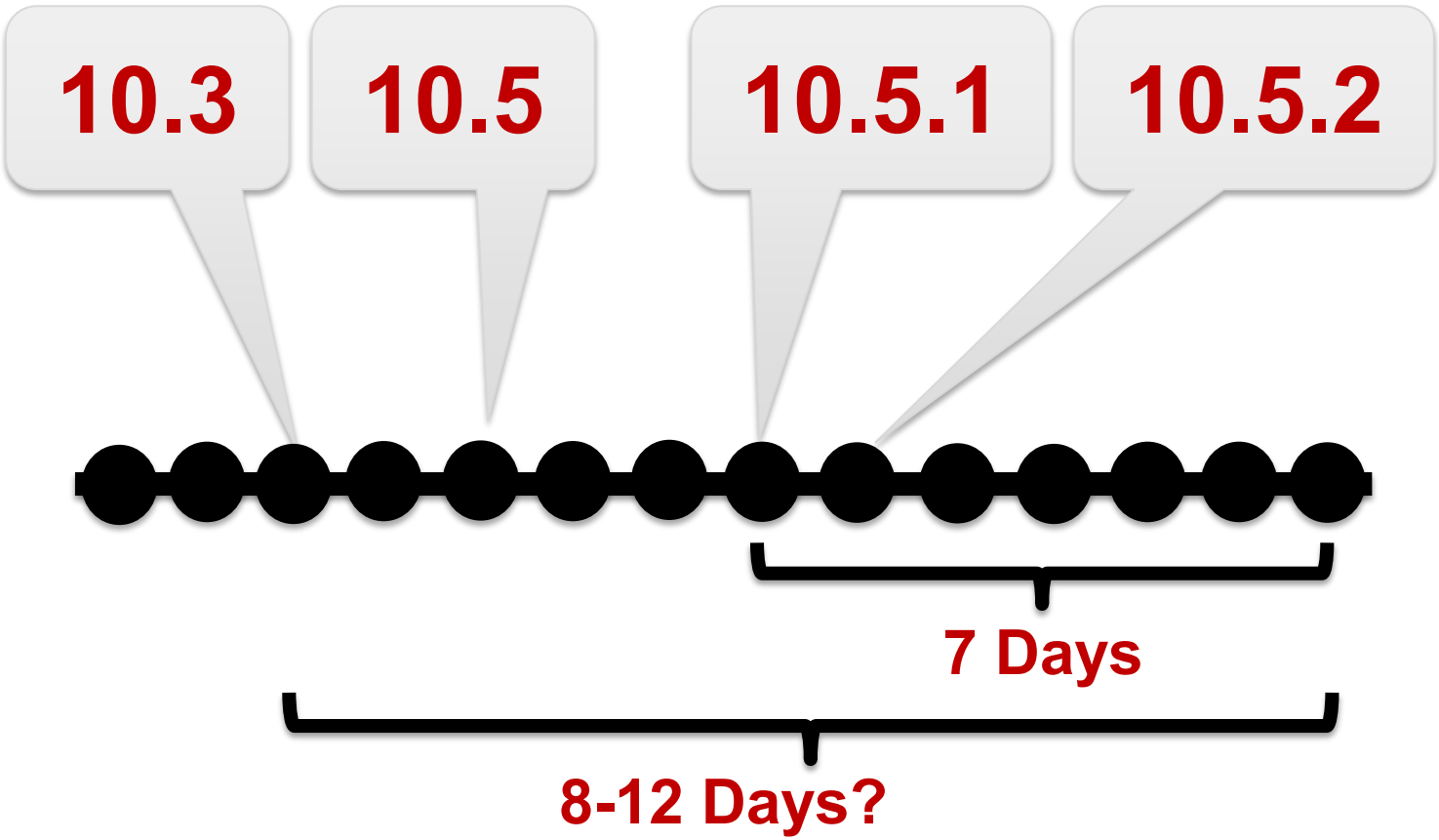




Miravis Ace at Feekes 10.3

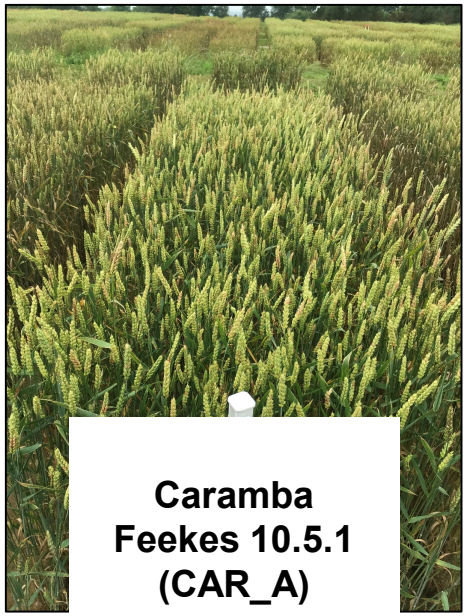
Fungicide Timing:

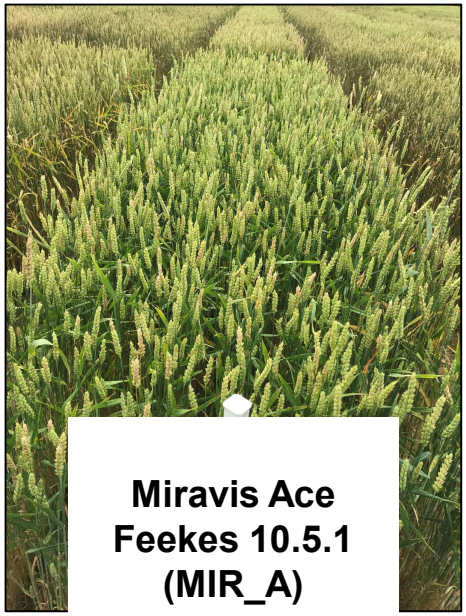
Early heading (10.3) to Mid-anthesis (10.5.2)



Early Anthesis Timing:

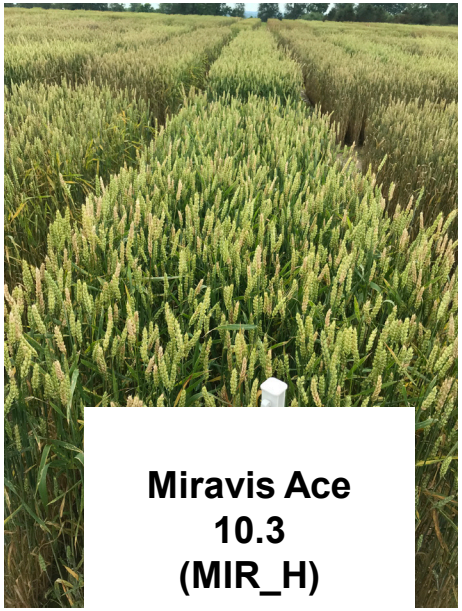
Miravis Ace vs Prosaro and Caramba

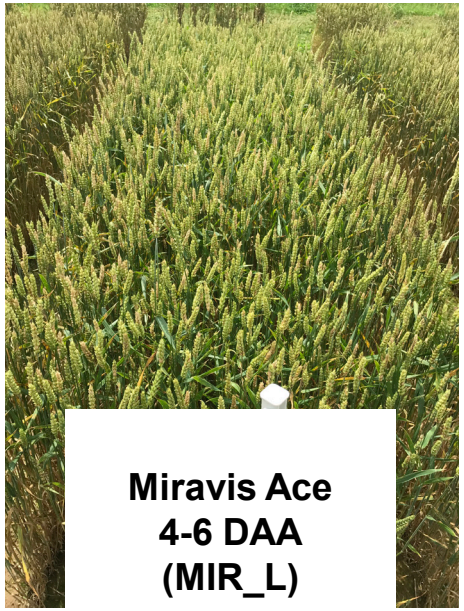




Miravis Ace Timing:

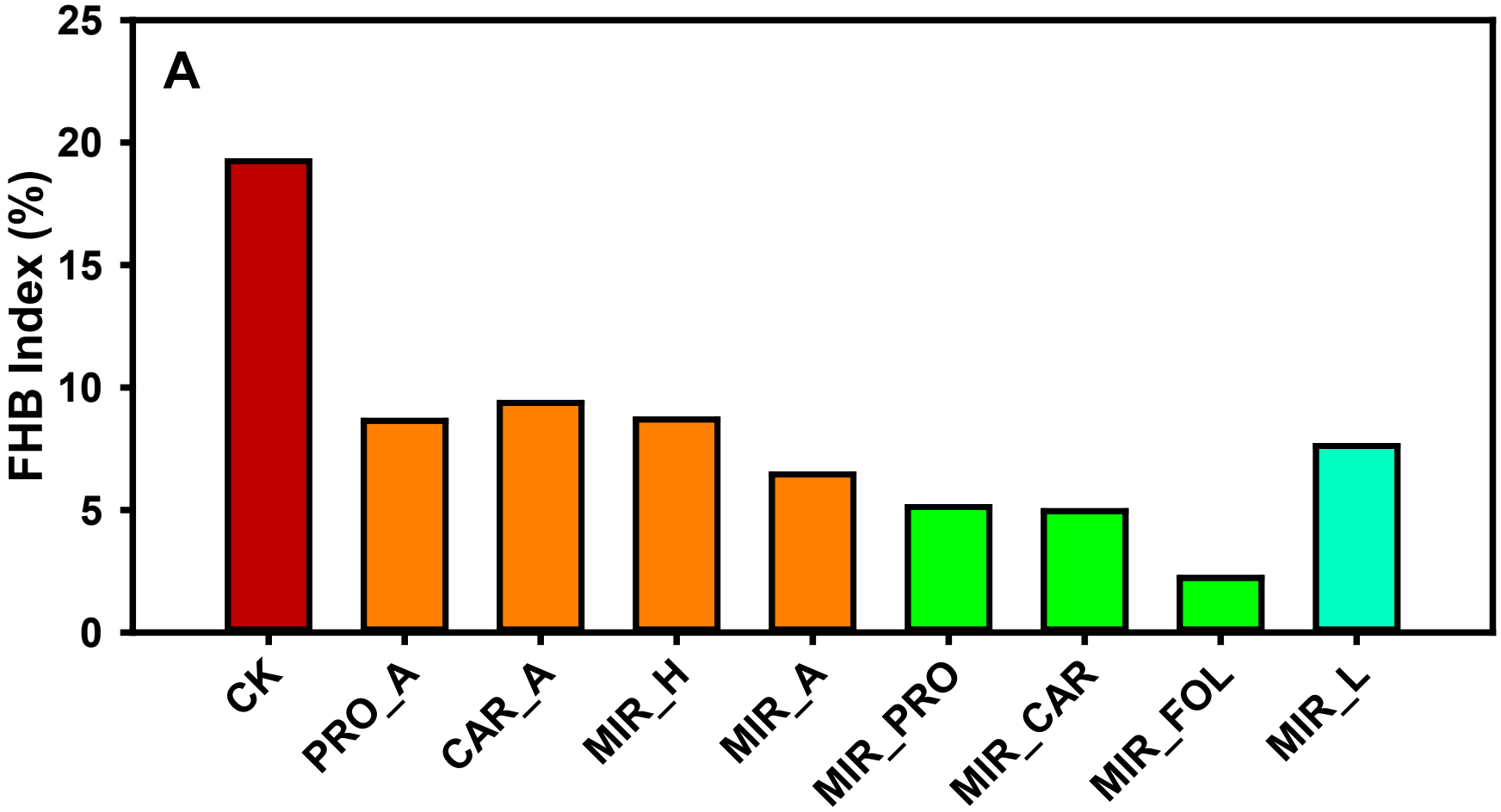
Early Heading to Late Anthesis





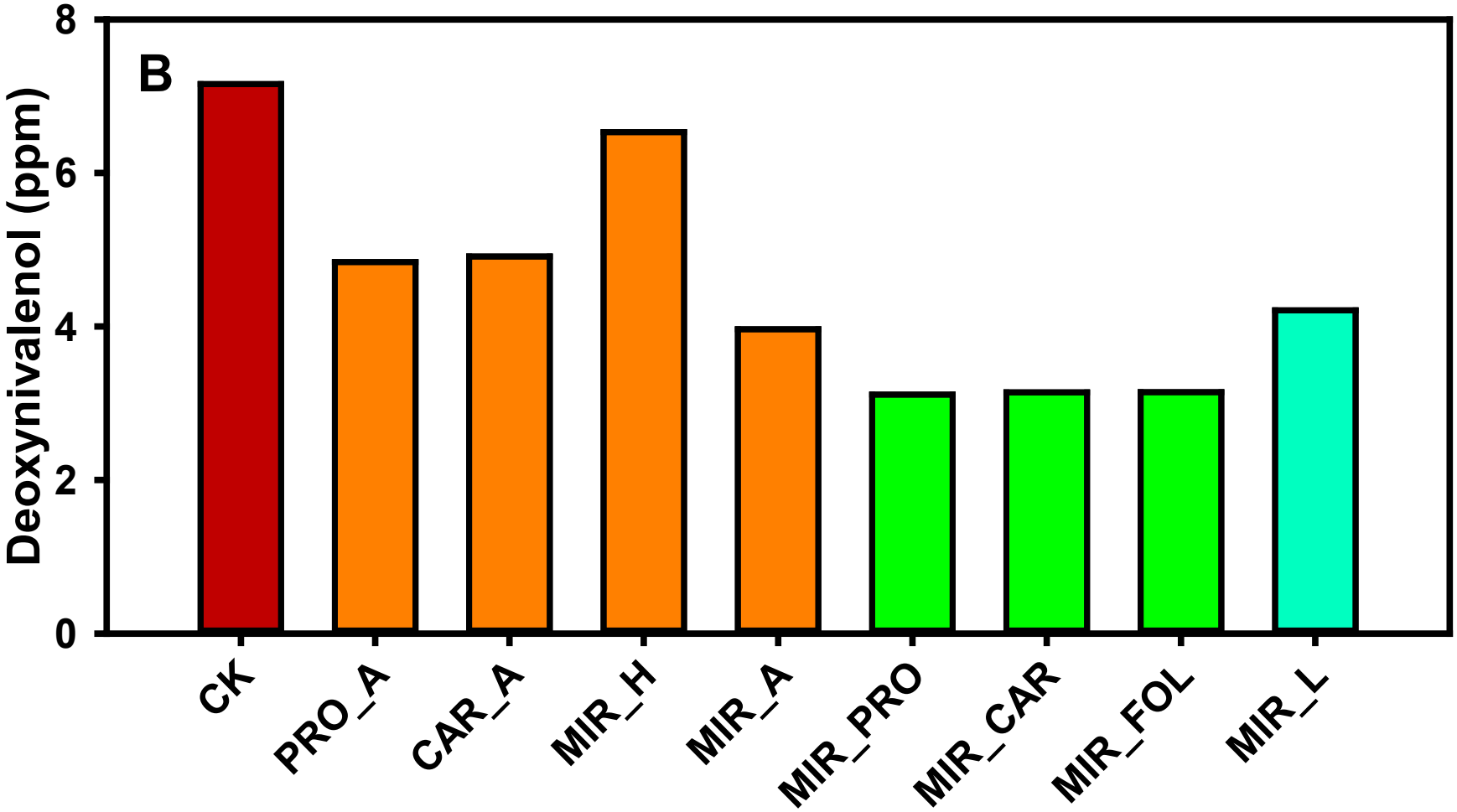
Prosaro/Caramba/Miravis Ace

Fusarium Head Blight



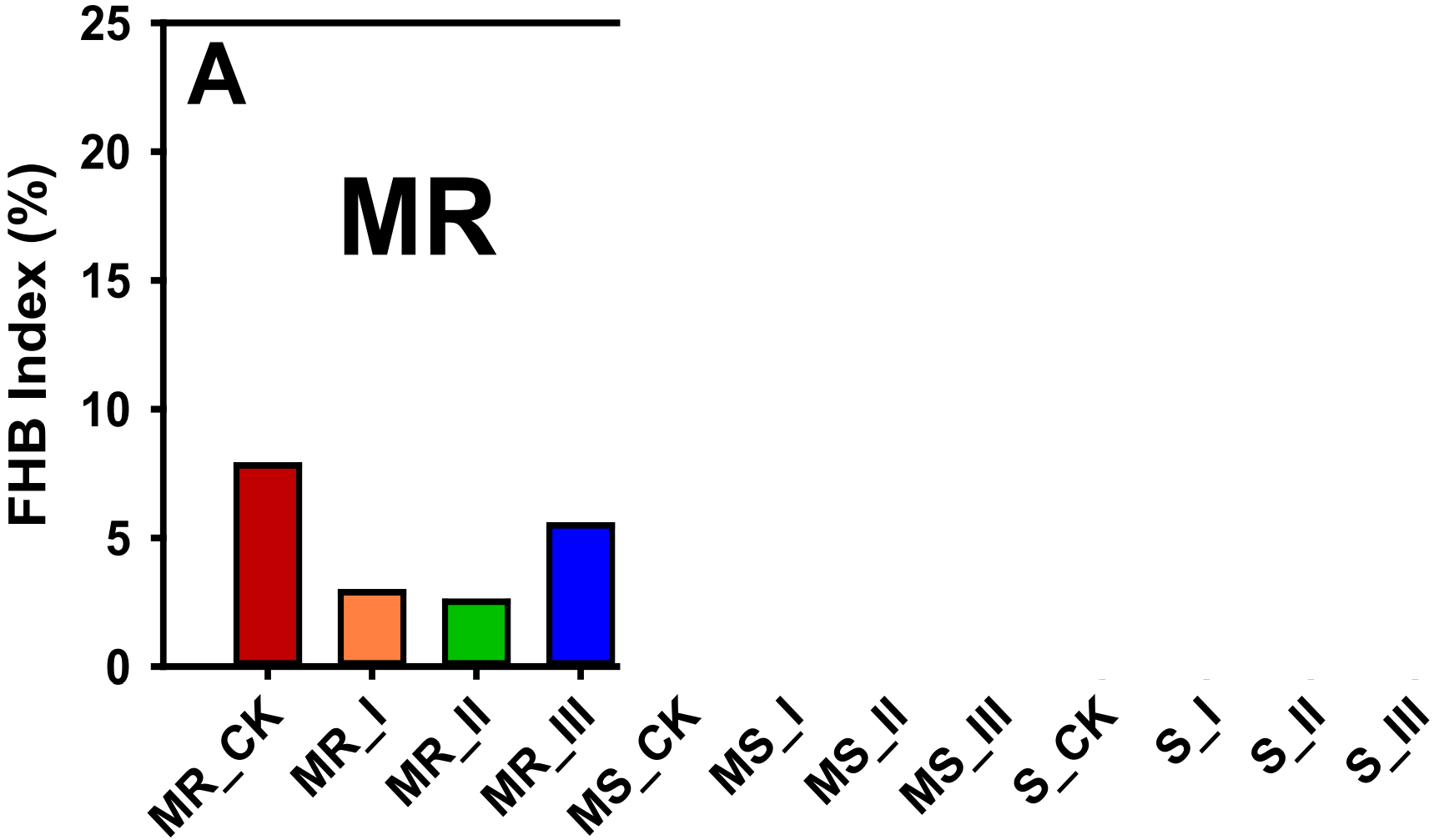
Prosaro/Caramba/Miravis Ace

Deoxynivalenol



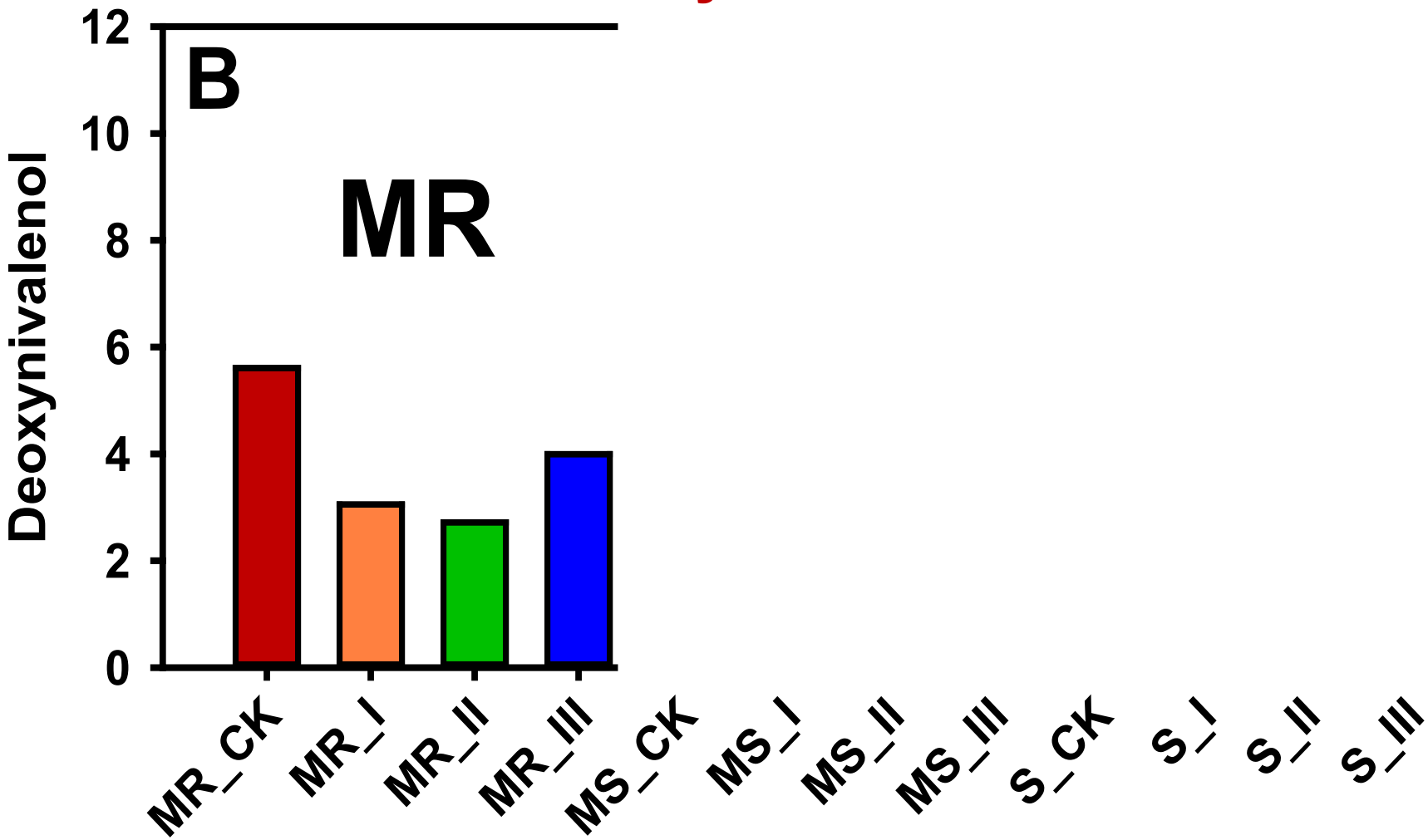
Timing x Genetic Resistance

Fusarium Head Blight



Timing x Genetic Resistance

Deoxynivalenol



Summary

- Both pre- and post-anthesis treatments were effective at reducing FHB.
- Miravis Ace was just as effective against FHB and DON as Caramba or Prosaro when applied at anthesis.
- Efficacy of Miravis Ace was comparable between anthesis and late applications, but was less consistent for early heading application.
- Two-treatments programs - an anthesis application of Miravis Ace followed by an application of Caramba, Prosaro, or Folicur 4-6 days later - led to the greatest reduction in DON.
- Combining an anthesis application with genetic resistance resulted in lower FHB and DON than resistance or fungicide application alone.

Acknowledgments

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