THE IMPORTANCE OF UNDERSTANDING THE DISEASE TRIANGLE IN ORDER TO IMPLEMENT SUCCESSFUL MANAGEMENT

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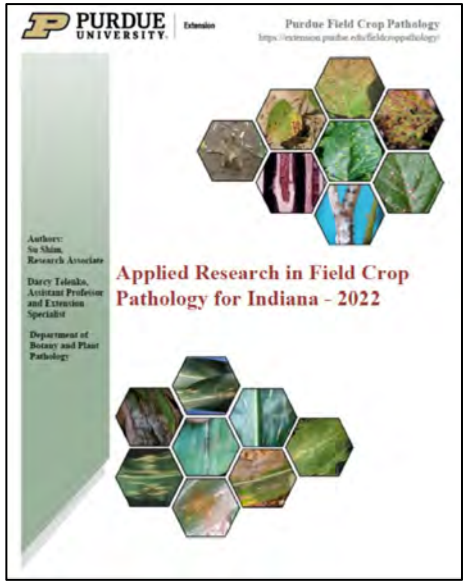
PURDUE UNIVERSITY | Botany and Plant Pathology

Resources for Indiana

Follow on Twitter: @DTelenko

New Purdue Field Crop Pathology Website - 2023

https://indianafieldcroppathology.com/



Crop Protection Network

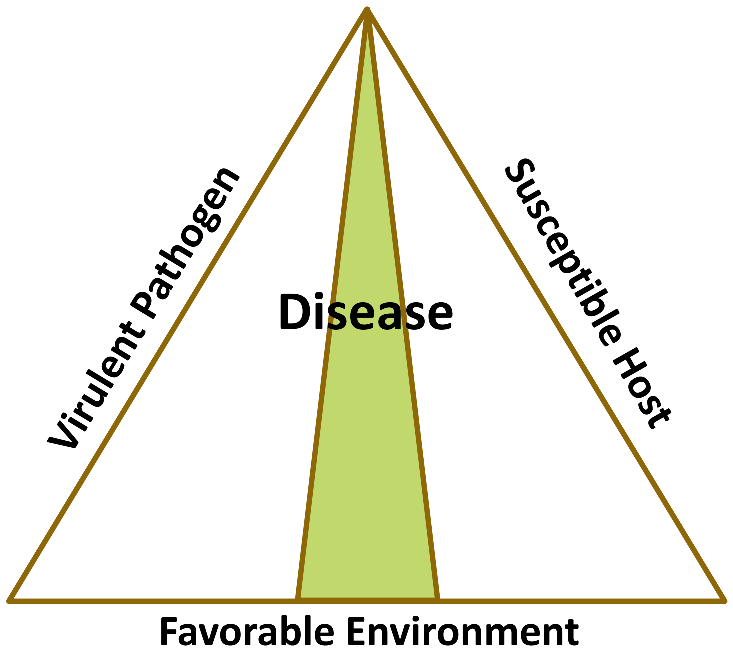
https://cropprotectionnetwork.org/

TELENKO FIELD CROP PATHOLOGY

Disease Triangle

Virulent pathogen:

- Overwinter?
- Endemic – already present in soil/debris
- Spore movement



Susceptible host:

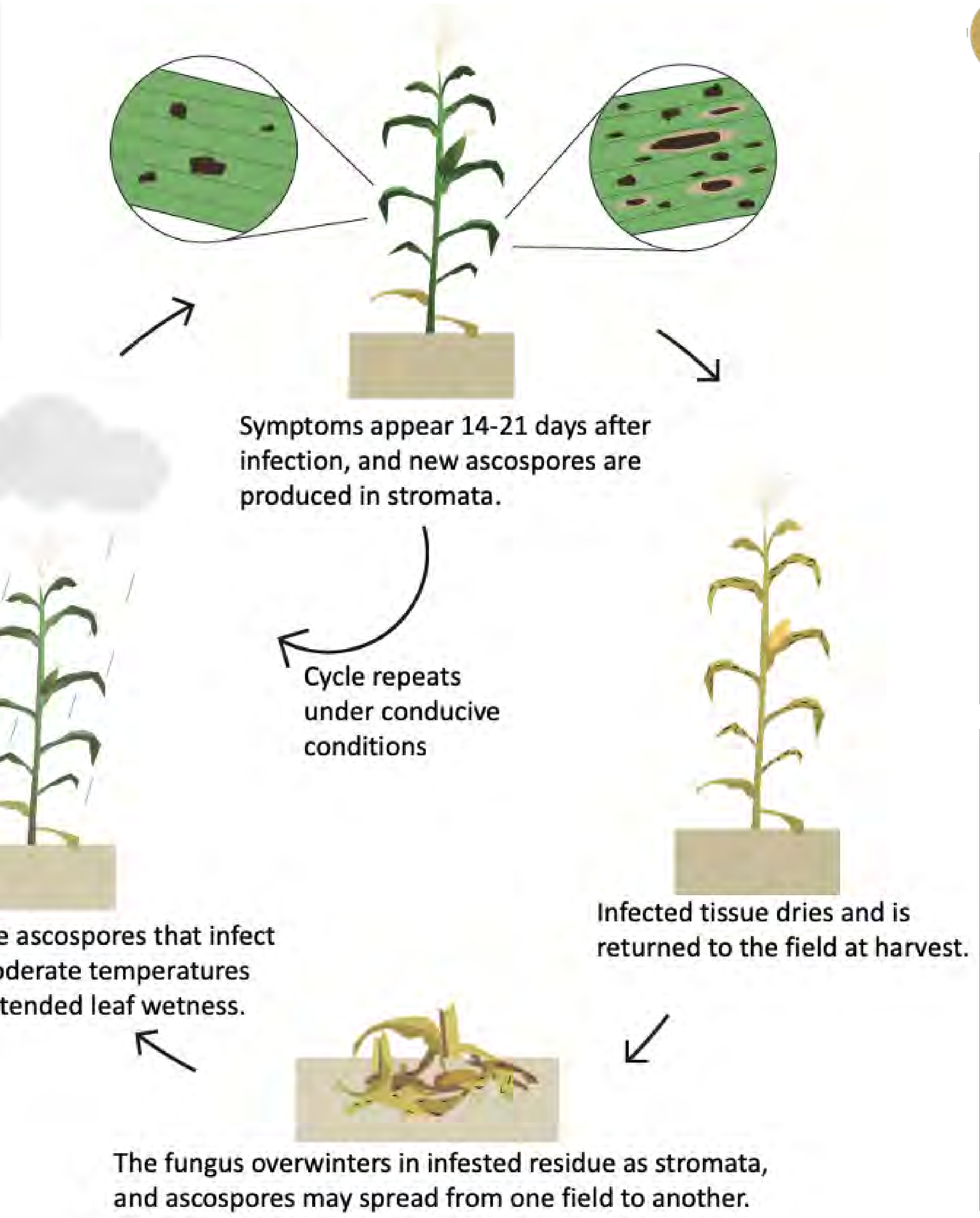
- Plant species
- Variety/hybrid susceptibility
- Growth stage

Favorable Environment:

- Temperature
- Moisture
- Leaf wetness


Tar spot of corn

Tar Spot Disease Cycle



CROP PROTECTION NETWORK
A Product of Land Grant Universities

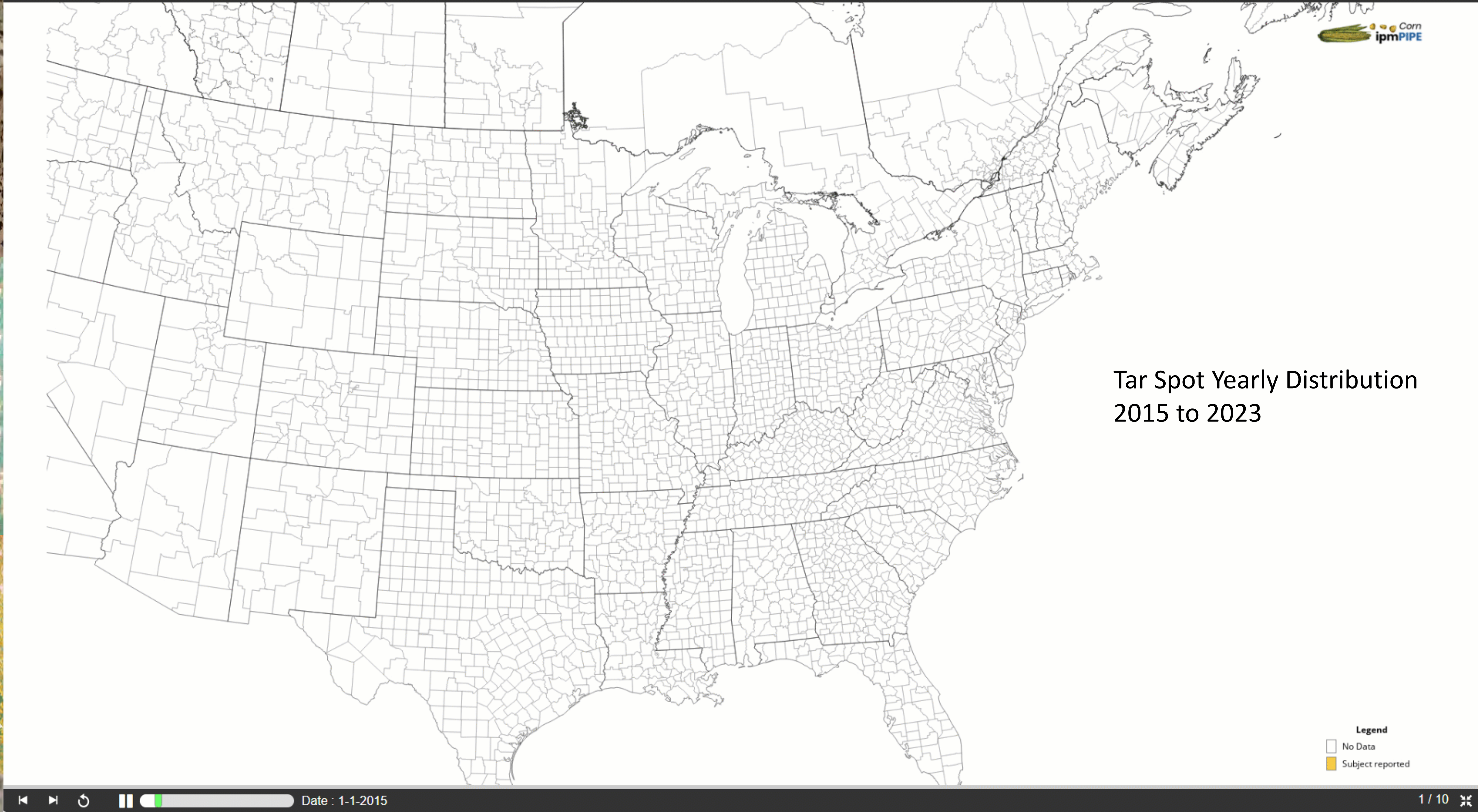
Weather Matters for Tar Spot

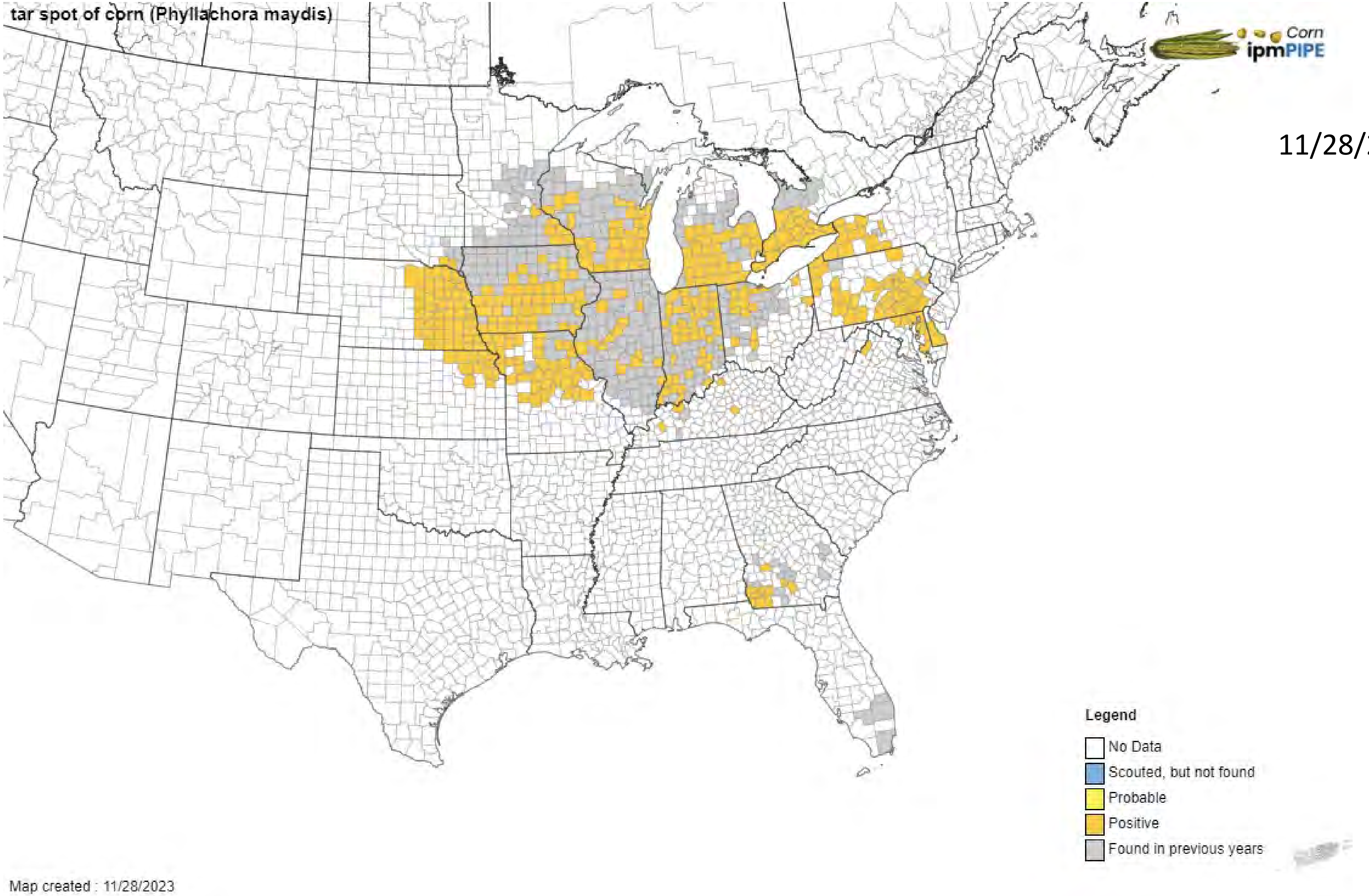
- Temperature is critical:
  - ✓Optimum conditions when extended periods (30 days) of mild temperature (64-73°F; 18-23°C).
  - ✓Monthly temperatures that exceed 73°F reduce tar spot progression.
- Moisture plays a role:
  - ✓Moisture important in process to aid spore germination
  - ✓Tar spot developed when relative humidity under 90% over 2-3 week span
  - ✓Extended periods of excessive moisture (RH > 90%), especially at high temperatures, can hinder disease progression.
- Use Prediction Tool: Tarspotter

Source: Webster, R. W., et al. 2023. Tar spot prediction in corn: The weather matters. Crop Protection Network. CPN-5012. doi.org/10.31274/cpn-20231220-1

TELENKO FIELD CROP PATHOLOGY

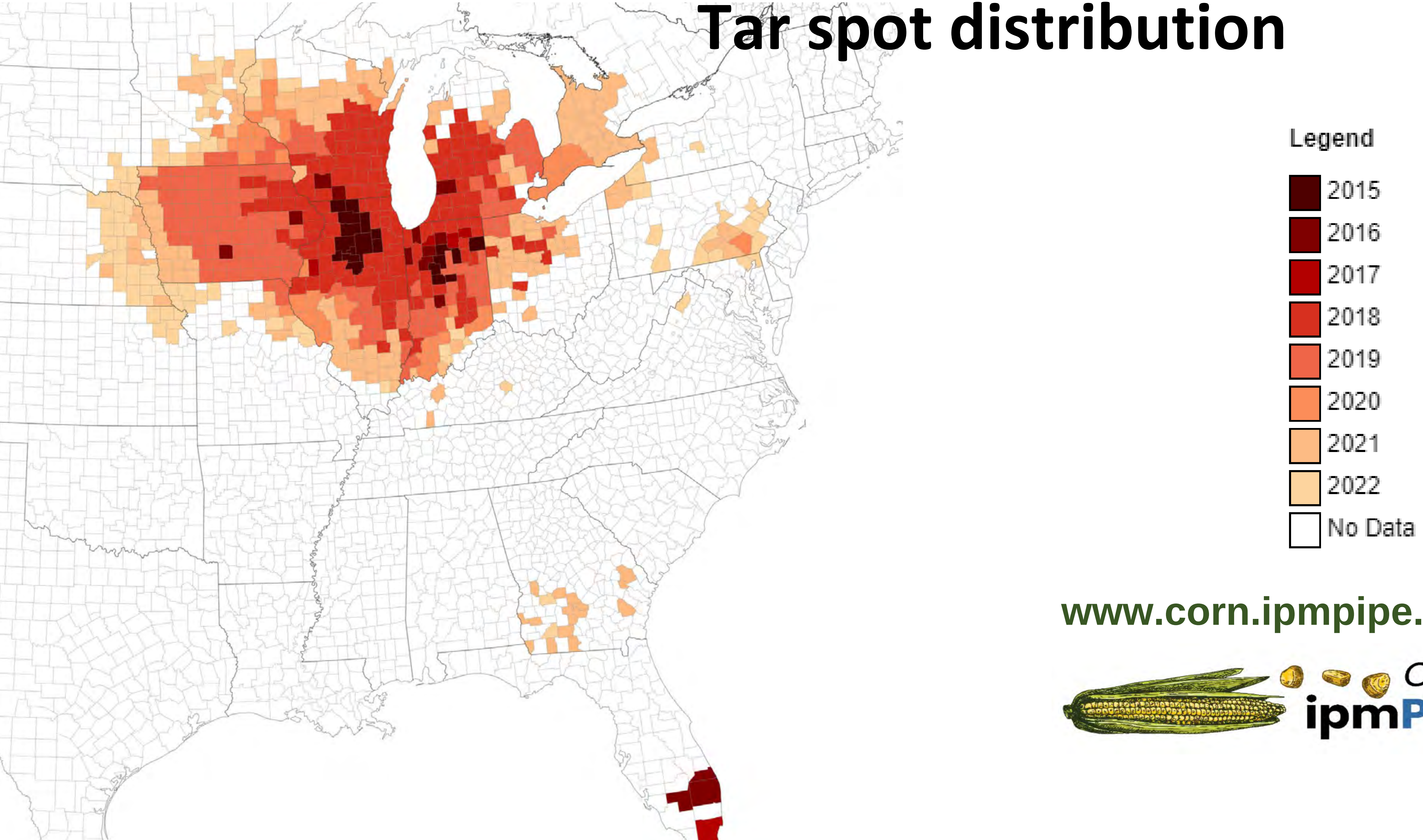
Tar Spot Yearly Distribution 2015 to 2023




tar spot of corn (Phyllachora maydis)
Corn ipmPIPE
Legend
No Data
Scouted, but not found
Probable
Positive
Found in previous years
Map created : 11/28/2023

11/28/2023

Tar spot distribution



www.corn.ipmpipe.org

Corn ipmPIPE

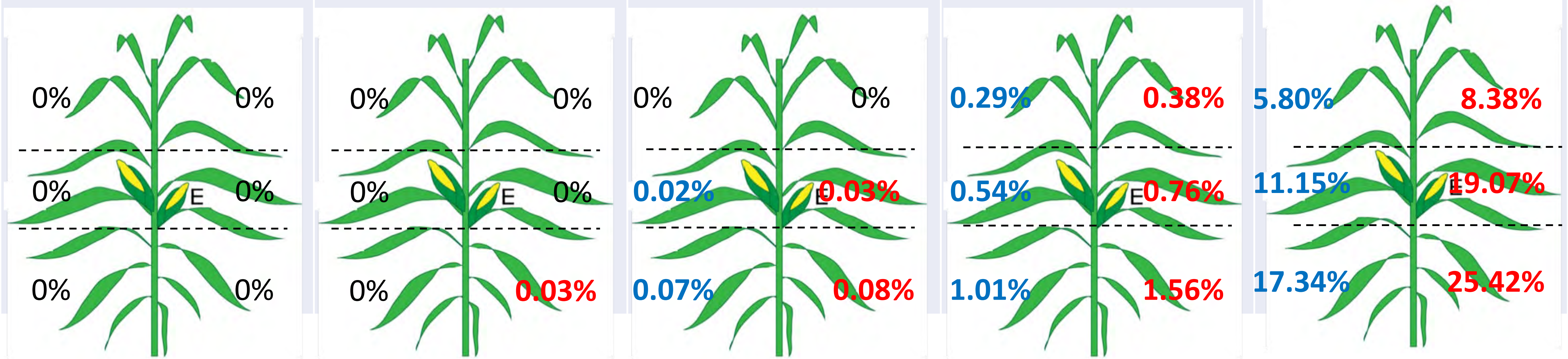
Tar Spot: *High residue* (Arlington, WI 2021)

Corn growth stage				
VT	R2	R3	R4	R5
0% 0%	0% 0%	0.04% 0.09%	1.58% 3.21%	6.59% 11.79%
0% 0%	0% 0%	0.11% 0.18%	3.06% 5.43%	13.03% 22.33%
0% 0%	0% 0%	0.27% 0.40%	4.46% 7.03%	24.63% 30.83%

BLUE = Resistant Variety
RED = Susceptible Variety

Tar Spot: *Low residue* (Arlington, WI 2021)

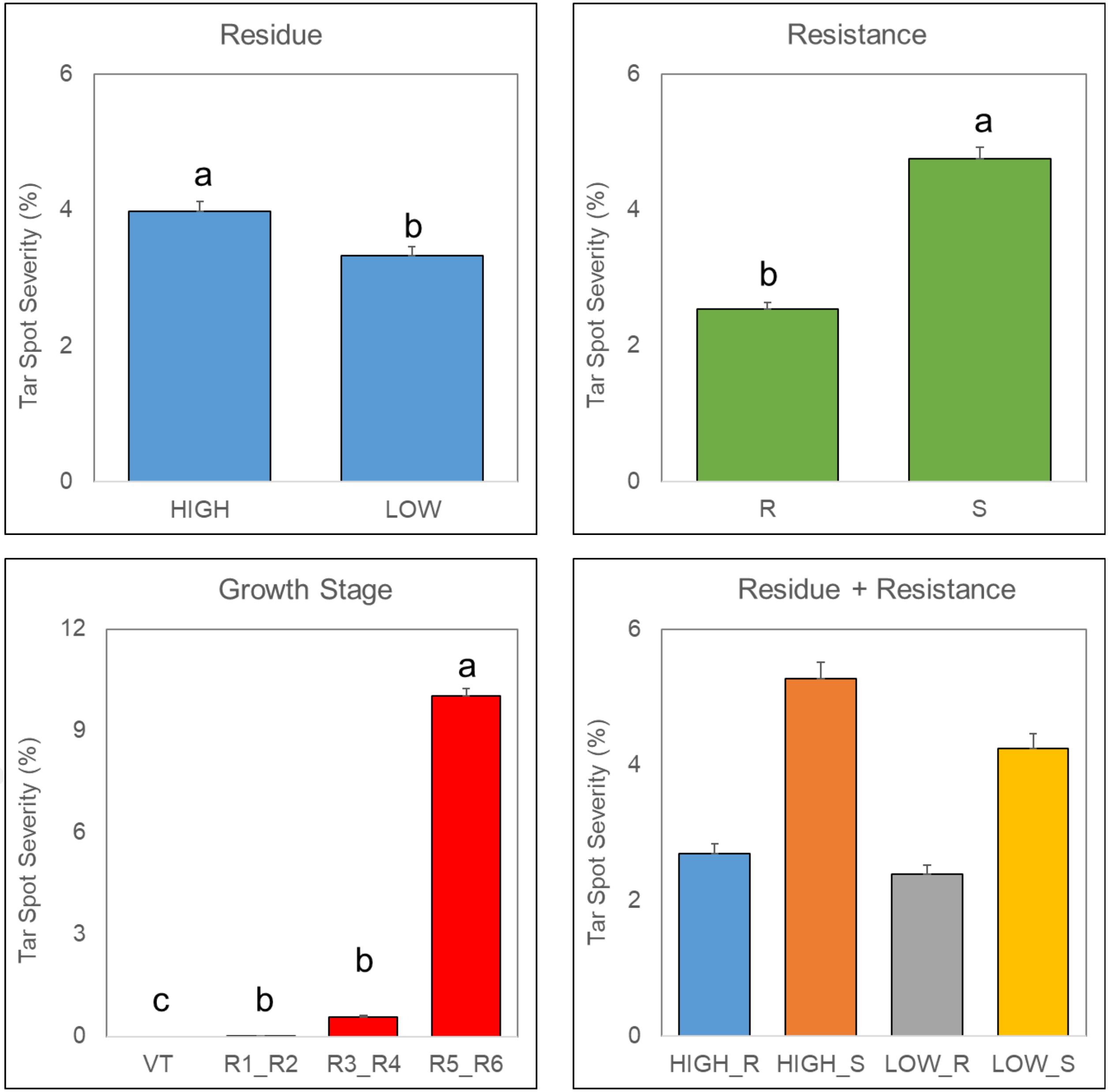
Corn growth stage									
VT		R2		R3		R4		R5	
0%	0%	0%	0%	0%	0%	0.29%	0.38%	5.80%	8.38%
0%	0%	0%	0%	0.02%	0.03%	0.54%	0.76%	11.15%	19.07%
0%	0%	0%	0.03%	0.07%	0.08%	1.01%	1.56%	17.34%	25.42%



BLUE = Resistant Variety
RED = Susceptible Variety

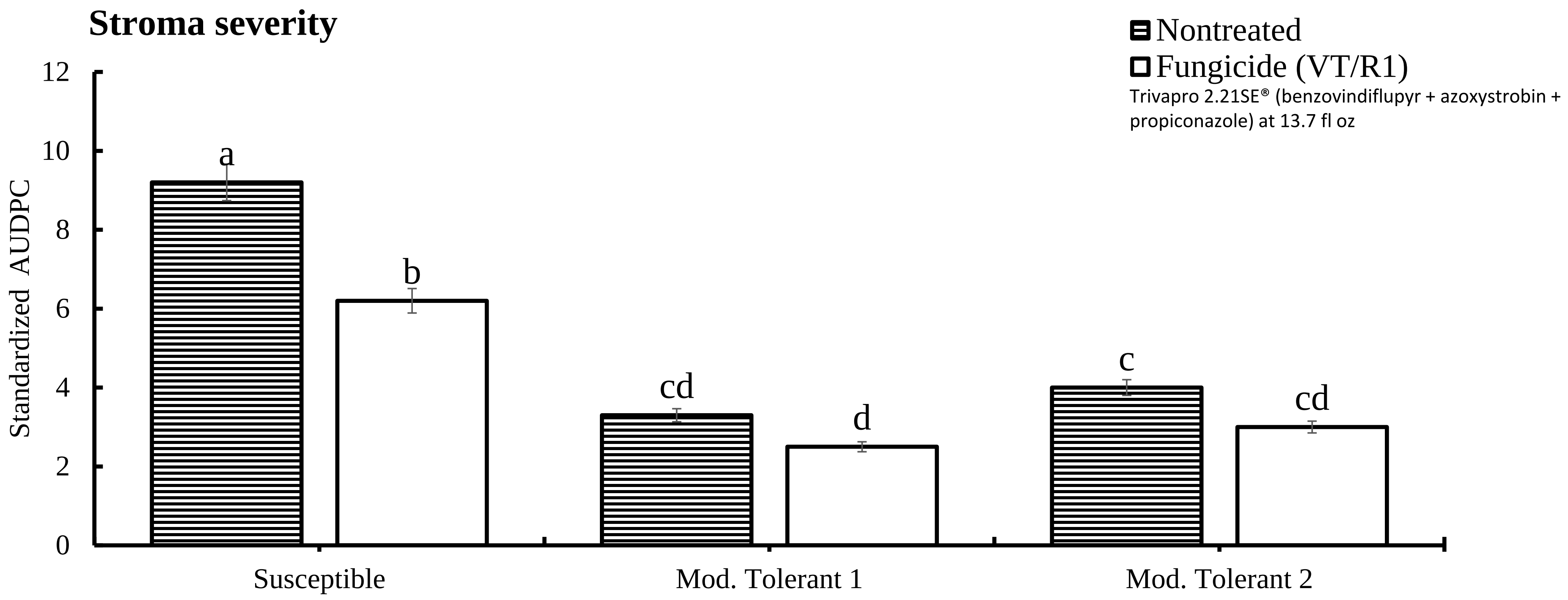
Tar Spot: Factor Effects (7 Field Trials)

- 2020: WI
- 2021: IA, IN, MI, WI
- Total: 7 field trials



NPMTI

Integration hybrid and fungicide application for control of tar spot 2019-2021



Ross, T. J.†, Chilvers, M. I., Byrne, A. M., Smith, D. L., Mueller, B., Shim, S., and Telenko, D. E. P. 2023. Integration of disease tolerance and fungicide application for management of tar spot on hybrid corn in North Central United States. Plant Health Progress. https://doi.org/10.1094/PHP-10-22-0103-RS.

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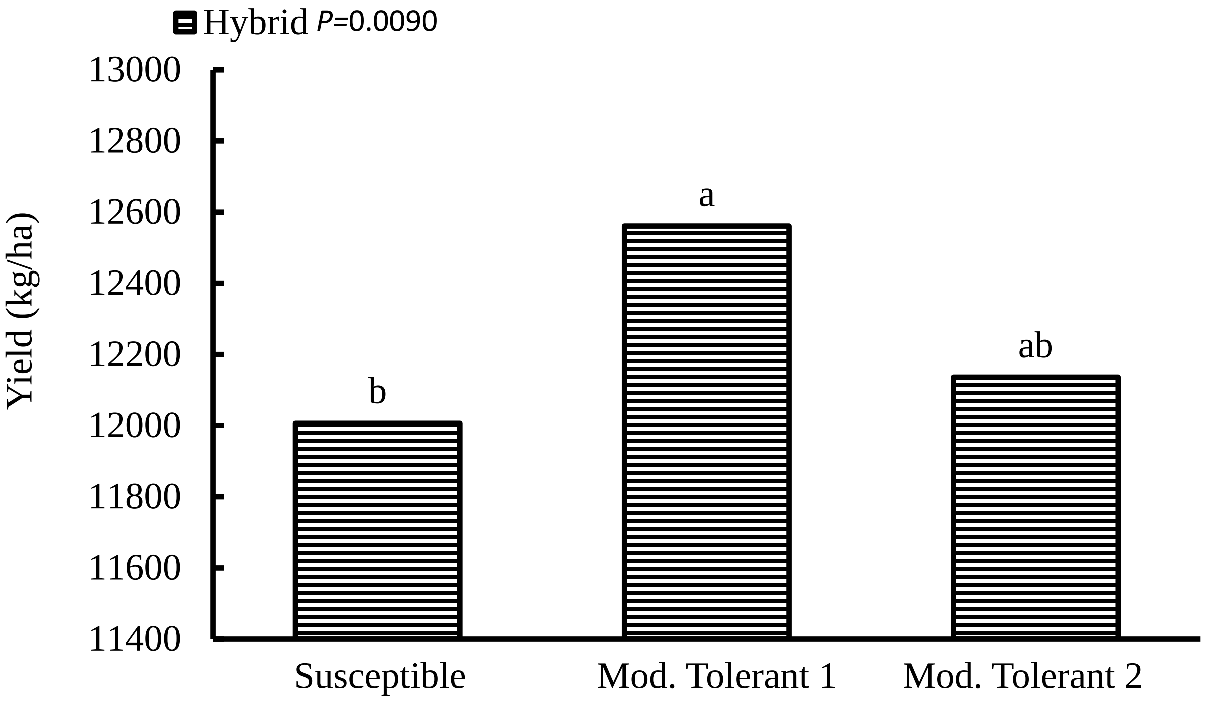
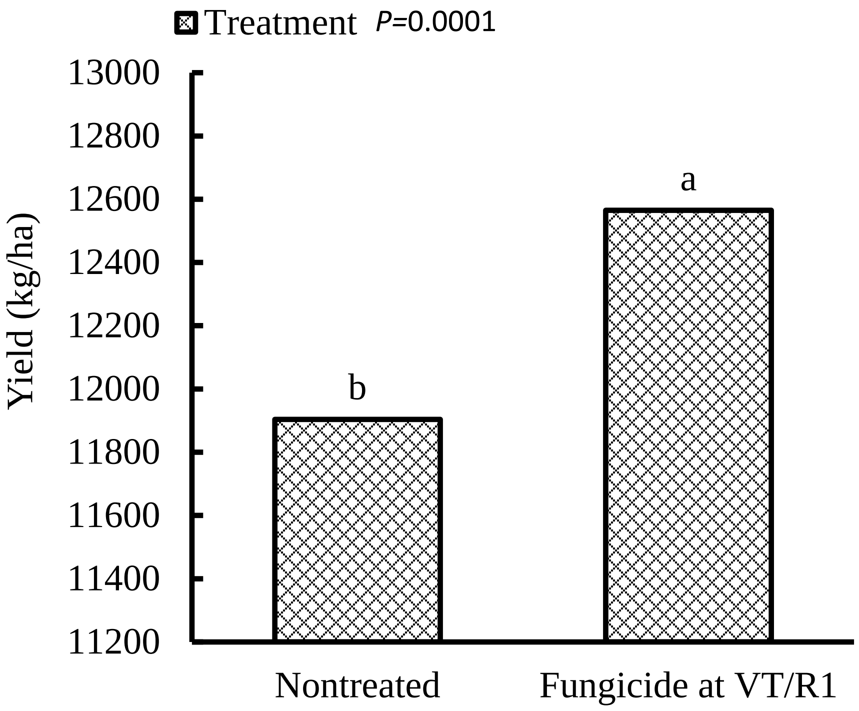
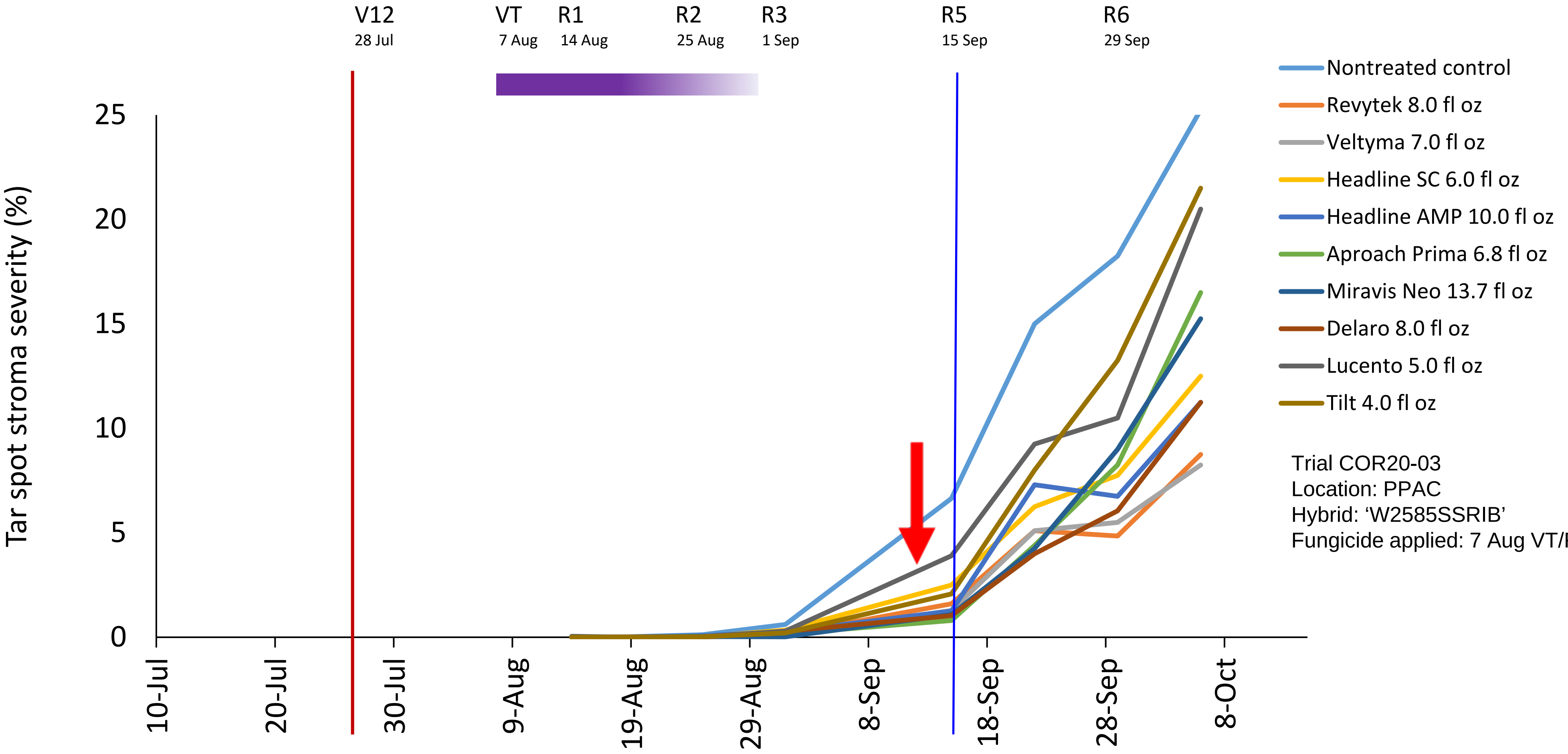




Trivapro 2.21SE® (benzovindiflupyr + azoxystrobin + propiconazole) at 13.7 fl oz

Ross, T. J.†, Chilvers, M. I., Byrne, A. M., Smith, D. L., Mueller, B., Shim, S., and Telenko, D. E. P. 2023. Integration of disease tolerance and fungicide application for management of tar spot on hybrid corn in North Central United States. Plant Health Progress. https://doi.org/10.1094/PHP-10-22-0103-RS.

Uniform Fungicide Trial for Tar Spot Disease Progress Indiana 2020



Trial COR20-03
Location: PPAC
Hybrid: 'W2585SSRIB'
Fungicide applied: 7 Aug VT/R1

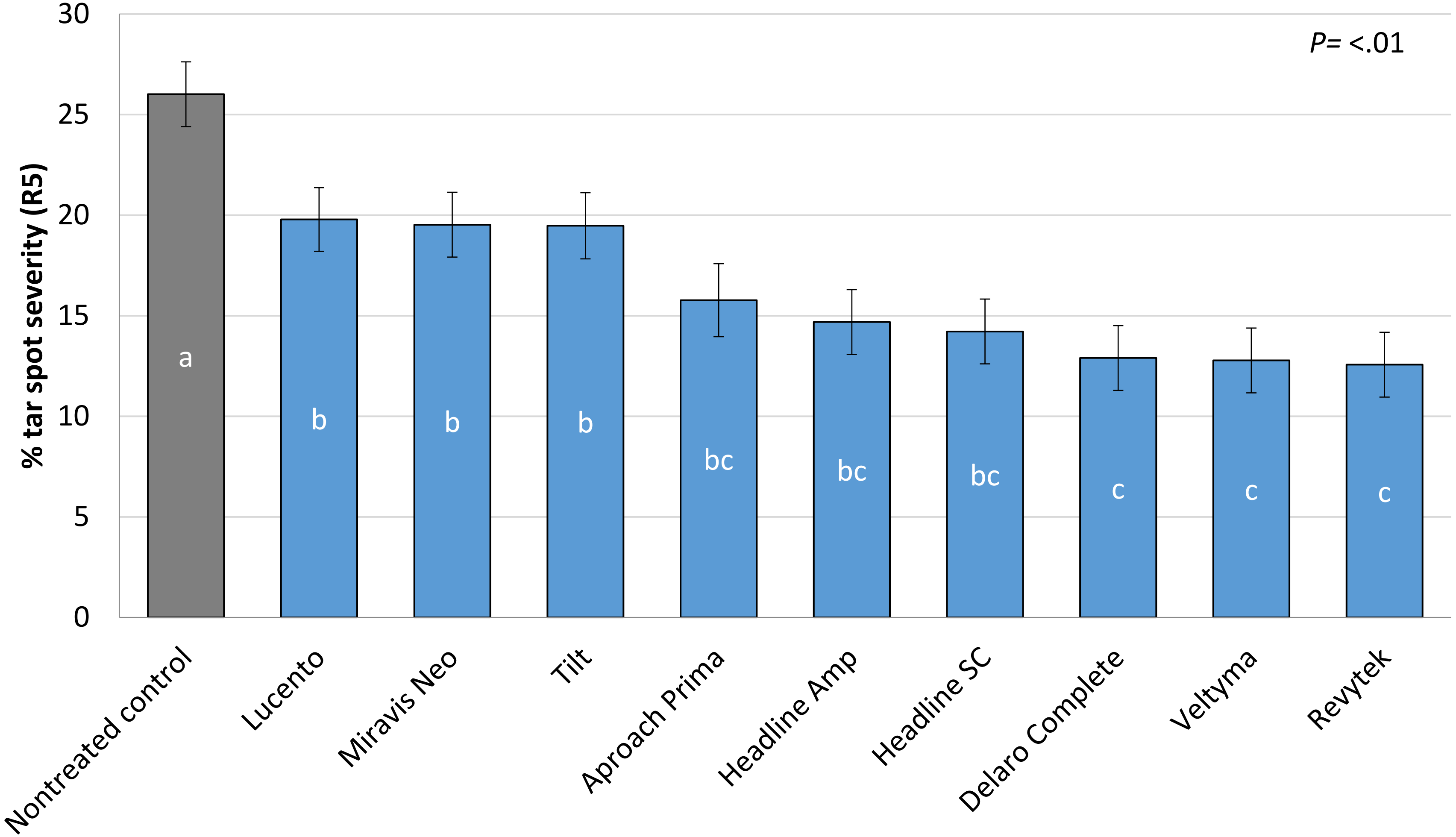
28 July - tar spot first detected

TELENKO FIELD CROP PATHOLOGY

Rapid development of tar spot in non-treated plots in Indiana 2019. Image on left taken 21 September and the same plot (right) 13 days later on 4 October

Source: Telenko et al. 2022. Fungicide efficacy on tar spot and yield of corn in the Midwestern United States. Plant Health Progress. *https://doi.org/10.1094/PHP-10-21-0125-RS*

Uniform Fungicide Trial on Tar Spot – Disease Severity 2021



2021 trials conducted in Illinois, Indiana, Michigan, Wisconsin, and Ontario, CA (5 environments)

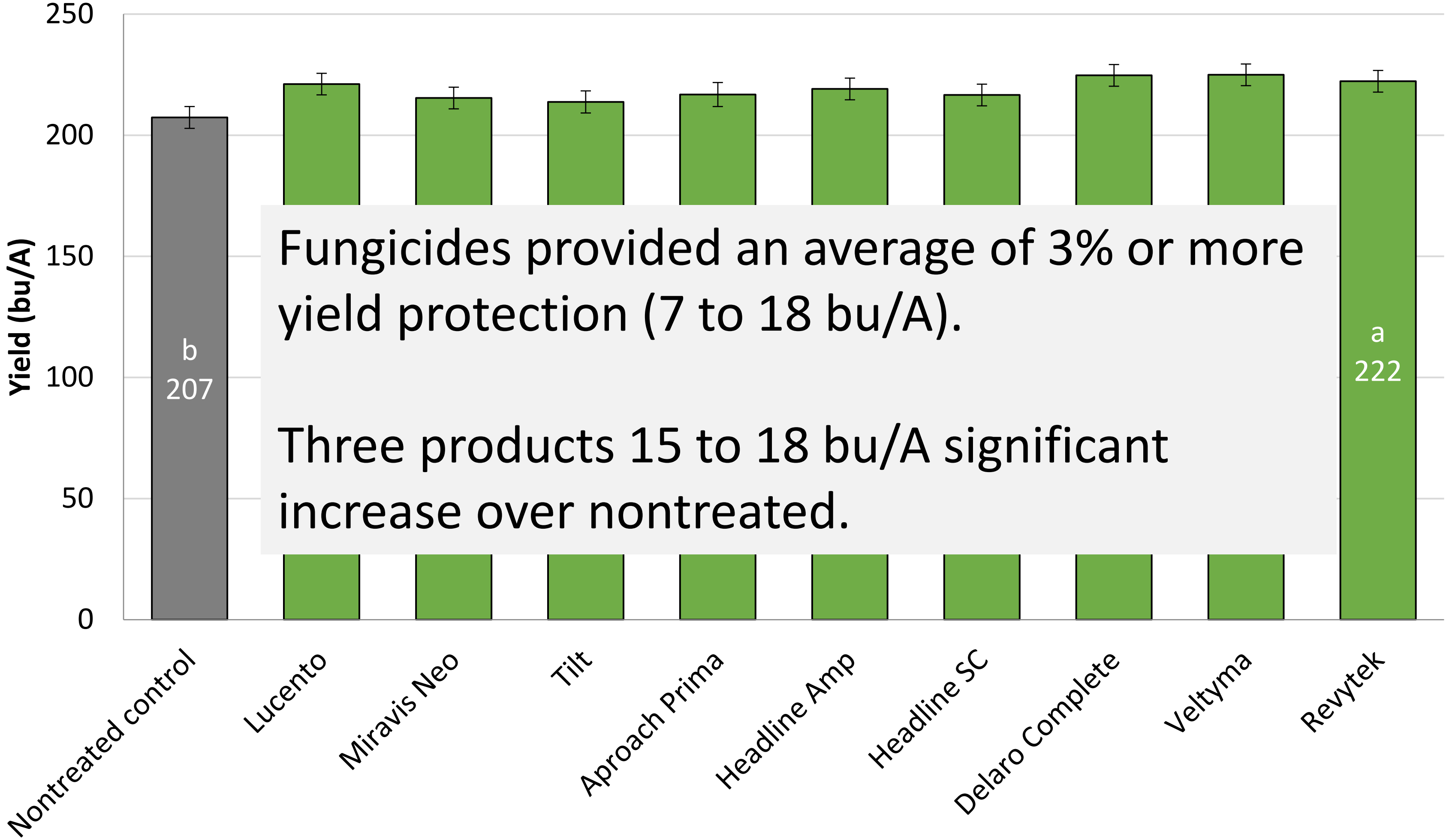
[y] Tar spot severity was rated by visually assessing the percentage of the symptomatic leaf area on the ear leaf at the dent growth stage (R5).

[z] Values are least squares means. Values with different letters are significantly different based on least square means test (α=0.05).

Telenko, D. E. P., Chilvers, M. I., Ames, K., Byrne, A. M., Check, J. C., Da Silva, C. R., Ross†, T. J., Smith, D. L., and Tenuta, A. 2022. Fungicide efficacy during a severe epidemic of tar spot on corn in the United States and Canada. Plant Health Progress. doi.org/10.1094/PHP-02-22-0012-BR.

TELENKO FIELD CROP PATHOLOGY

Uniform Fungicide Trial on Tar Spot – Yield 2021



Fungicides provided an average of 3% or more yield protection (7 to 18 bu/A).

Three products 15 to 18 bu/A significant increase over nontreated.

2021 trials conducted in Illinois, Indiana, Michigan, Wisconsin, and Ontario, CA (5 environments)

P= 0.004

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TELENKO FIELD CROP PATHOLOGY

Fungicide Timing – Indiana 2019, 2020, 2021

Fungicide: Trivapro 13.7 fl oz/A (benzovindiflupyr + azoxystrobin + propiconazole)

First detection of tar spot

Trials COR19-05/COR20-05/COR21-03
Location: PPAC
Hybrid: 'W2585SSRIB'

2019 — **13 Jul**

- V7 – 8 Jul
- V9 – 15 Jul
- V10 – 19 Jul
- VT/R1 – 7 Aug
- R2 – 23 Aug
- V7 fb VT – 8 Jul, 7 Aug
- Tarspotter – no app

2020 — **28 Jul**

- V8 – 14 Jul
- V10 – 20 Jul
- VT/R1 – 7 Aug
- R2 – 21 Aug
- R3 – 2 Sep
- R4 – 11 Sep
- R5 – 23 Sep
- V8 fb VT – 14 Jul,7 Aug
- Tarspotter – no app

2021 — **3 Jul**

- V8 – 23 Jul
- V12 – 2 Aug
- R1 – 6 Aug
- R2 – 20 Aug
- R3 – 30 Aug
- R4 – 10 Sep
- R5 – 16 Sep
- V8 fb R1 – 23 Jul, 6 Aug
- Tarspotter – 2 Aug

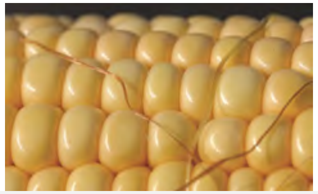

V7-V12 Vegetative


VT-Tassel


R1-Silk


R2 – Blister

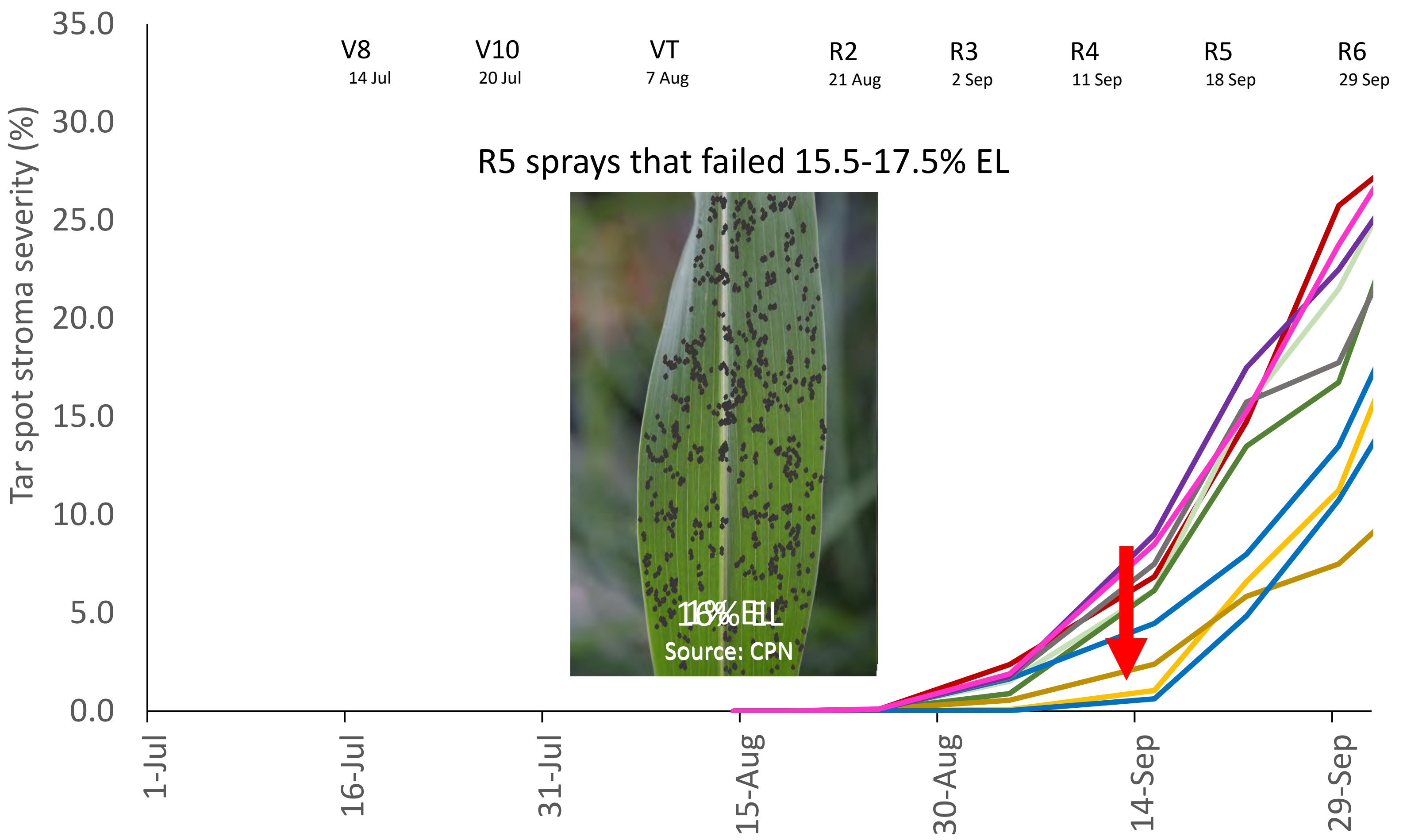

R3 – Milk


R4- Dough


R5 - Dent

*Photos courtesy of C. Gerber Dept. Agronomy

Fungicide Timing and Model Validation for Tar Spot in Corn – Disease Progress, Indiana 2020

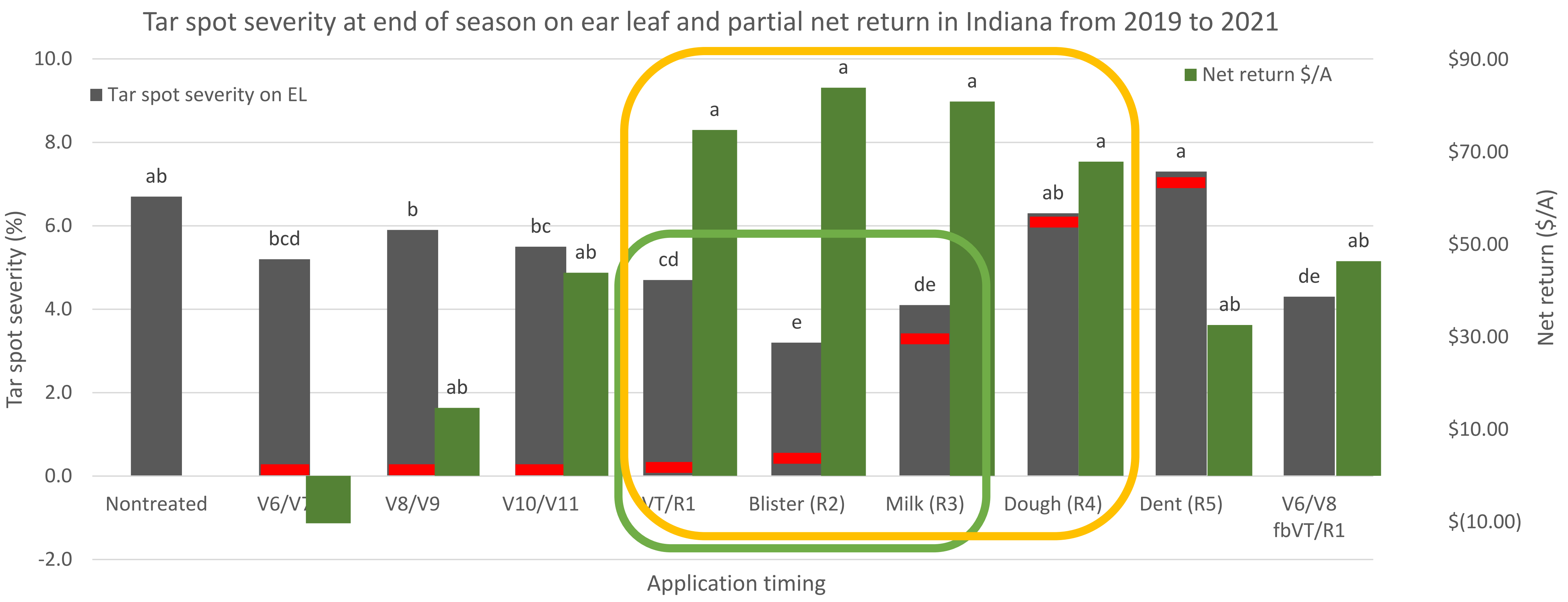


R2 sprays good 0.01-0.3% EL
R3 sprays okay – 1.65-2.2% EL

R4 sprays that failed 5.9-7.5% EL
R5 sprays that failed 15.5-17.5% EL

Trial COR20-05
Location: PPAC
Hybrid: 'W2585SSRIB'
Fungicide: Trivapro 13.7 fl oz/A
28 July 2020 tar spot first detected

TELENKO FIELD CROP PATHOLOGY



Location: PPAC
Hybrid: 'W2585SSRIB'
Fungicide: Trivapro 13.7 fl oz/A

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TELENKO FIELD CROP PATHOLOGY

Net returns from foliar fungicides and timed applications on tar spot management in Indiana

To assess **yield response and net return**, site-years were groups into **two baseline disease severity condition groups:**

1. **High disease condition (TS high ≥ 5%)** – Tar spot severity in nontreated plots was ≥5%.
2. **Low disease condition (TS low < 5%)** – Tar spot severity in the nontreated plots was <5%.

Site-years	Severity of tar spot stroma (%)	Severity of tar spot foliar symptoms (%)	
FUNGICIDE EFFICACY TRIALS			
Wanatah 2019	29.6	41.8	TS high ≥ 5%
Wanatah 2020	30.7	75.3	
Wanatah 2021	33.0	100.0	
West Lafayette 2019	0.0	0.0	TS low < 5%
West Lafayette 2020	0.1	0.0	
FUNGICIDE TIMING TRIALS			
Wanatah 2019	27.1	69.5	TS high ≥ 5%
Wanatah 2020	29.2	55.9	
Wanatah 2021	35.5	92.3	
West Lafayette 2019	0.0	0.0	TS low < 5%
West Lafayette 2020	0.3	0.0	

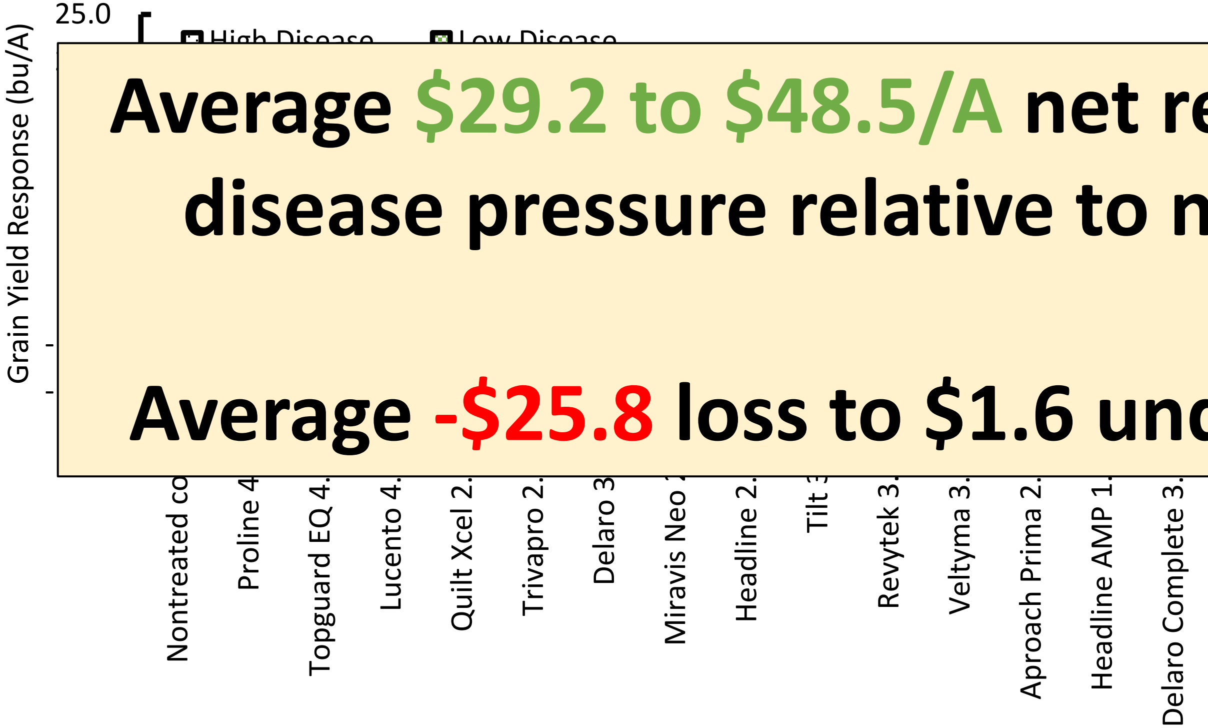
Ross, T. J., Allen, T. W., Shim, S., Thompson, N. M., and Telenko, D. E. P. 2023. Investigations into economic returns resulting from foliar fungicides and application timing on management of tar spot in Indiana hybrid corn. Plant Disease. https://doi.org/10.1094/PDIS-05-23-0932-RE

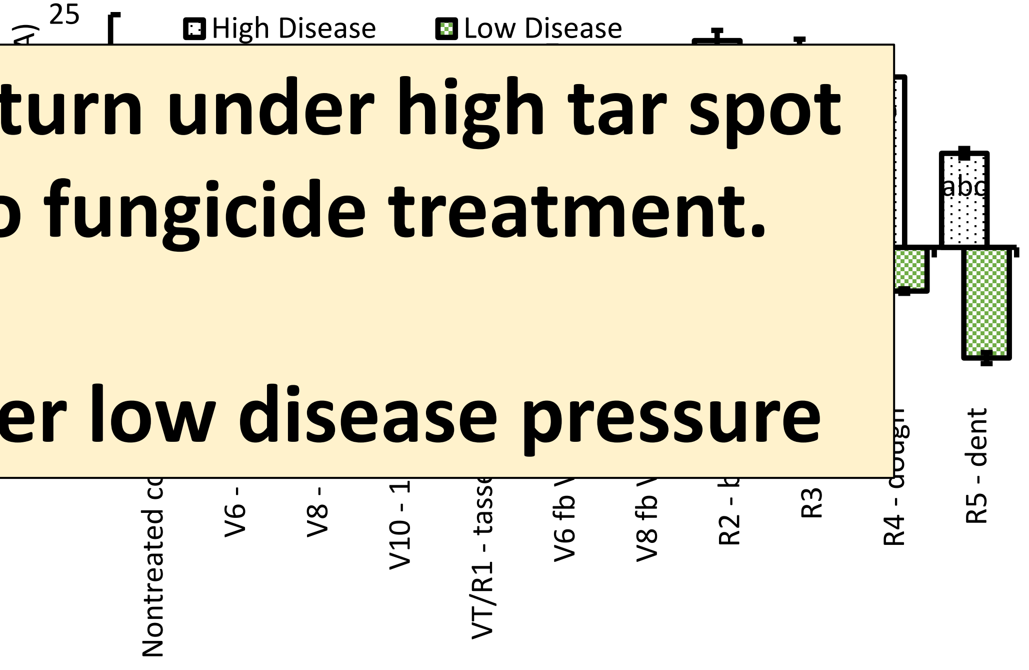
TELENKO FIELD CROP PATHOLOGY

Net returns from foliar fungicides and application timing on tar spot management in Indiana

TS high - average yield increase 9.5 bu/A (range = -1.2 to 18.7 bu/A)
TS low – average yield increase 3.0 bu/A (range = -7.8 to 11.1 bu/A)

TS high - average yield increase 14.6 bu/A (range = 6.2 to 22.2 bu/A)
TS low – average yield increase - 2.7 bu/A (range = -11.9 to 9.3 bu/A)





Average $29.2 to $48.5/A net return under high tar spot disease pressure relative to no fungicide treatment.

Average -$25.8 loss to $1.6 under low disease pressure

Ross, T. J., Allen, T. W., Shim, S., Thompson, N. M., and Telenko, D. E. P. 2023. Investigations into economic returns resulting from foliar fungicides and application timing on management of tar spot in Indiana hybrid corn. Plant Disease. https://doi.org/10.1094/PDIS-05-23-0932-RE

TELENKO FIELD CROP PATHOLOGY

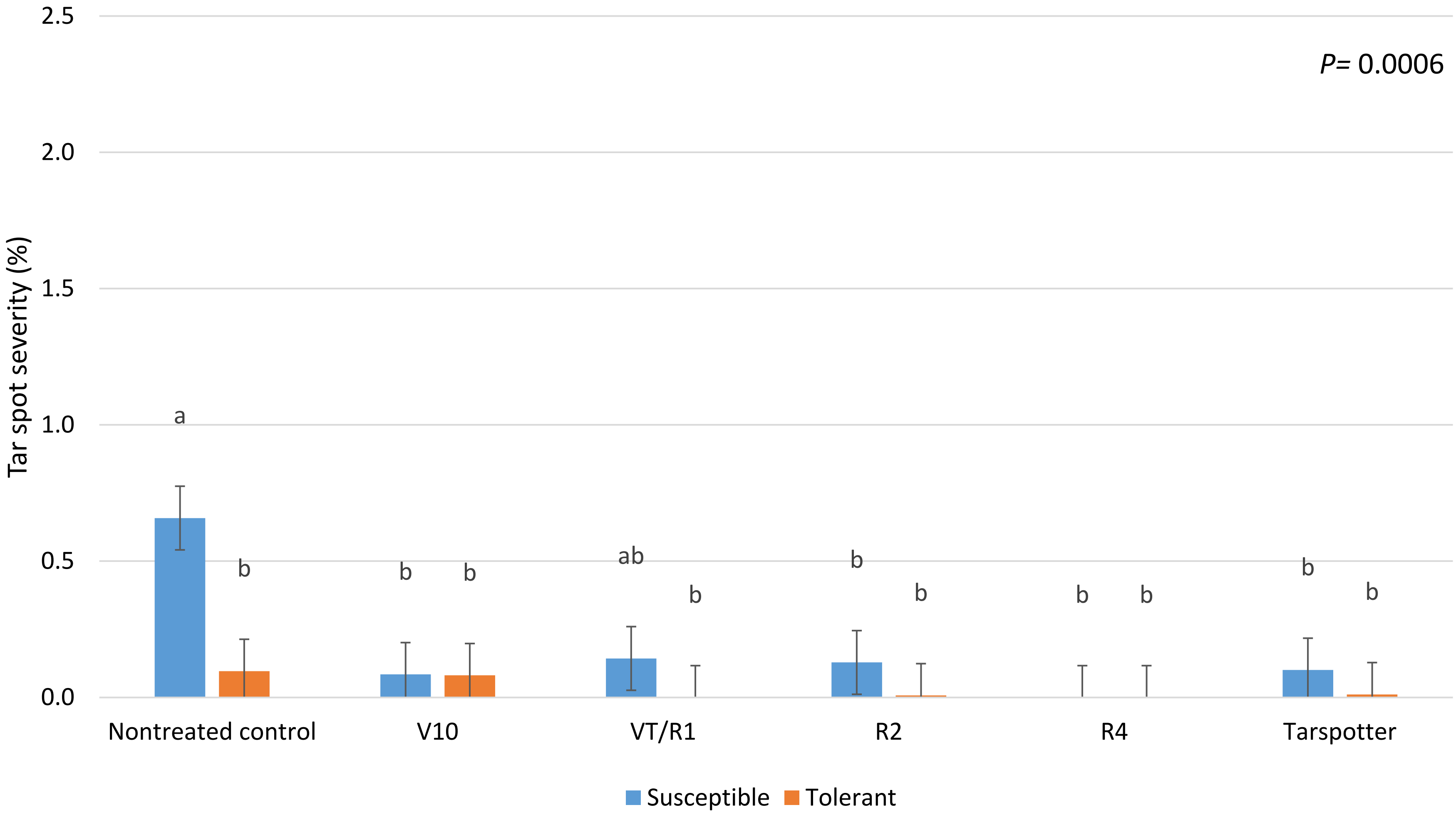
Hybrid by Fungicide Timing Trials on Tar Spot Indiana 2022 and 2023

Hybrids	**Dates 2022**	**Dates 2023**
Tar spot susceptible	planted 20 May	planted 18 May
Tar spot tolerant	planted 20 May	planted 18 May
Fungicide Programs		
Nontreated control		
Delaro Complete 8 fl oz/A at V10	21 Jul	25 Jul
Delaro Complete 8 fl oz/A at VT/R1	2 Aug	3 Aug
Delaro Complete 8 fl oz/A at R2	12 Aug	22 Aug
Delaro Complete 8 fl oz/A at R4	23 Aug	29 Aug
Delaro Complete 8 fl oz/A based on Tarspotter	V8 14 Jul fb VT/R1 2 Aug	R2 17 Aug fb R4 29 Aug
Tar spot first detection	1 Sep	31 Jul

Grant no. 2022-68008-36510

Hybrid by Fungicide – **LOW** Disease Severity at R6 in 2022

Grant no. 2022-68008-36510

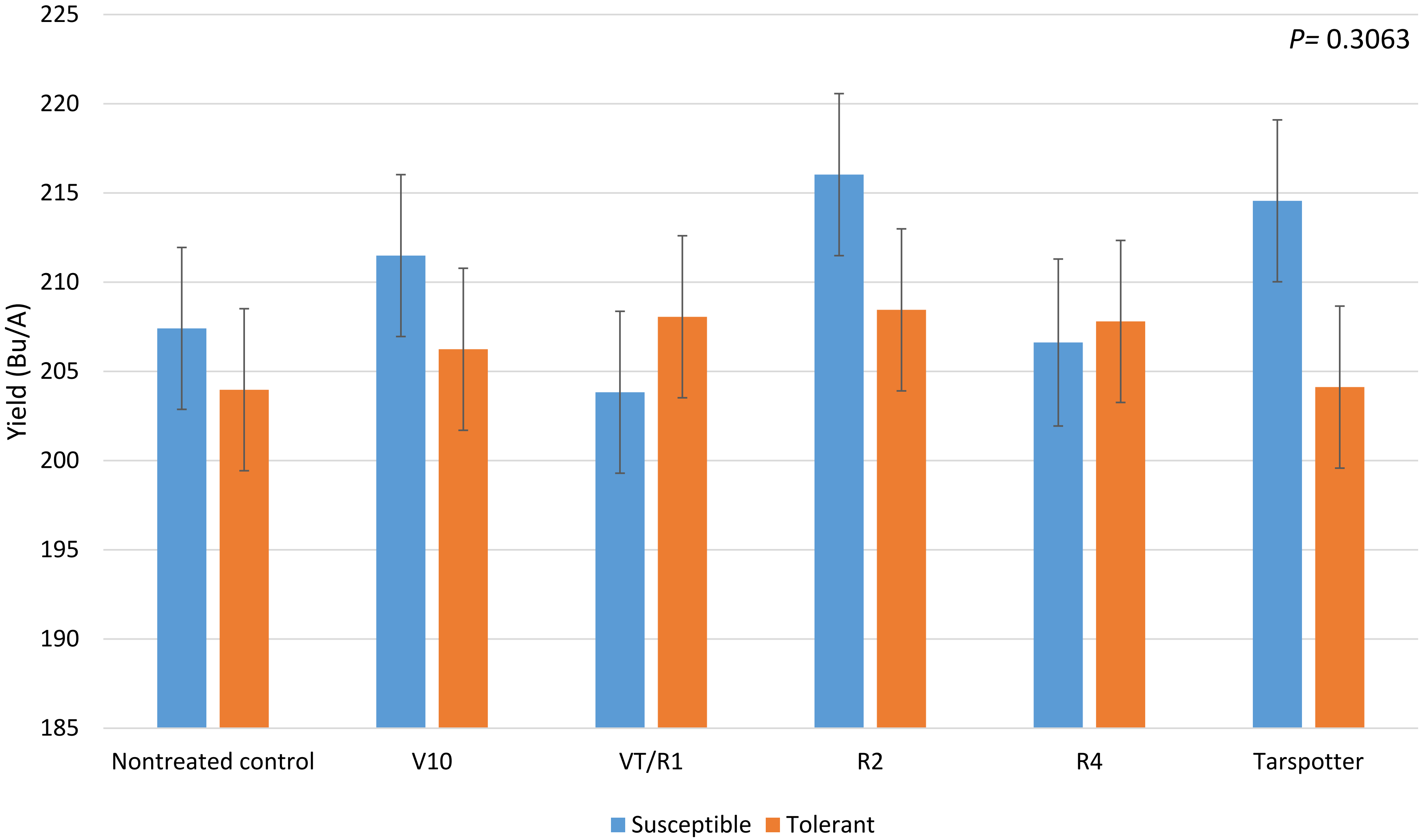


2022 trials conducted in Indiana, Michigan, Wisconsin, and Ontario, CA
(4 environments)

[z] Values are least squares means. Values with different letters are significantly different based on least square means test (α=0.05).
[y] Tar spot severity was rated by visually assessing the percentage of the symptomatic leaf area on the ear leaf at the mature growth stage (R6).

Hybrid by Fungicide – Yield 2022

Grant no. 2022-68008-36510



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Indiana 2023

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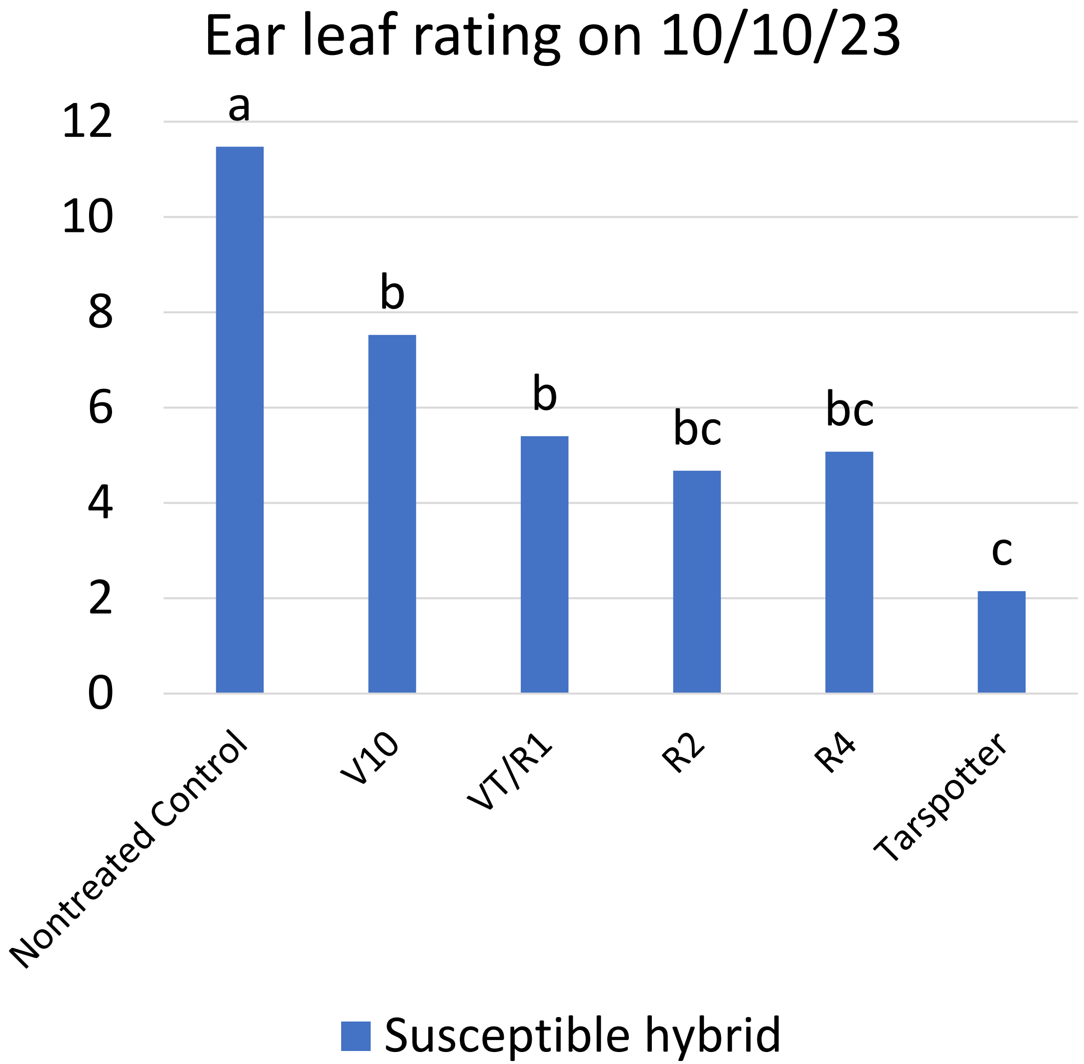

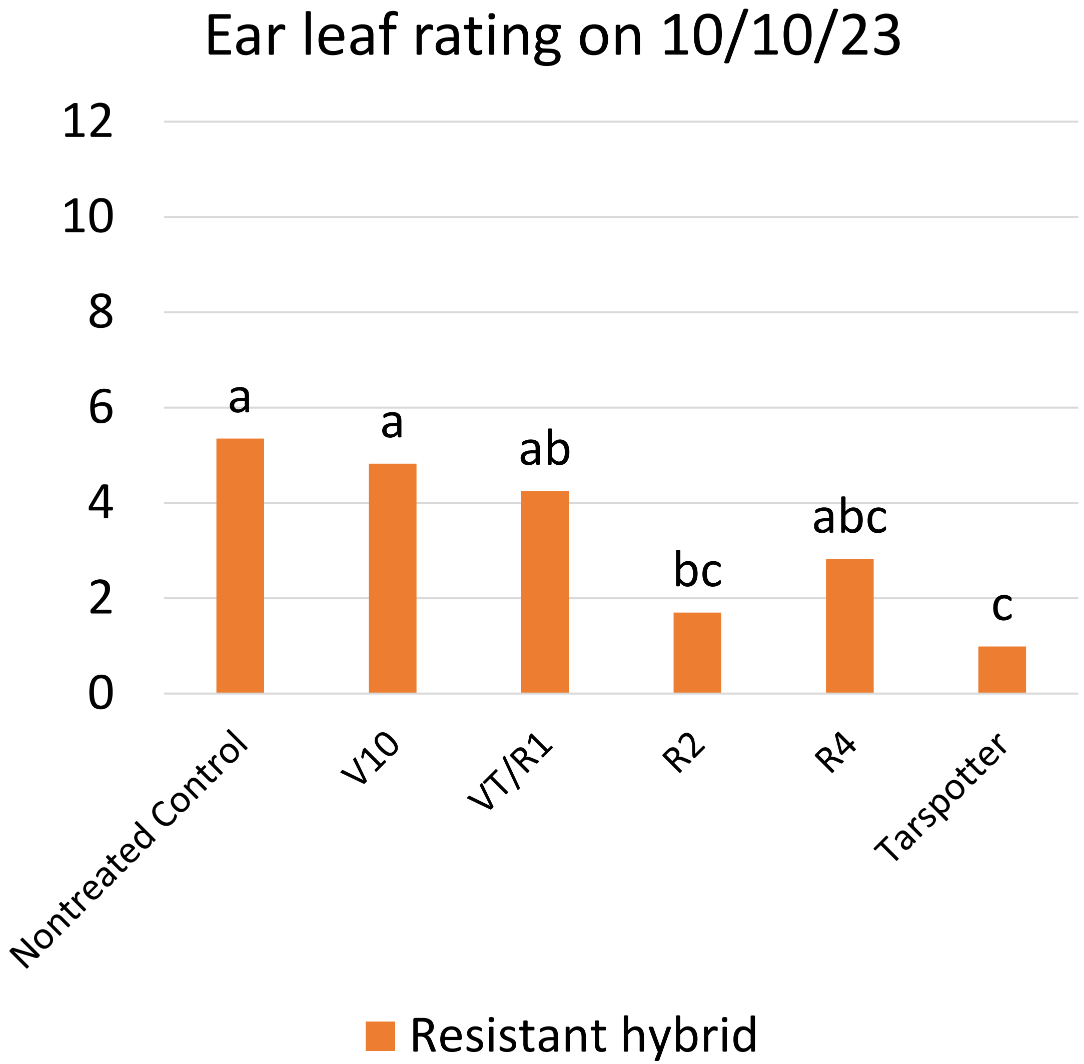

Indiana 2023

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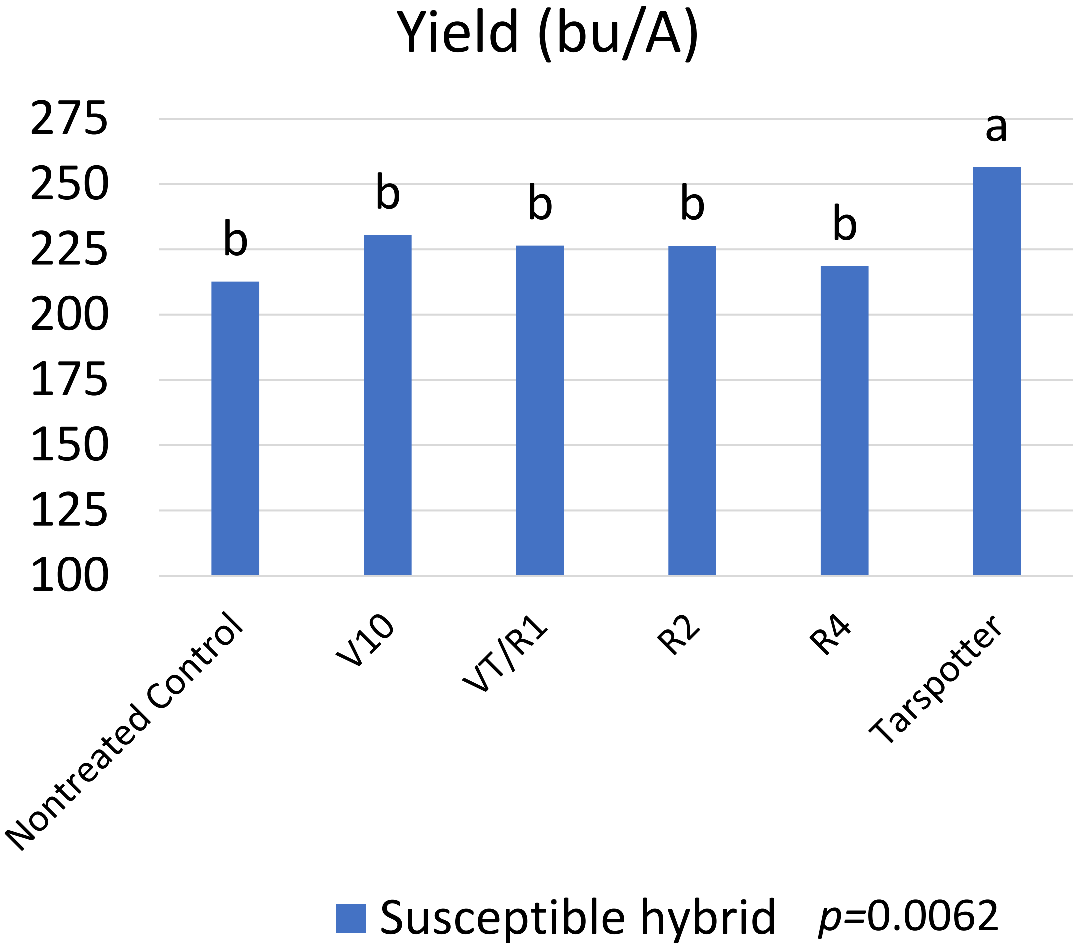
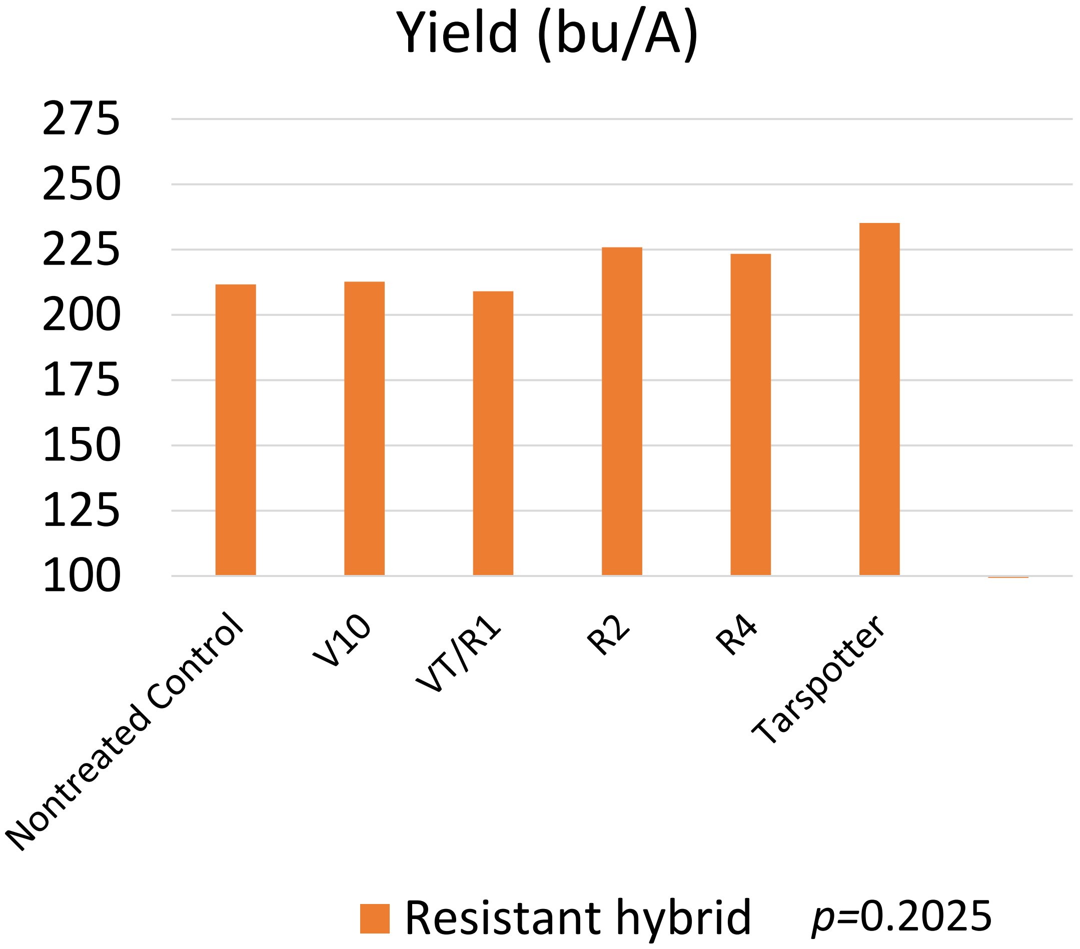




TELENKO FIELD CROP PATHOLOGY

Fungicide Efficacy Resource for Corn

CROP PROTECTION NETWORK
A Product of Land Grant Universities

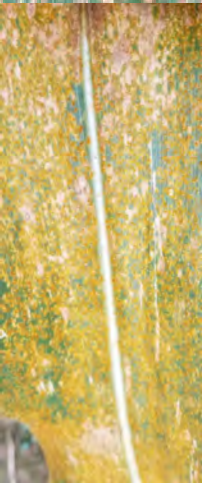
Fungicide mode of action groups:
Group 11 QoI Strobilurins
Group 3 DMI Triazoles
Group 7 SDHI

Efficacy categories:
NR=Not Recommended; P=Poor; F=Fair; G=Good; VG=Very Good; E=Excellent; NL = Not Labeled for use against this disease; U = Unknown efficacy or insufficient data to rank product

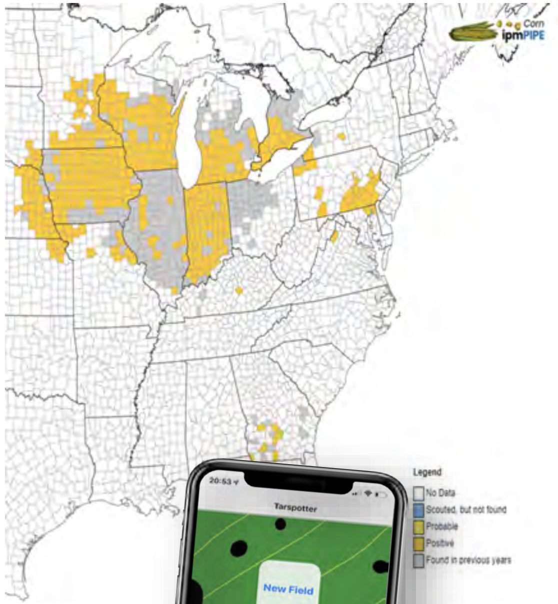
Fungicide Efficacy for Control of Corn Diseases Table (03/2021)

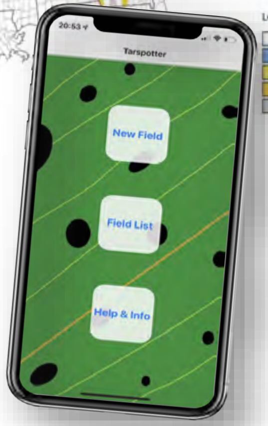
Group	Active ingredient (%)	Product/Trade name	Rate/A (fl oz)	Anthracnose leaf blight	Common rust	Eyespot	Gray leaf spot	Northern corn leaf blight	Southern rust	Tar spot[1]	Harvest restriction[2]
11	Azoxystrobin 22.9%	Quadris 2.08 SC, multiple generics	6.0 - 15.5	VG	E	VG	E	G	VG	NL	7 days
11	Pyraclostrobin 23.6%	Headline 2.09 EC/SC	6.0 - 12.0	VG	E	E	E	VG	VG	NL	7 days
11	Picoxystrobin	Aproach 2.08 SC	3.0 – 12.0	VG	VG-E	VG	F-VG	VG	G	G[3]	7 days
3	Flutriafol 20.9%	Xyway LFR 1.92 SC Xyway 3D 2.5 SC	LFR: 7.6-15.2 3D: 5.8-11.8	NL	U	NL	VG-E	VG	NL	NL	N/A
3	Propiconazole 41.8%	Tilt 3.6 EC, multiple generics	2.0 - 4.0	NL	VG	E	G	G	F	NL	30 days
3	Prothioconazole 41.0%	Proline 480 SC	5.7	U	VG	E	U	VG	G	NL	14 days
3	Tebuconazole 38.7%	Folicur 3.6 F, multiple generics	4.0 - 6.0	NL	U	NL	U	VG	F	NL	36 days
3	Tetraconazole 20.5%	Domark 230 ME	4.0 – 6.0	U	U	U	E	VG	G	G-VG[3]	R3 (milk)
11 3	Azoxystrobin 13.5% Propiconazole 11.7%	Quilt Xcel 2.2 SE, multiple generics	10.5 - 14.0	VG	VG-E	VG-E	E	VG	VG	G-VG[3]	30 days
7 11 3	Benzovindiflupyr 2.9% Azoxystrobin 10.5% Propiconazole 11.9%	Trivapro 2.21 SE	13.7	U	U	U	E	VG	E	G-VG	30 days
3 11	Cyproconazole 7.17% Picoxystrobin 17.94%	Aproach Prima 2.34 SC	3.4 – 6.8	U	U	U	E	VG	G	G-VG[3]	30 days

TELENKO FIELD CROP PATHOLOGY



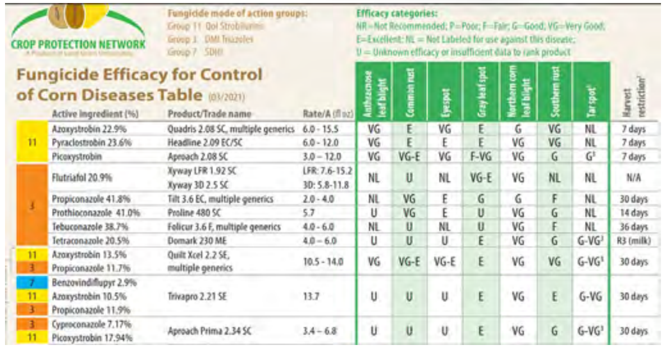
Recommendations: Tar Spot Disease Management





- **Assess risk – is it endemic in your area? Scout!!**
- **Talk to your seed salesperson about hybrid resistance**
- **Consider fungicides**
  - Mixed mode of action
  - **Timing very important, use maps and apps**
  - Application will need to occur close to the onset of the epidemic
  - If applying fungicides be sure to leave check strips
- **Manage irrigation**
- ~~**Rotate to other crops and residue management**~~

Less effective for tar spot



CROP PROTECTION NETWORK

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11	Picoxystrobin	Aproach 2.08 SC	3.0 – 12.0	VG	VG-E	VG	F-VG	VG	G	G[3]	7 days
3	Flutriafol 20.9%	Xyway LFR 1.92 SC Xyway 3D 2.5 SC	LFR: 7.6-15.2 3D: 5.8-11.8	NL	U	NL	VG-E	VG	NL	NL	N/A
3	Propiconazole 41.8%	Tilt 3.6 EC, multiple generics	2.0 - 4.0	NL	VG	E	G	G	F	NL	30 days
3	Prothioconazole 41.0%	Proline 480 SC	5.7	U	VG	E	U	VG	G	NL	14 days
3	Tebuconazole 38.7%	Folicur 3.6 F, multiple generics	4.0 - 6.0	NL	U	NL	U	VG	F	NL	36 days
3	Tetraconazole 20.5%	Domark 230 ME	4.0 – 6.0	U	U	U	E	VG	G	G-VG[3]	R3 (milk)
11 3	Azoxystrobin 13.5% Propiconazole 11.7%	Quilt Xcel 2.2 SE, multiple generics	10.5 - 14.0	VG	VG-E	VG-E	E	VG	VG	G-VG[3]	30 days
7 11 3	Benzovindiflupyr 2.9% Azoxystrobin 10.5% Propiconazole 11.9%	Trivapro 2.21 SE	13.7	U	U	U	E	VG	E	G-VG	30 days
3 11	Cyproconazole 7.17% Picoxystrobin 17.94%	Aproach Prima 2.34 SC	3.4 – 6.8	U	U	U	E	VG	G	G-VG[3]	30 days

Telenko, D., Chilvers, M., Kleczewski, N., Mueller, D., Plewa, D., Robertson, A., Smith, D., Tenuta, A., and Wise, K. 2020. Tar Spot. CPN 2012-W. doi.org/10.31274/cpn-20190620-008.

TELENKO FIELD CROP PATHOLOGY

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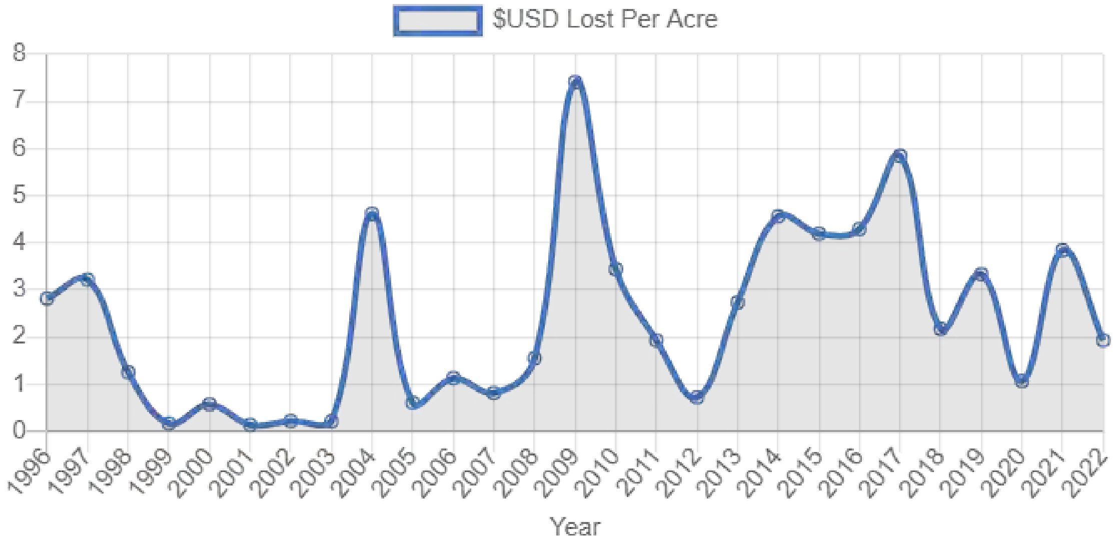
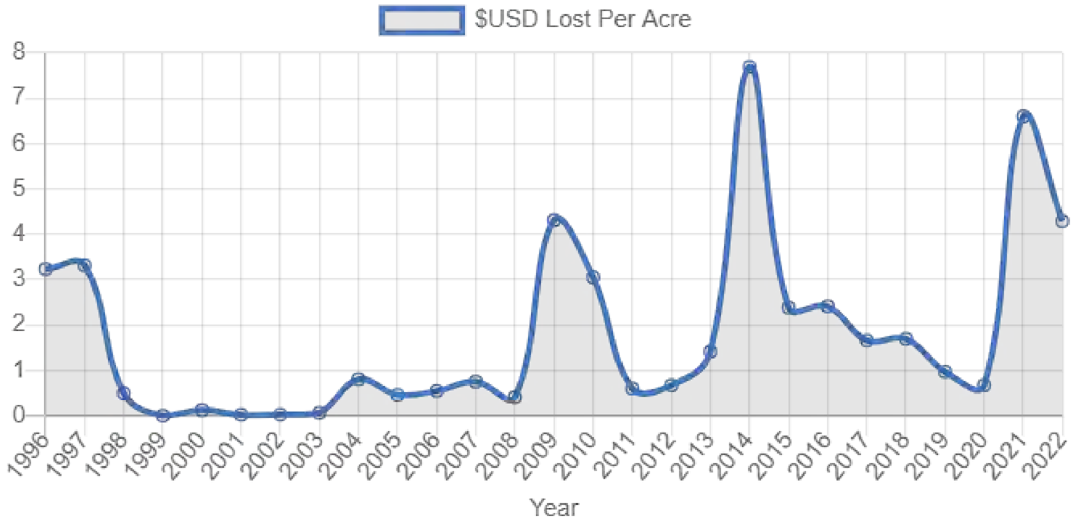
Estimated damage of white mold ($/acre) to soybean grown in the U.S. and Indiana

U.S



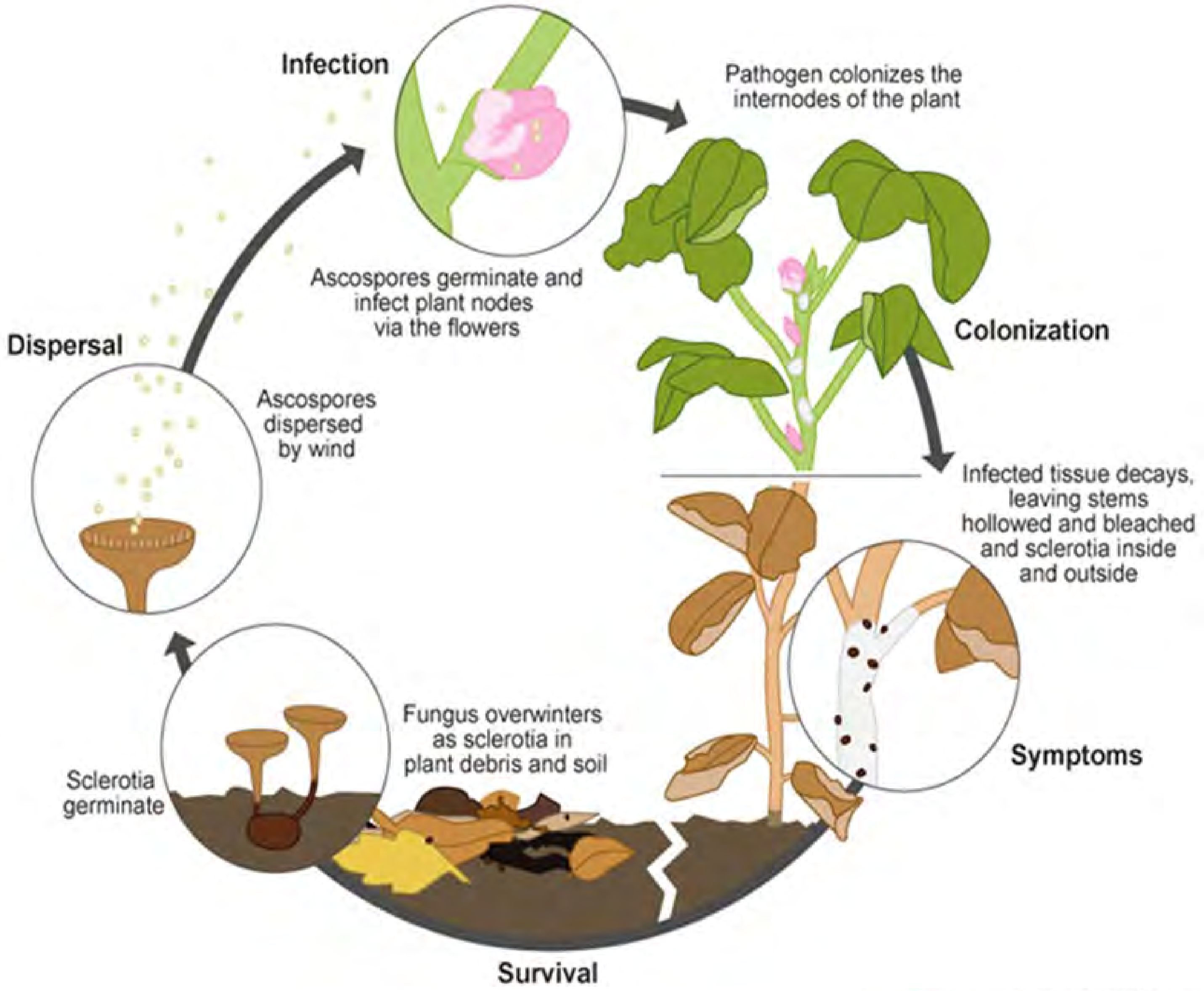
Indiana



Source: Crop Protection Network

White mold disease cycle

Process requires:
-moderate temperatures (≤21 C [70 F] averages; Nighttime temps matter a lot!)
-high humidity (not necessarily excessive rain)
-Between row canopy closure of 40% or more



The Main Questions

- When should I spray for white mold?
  - What fungicides work for managing white mold?
- Is there genetic resistance to white mold?
- What cultural practices should I use in my integrated management strategy for white mold?
- What other technologies can I utilize for white mold management?

SSR Prediction and Using Fungicides to Manage the Disease

Willbur, J.F., Fall, M.L., Blackwell, T., Bloomingdale, C.A., Byrne, A.M., Chapman, S.A., Holtz, D., Isard, S.A., Magarey, R.D., McCaghey, M., Mueller, B.D., Russo, J.M., Schlegel, J., Chilvers, M.I., Mueller, D.S., and Smith, D.L. 2018. Weather-based models for assessing the risk of Sclerotinia sclerotiorum apothecial presence in soybean (Glycine max) fields. Plant Disease. DOI:10.1094/PDIS-04-17-0504-RE

Willbur, J.F., Fall, M.L., Byrne, A.M., Chapman, S.A., McCaghey, M.M., Mueller, B.D., Schmidt, R., Chilvers, M.I., Mueller, D.S., Kabbage, M., Giesler, L.J., Conley, S.P., and Smith, D.L. 2018. Validating Sclerotinia sclerotiorum apothecial models to predict Sclerotinia stem rot in soybean (Glycine max) fields. Plant Disease. https://doi.org/10.1094/PDIS-02-18-0245-RE.

Fall, M., Willbur, J., Smith, D.L., Byrne, A., and Chilvers, M. 2018. Spatiotemporal distribution pattern of Sclerotinia sclerotiorum apothecia is modulated by canopy closure and soil temperature in an irrigated soybean field. Phytopathology. https://doi.org/10.1094/PDIS-11-17-1821-RE.

Willbur, J.F., Mitchell, P.D., Fall, M.L., Byrne, A.M., Chapman, S.A., Floyd, C.M., Bradley, C.A., Ames, K.A., Chilvers, M.I., Kleczewski, N.M., Malvick, D.K., Mueller, B.D., Mueller, D.S., Kabbage, M., Conley, S.P., and Smith, D.L. 2019. Meta-analytic and economic approaches for evaluation of pesticide impact on Sclerotinia stem rot control and soybean yield in the North Central U.S. Phytopathology 109:1157-1170.

How Important Are Apothecia?

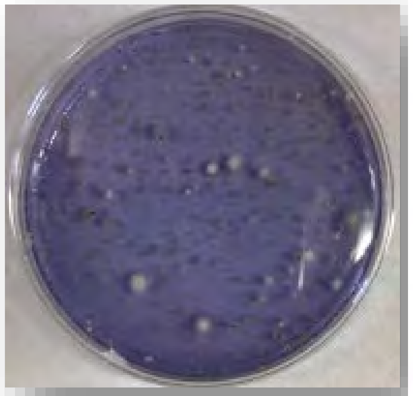
- Formation of apothecia critical for SSR development in soybean

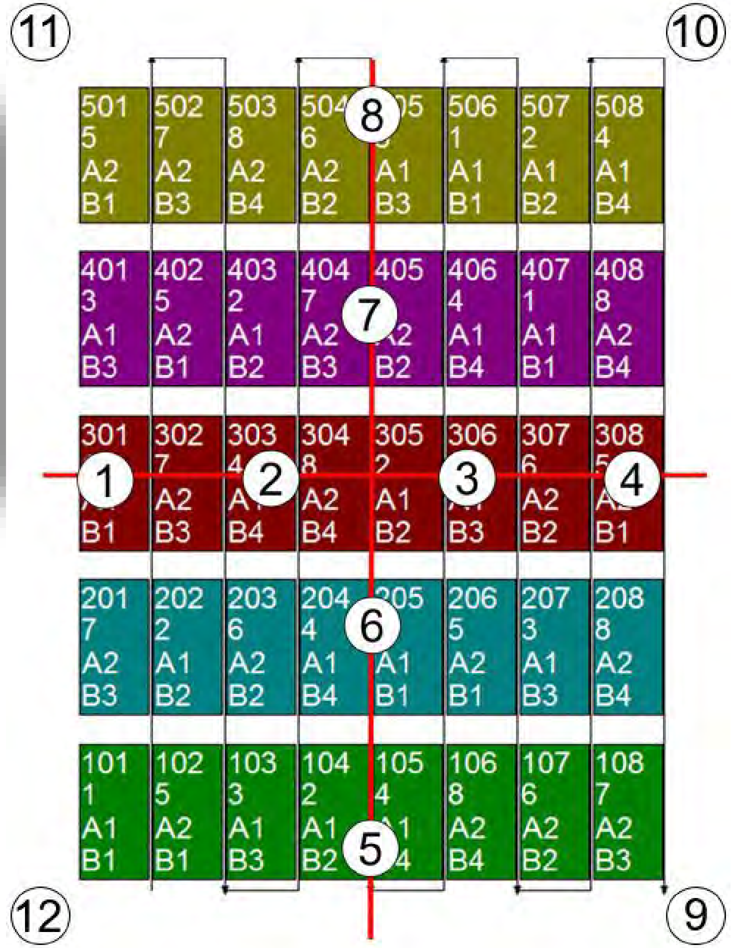
- Majority of infections in soybean occur due to ascospore release from apothecia within the field

Boland and Hall, 1988, Plant Pathology , 37:329-336
Wegulo, Sun, Martinson, and Yang, Can. J. Plant Sci., 80:389-402

Apothecial Mapping and Spore Trapping

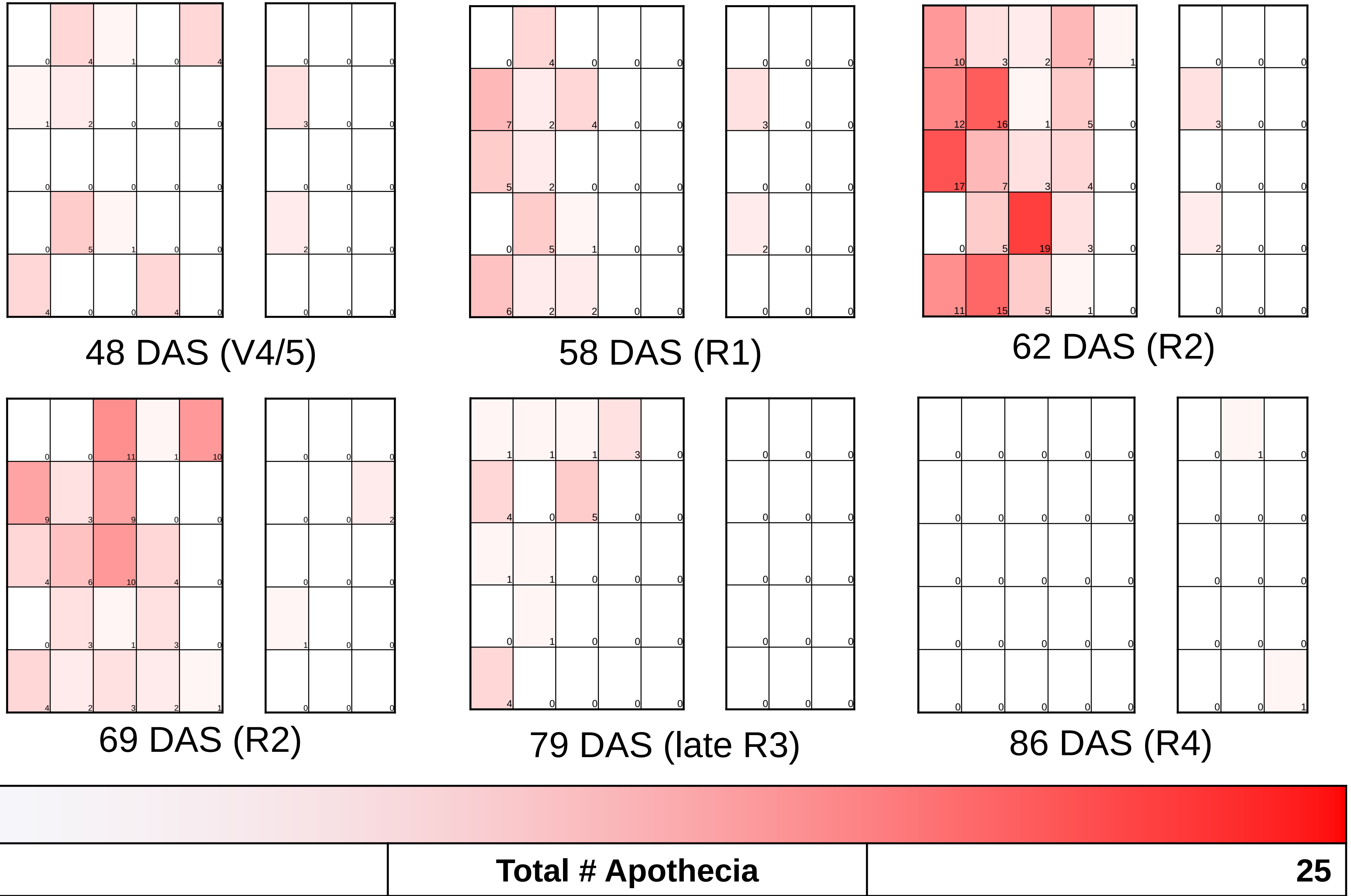
- Using semi-selective media:
- Exposed plates under canopy facing prevailing winds for 3 consecutive hours between 09:00 and 14:00
- Used 8 spore traps placed evenly along transects (shown at right)



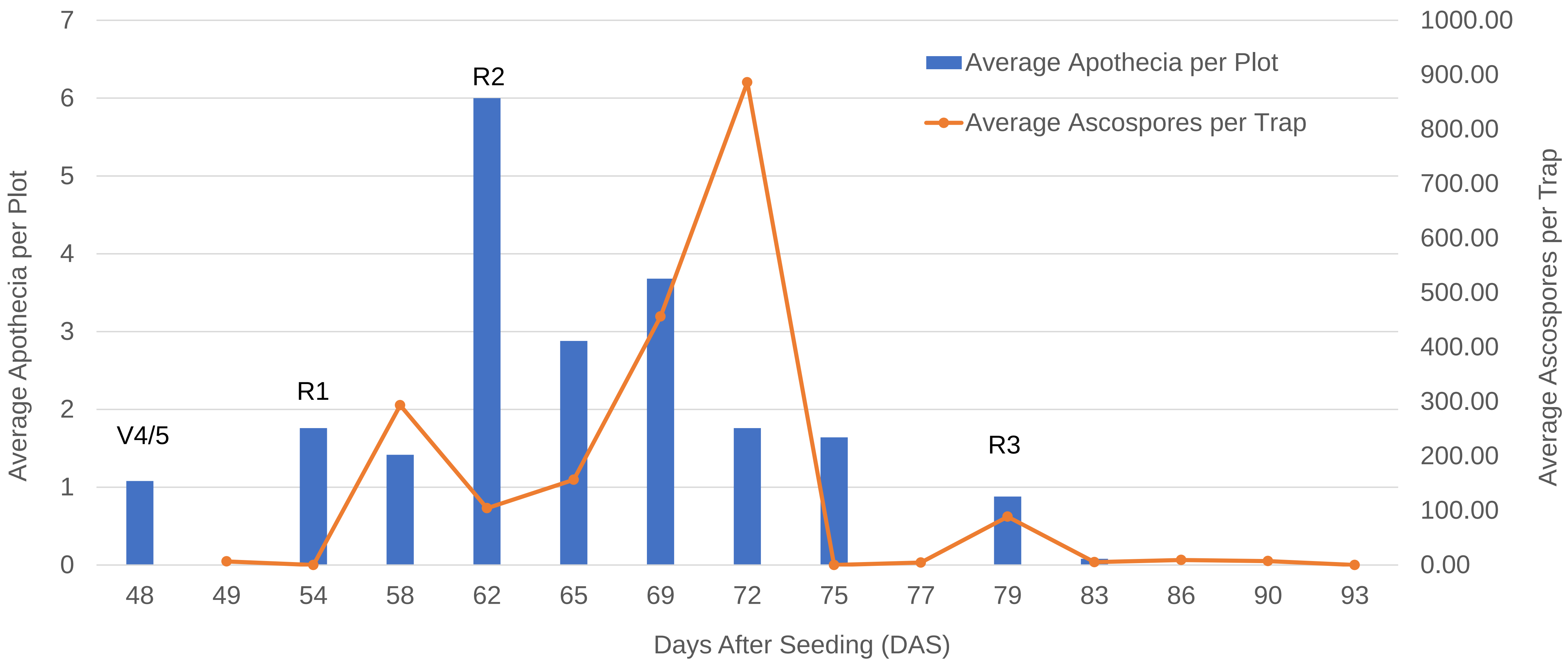


Foster, A. J., Kora, C., McDonald, M. R., & Boland, G. J. (2011). Development and validation of a disease forecast model for Sclerotinia rot of carrot. *Canadian Journal of Plant Pathology*, *33*(2), 187–201. doi:10.1080/07060661.2011.563753

2015 Apothecial Scouting

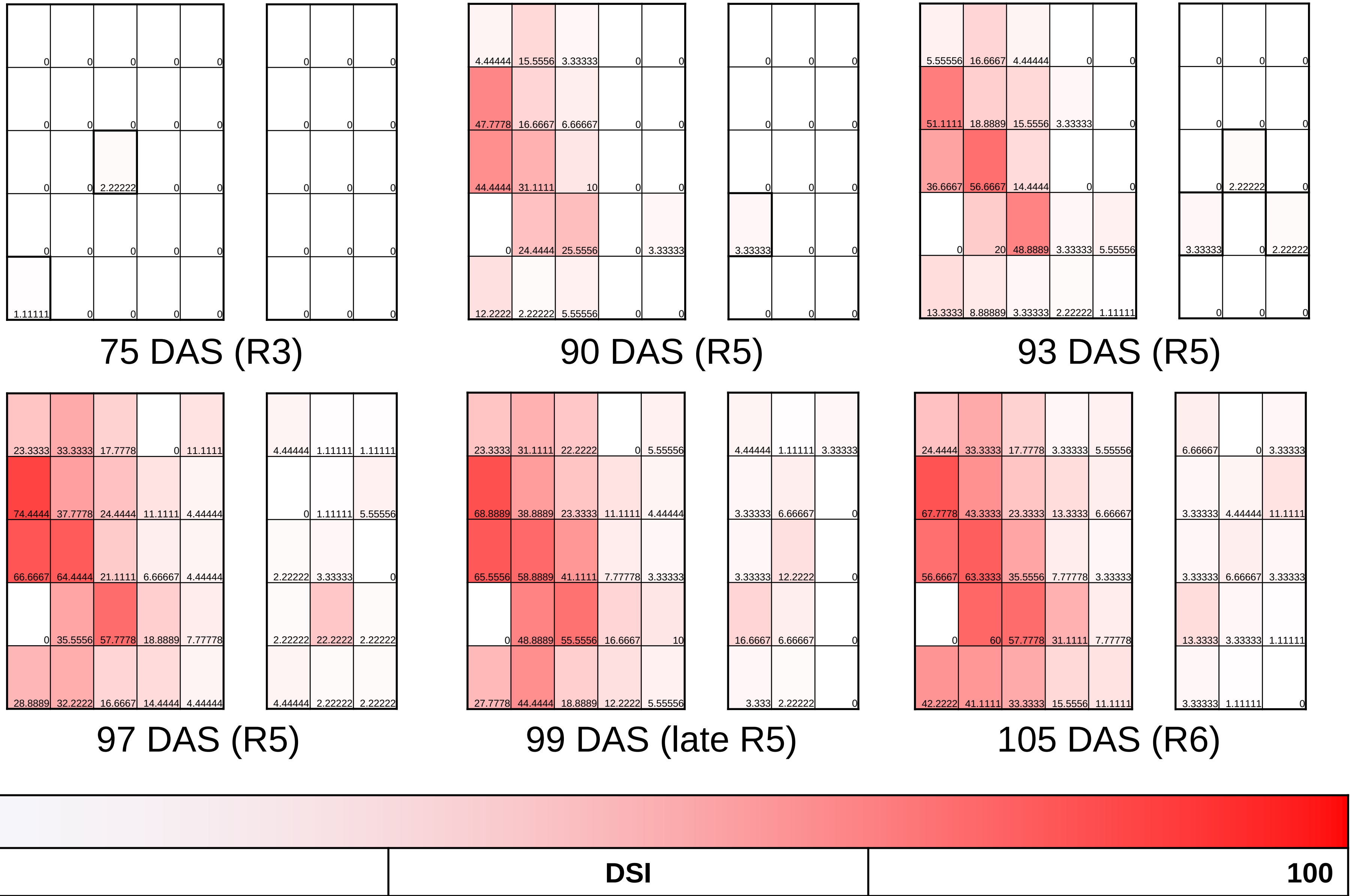


Apothecia and Trap Data



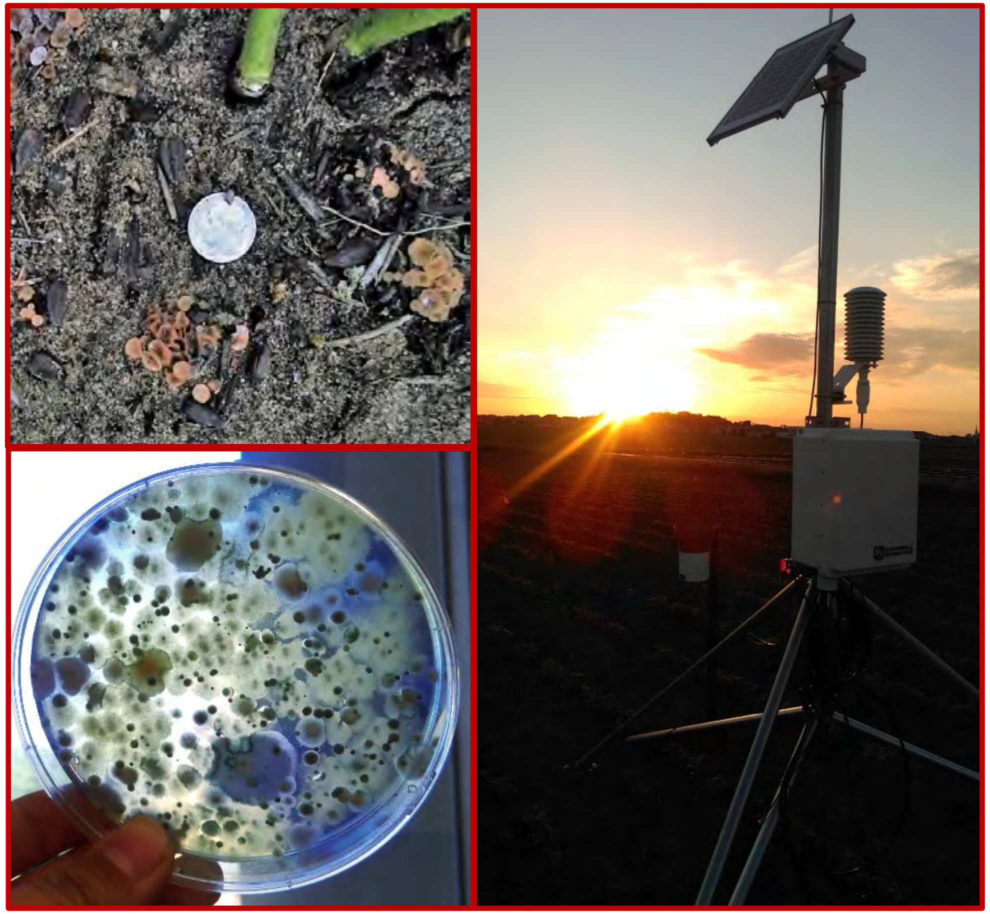
2015 Disease Severity Index

late July to late August (6 ratings)



Data Collection

- Developed standardized protocols for intensive, multi-state apothecial and ascospore monitoring
- Scouted research trials for apothecia in Iowa, Michigan, and Wisconsin
  - **9 site-years (n = 3,866)**
- Monitored ascospores using *Sclerotinia* semi-selective media
- Accessed high-resolution gridded weather data and validated with an on-site Campbell weather station



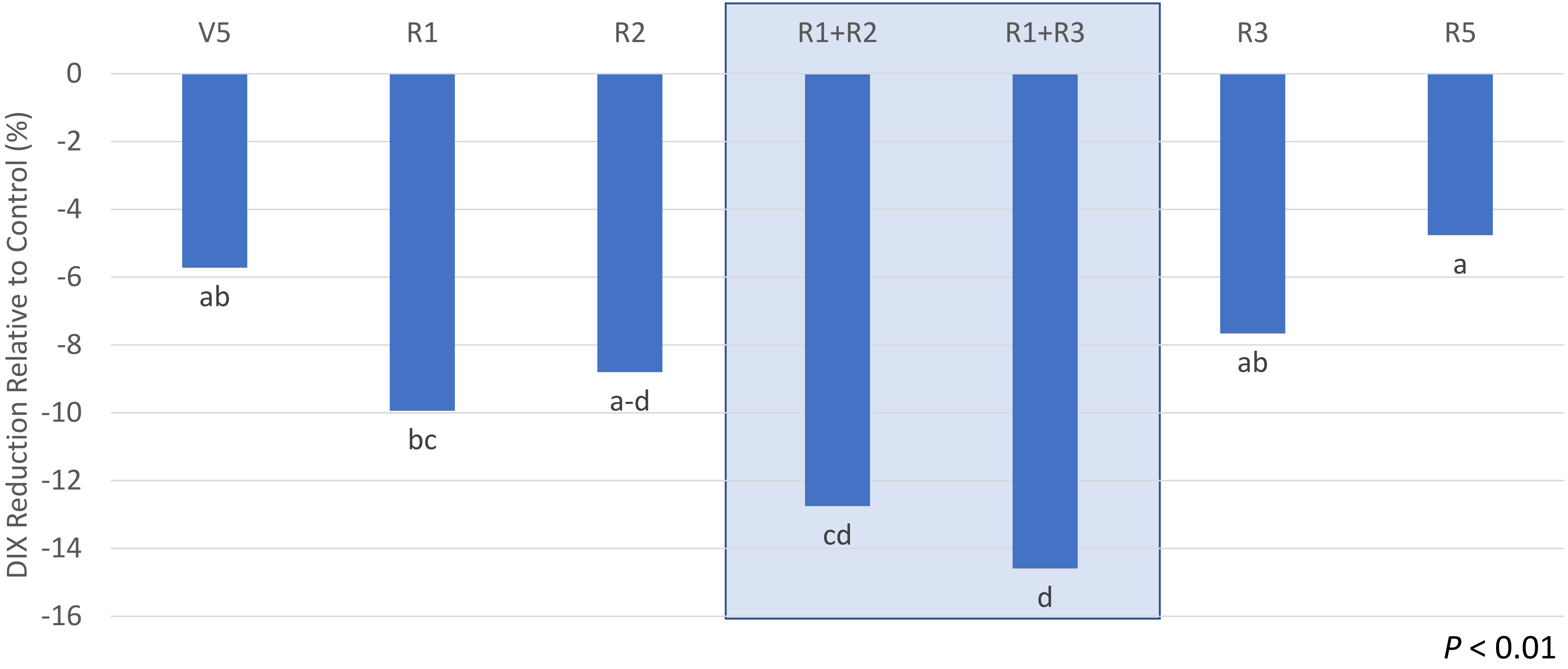
iPhone and Android App - Sporecaster

- Based on Research From 3 publications
  1. Willbur, J.F., Fall, M.L., Blackwell, T., Bloomingdale, C.A., Byrne, A.M., Chapman, S.A., Holtz, D., Isard, S.A., Magarey, R.D., McCaghey, M., Mueller, B.D., Russo, J.M., Schlegel, J., Young, M., Chilvers, M.I., Mueller, D.S., and Smith, D.L. 2018. Weather-based models for assessing the risk of Sclerotinia sclerotiorum apothecial presence in soybean (*Glycine max*) fields. Plant Disease. DOI:10.1094/PDIS-04-17-0504-RE
  2. Willbur, J.F., Fall, M.L., Byrne, A.M., Chapman, S.A., McCaghey, M.M., Mueller, B.D., Schmidt, R., Chilvers, M.I., Mueller, D.S., Kabbage, M., Giesler, L.J., Conley, S.P., and Smith, D.L. 2018. Validating *Sclerotinia sclerotiorum* apothecial models to predict Sclerotinia stem rot in soybean (*Glycine max*) fields. Plant Disease. https://doi.org/10.1094/PDIS-02-18-0245-RE.
  3. Fall, M., Willbur, J., Smith, D.L., Byrne, A., and Chilvers, M. 2018. Spatiotemporal distribution pattern of Sclerotinia sclerotiorum apothecia is modulated by canopy closure and soil temperature in an irrigated soybean field. Phytopathology. https://doi.org/10.1094/PDIS-11-17-1821-RE.
- Available for the U.S. and Canada
- Can be run in the field or at the desk
- Uses a combination of user inputs and GPS-referenced weather information to provide a risk of white mold so you can make a spray decision
- As of Summer, 2021 (Released May 2018)

  -Updated on over **3,000 devices**

  -**500** forecasts per day during July (Peak Period)
- Awarded the 2018 American Society of Agronomy (ASA) Extension Education Community Educational Award in the category of digital decision aids (software, web-based, smartphone and tablet apps)

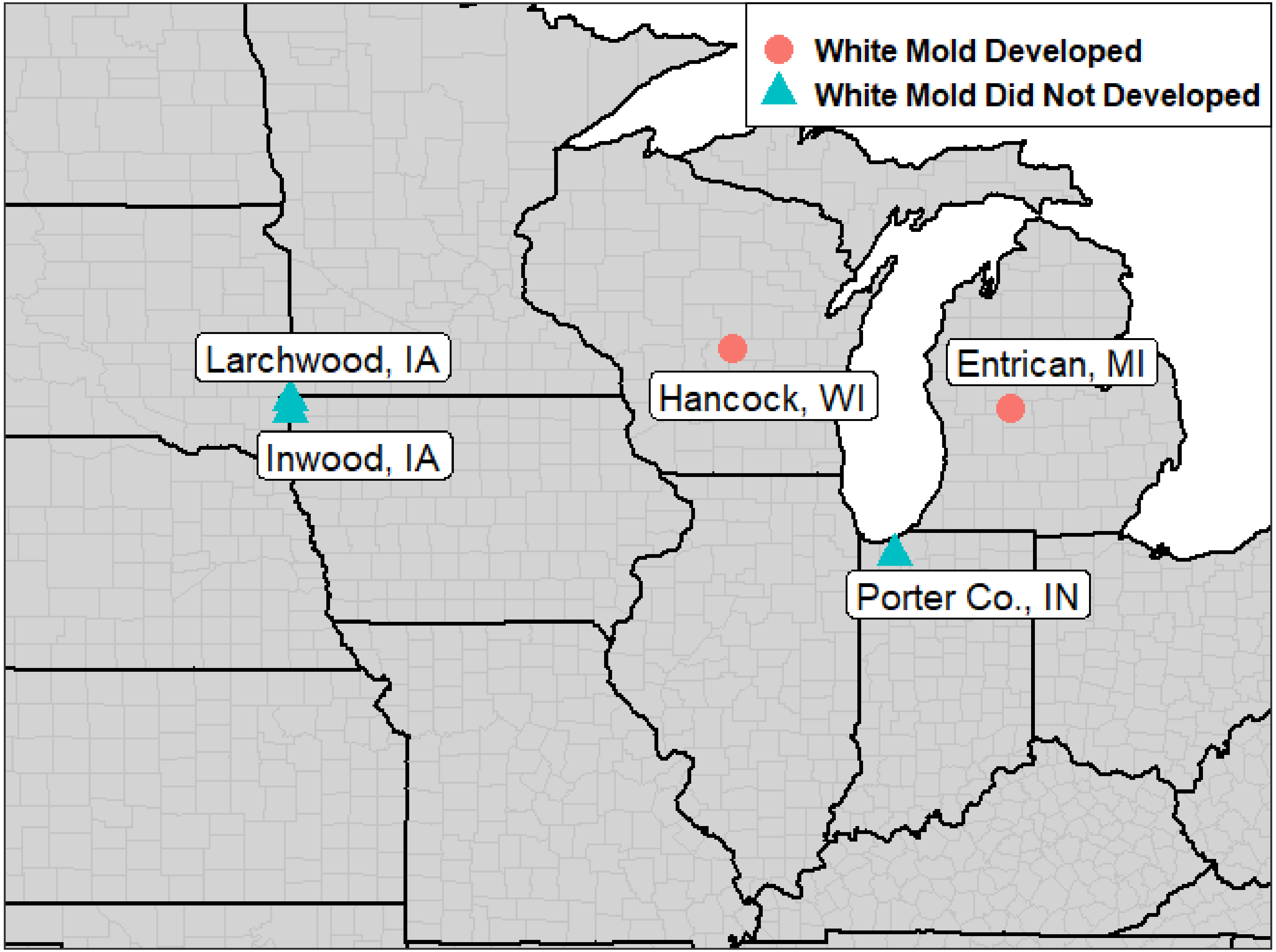
Timing of Fungicide Application Plays a Significant Role in Maximizing Disease Reduction



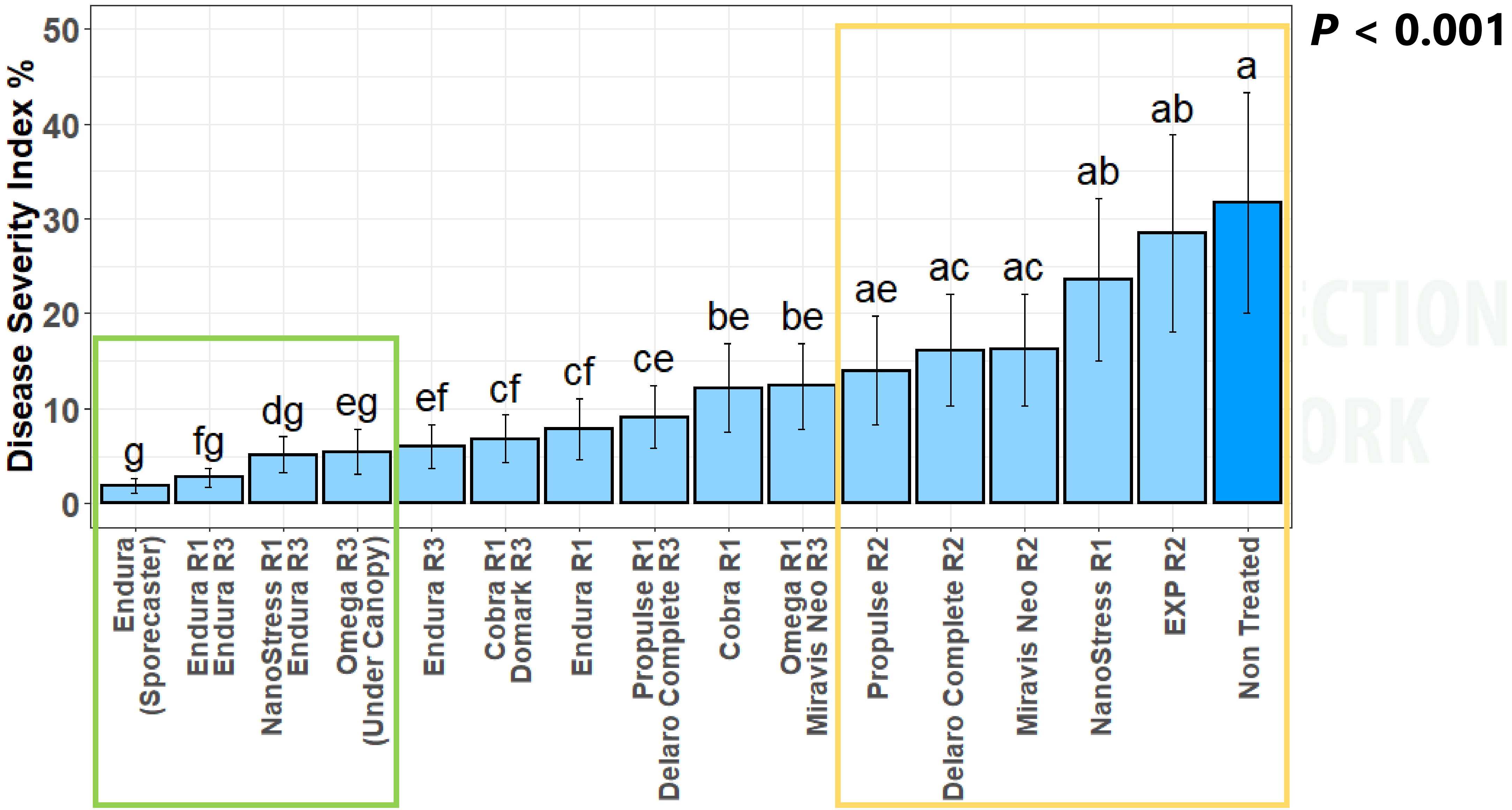
Coordinated White Mold Fungicide Trials 2021-22

Richard Wade Webster, Martin I. Chilvers, Daren S. Mueller,
Darcy E. P. Telenko, and Damon L. Smith

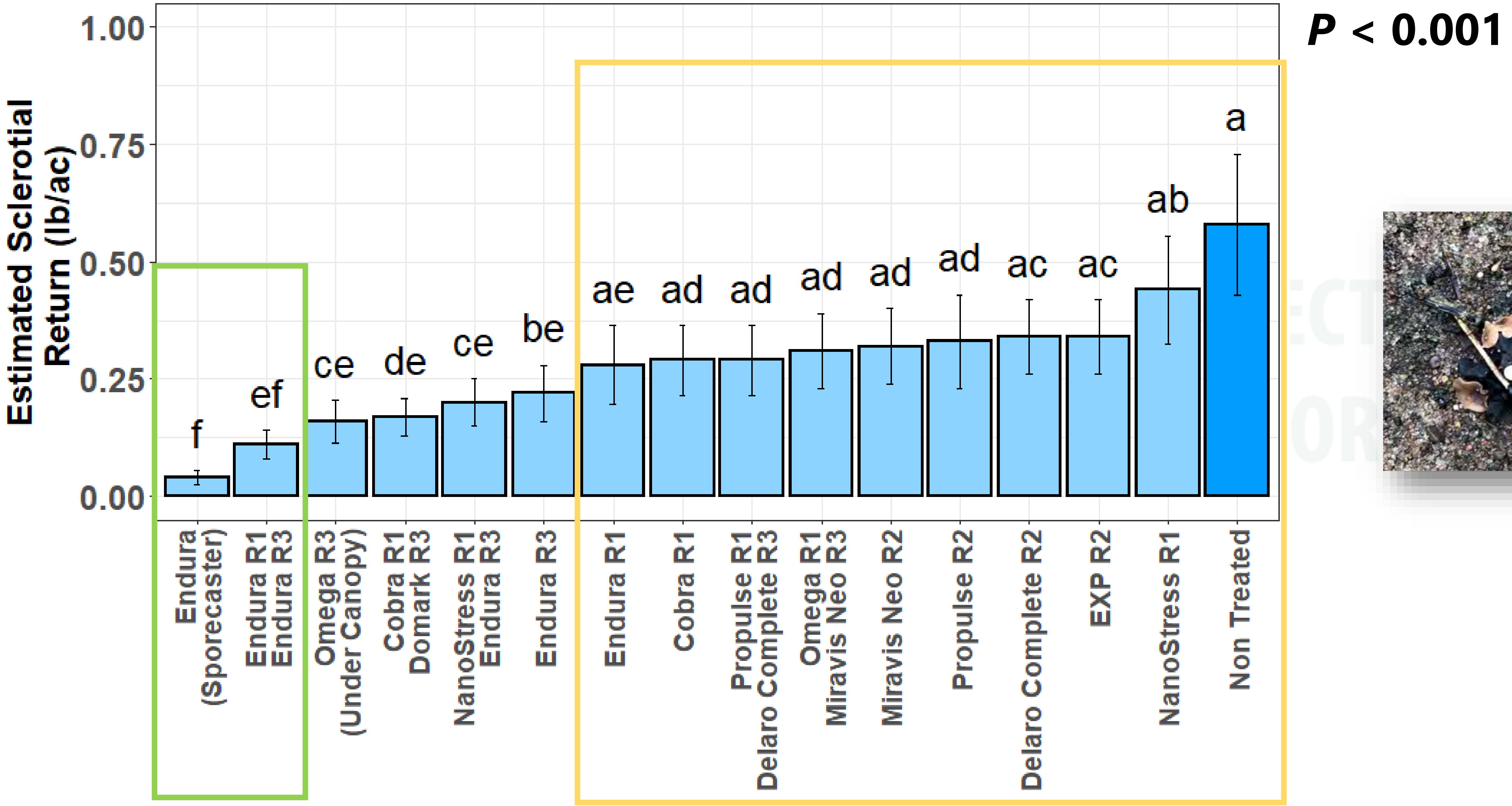
- **2021**
- **5 site-years**
- **White mold developed in 2 of the 5 site-years**
  (average disease incidence >1%)



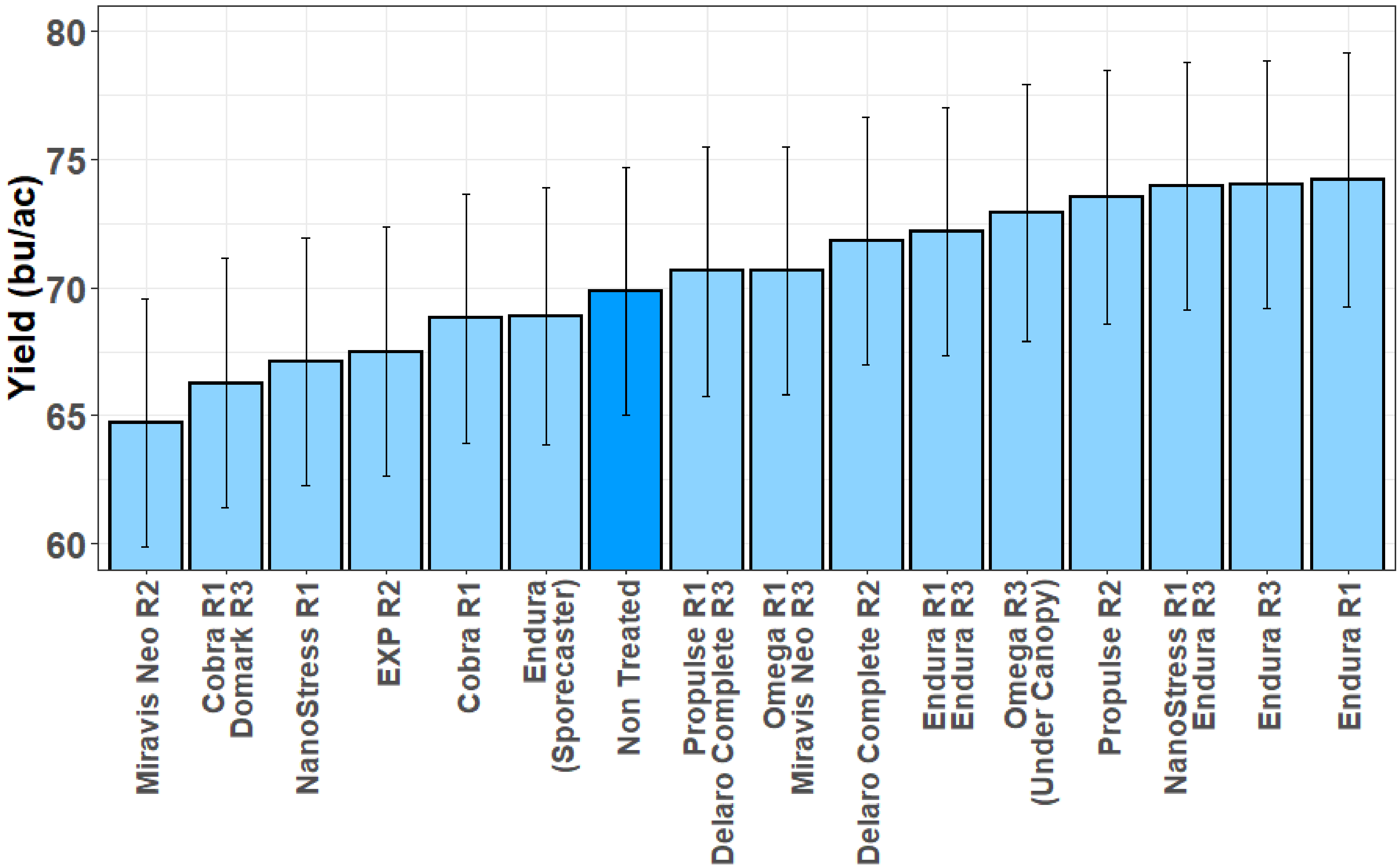
White Mold Disease Severity Index



Predicted White Mold Sclerotial Return



Yield – Site-years with White Mold



2 Site-years

P **= 0.11**


What are the next “Big Things”?

We need to Double Down Cultural Practices and Work in New Tech

Maximizing Fungicide Efficacy

Depends on

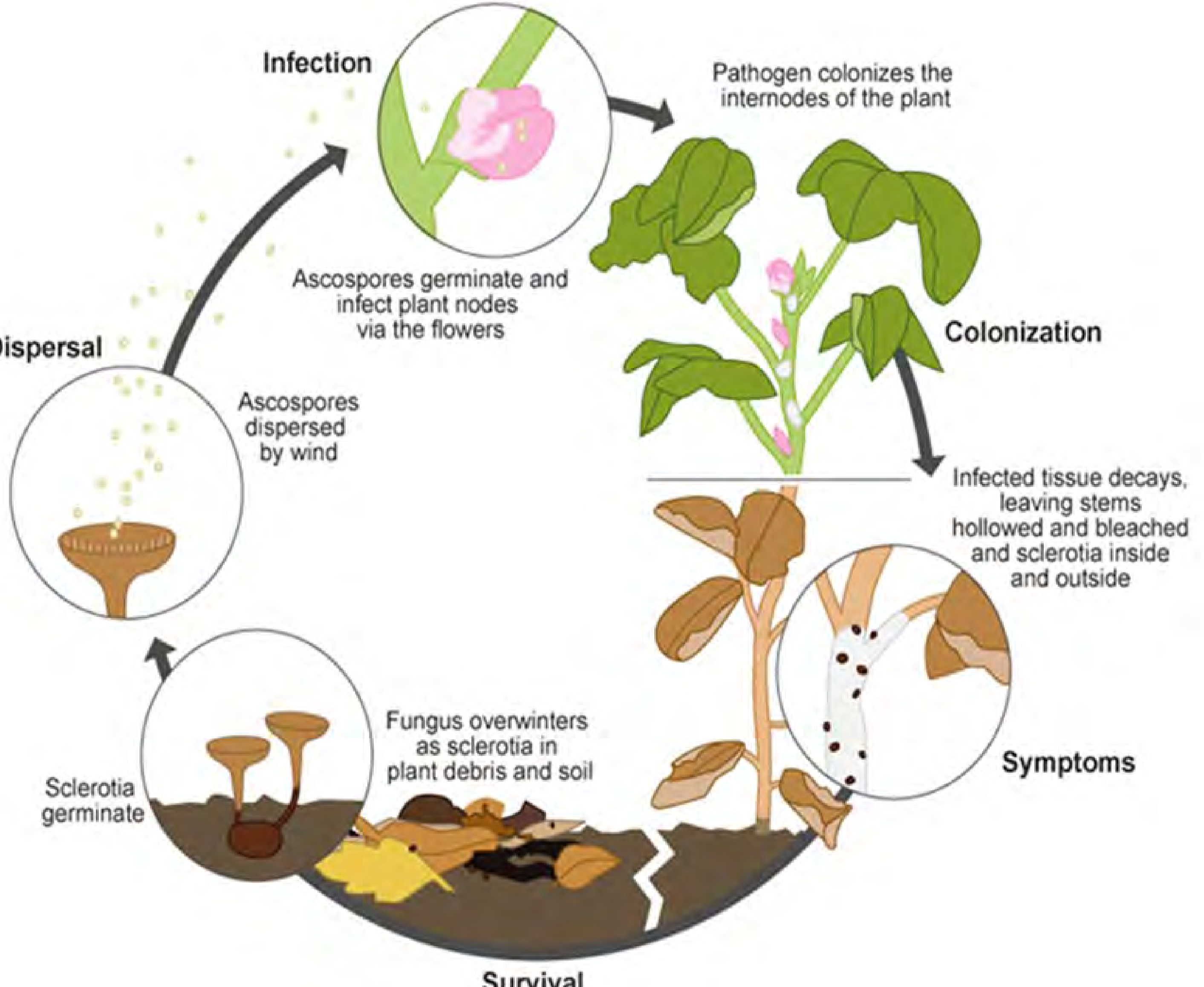
- Accurate timing and Frequency (Sporecaster)
- Taking advantage of application technology
  - -Drop Nozzles
  - -Drones?

Where do management tools break cycle?

Cultural and agronomic practices (resistance, rotation, row/population)

Biological - CONTANS

Rol d rye



Let's Revisit our Advice

1. Adjusting cultural practices can reduce white mold
   I. Don't Focus on row spacing; narrow row spacing is acceptable
   II. Don't be afraid to lower planting populations (focus on getting 90,000-100,000 seeds/a out of the ground)
   III. Push for resistant varieties; this is the only way to make big leaps in management
   IV. Rotation! Don't forget using small grains in the rotation!
2. A few fungicide programs can offer some control; choose the right program and resist the "silver bullet" temptation
   I. Reduce the expectation (over-reliance) of fungicide performance
   II. "Fungicide only makes a bad situation, less bad"
   III. Applications should be focused at the R3 growth stage or use Sporecaster!
   IV. Applying fungicide with 360 drop-nozzles or similar technology may improve efficacy

Let’s Revisit our Advice

3. Use prediction models to improve the use and efficiency of fungicide products
    I. Fungicide application timing is critical! See Above!; Epidemic initiation and duration isn’t the same each season!
    II. White mold Apps.- Download Sporecaster and Sporebuster!
    III. Reduce the action threshold for Sporecaster to 20% for known susceptible varieties
4. Technologies that might help
    I. Roller-crimped rye and combining with resistant varieties at the right seeding rate, may eliminate the need for a fungicide application
    II. Drone applications of fungicide aren’t terrible for those tight, hard-to-reach areas

Take Home Points

- Fields with a history of high white mold pressure benefit from wide row spacing and low seeding rates
- Fields without a history of white mold will benefit from narrow row spacing and high seeding rates
- Management of white mold will reduce the development of new inoculum

Recommendations

1. If planting 15 inch rows into fields with a history of white mold, drop seeding rate to 110,000 seeds/ac.
2. If planting into fields with a history of severe white mold, widen rows to 30 inches and drop seeding rate to 110,000 seeds/ac
3. If planting into field with no history of white mold, continue using local recommendations

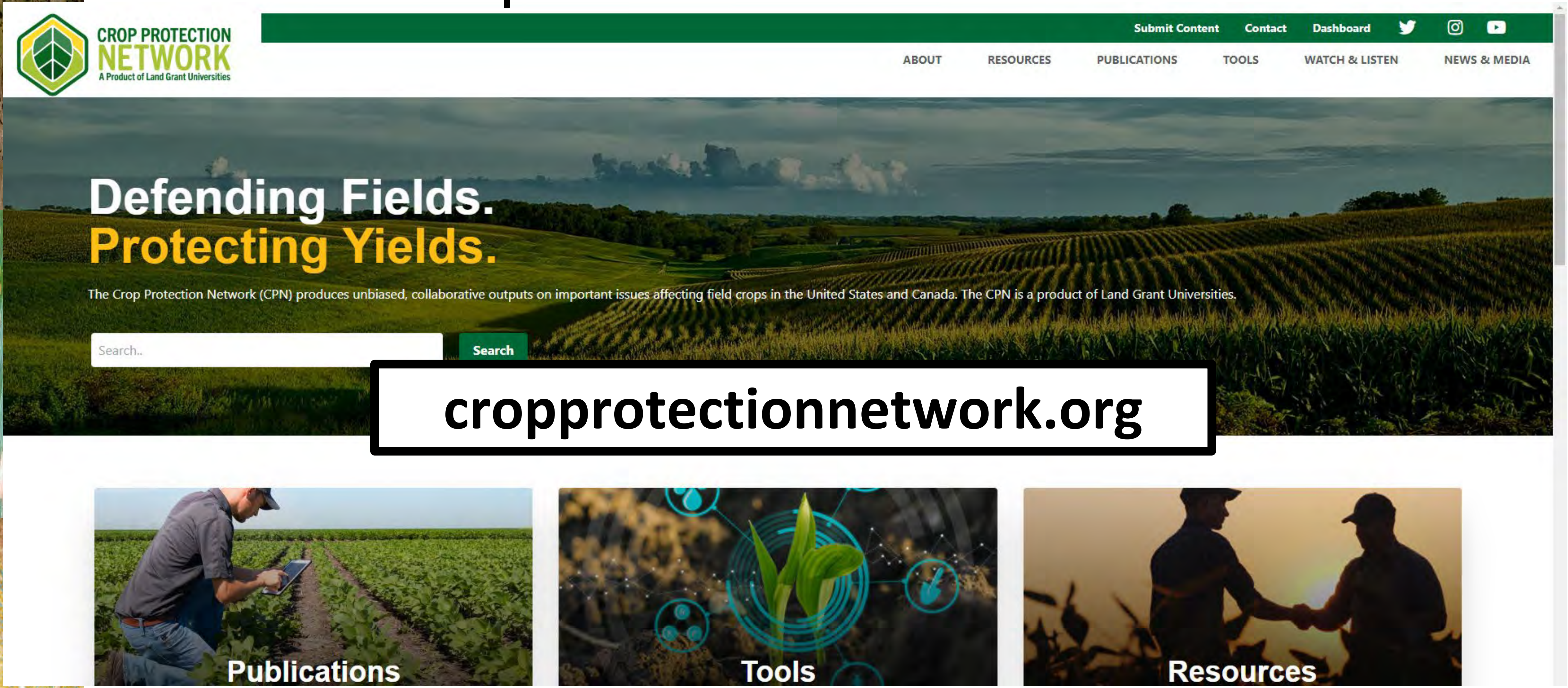
Final Thoughts

Sustainable Disease Management

- Use host res
- Understand
  - Environr
  - When dc
  - Where?
  - Importa
- Leave non-tr
- Resistance r
  - Rotation
  - Full labe

TELENKO FIELD CROP PATHOLOGY

Crop Protection Network



cropprotectionnetwork.org

QUESTIONS?

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https://indianafieldcroppathology.com/

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Diseases to Watch Out For!

Red Crown Rot in Soybean – *Calonectria ilicicola*

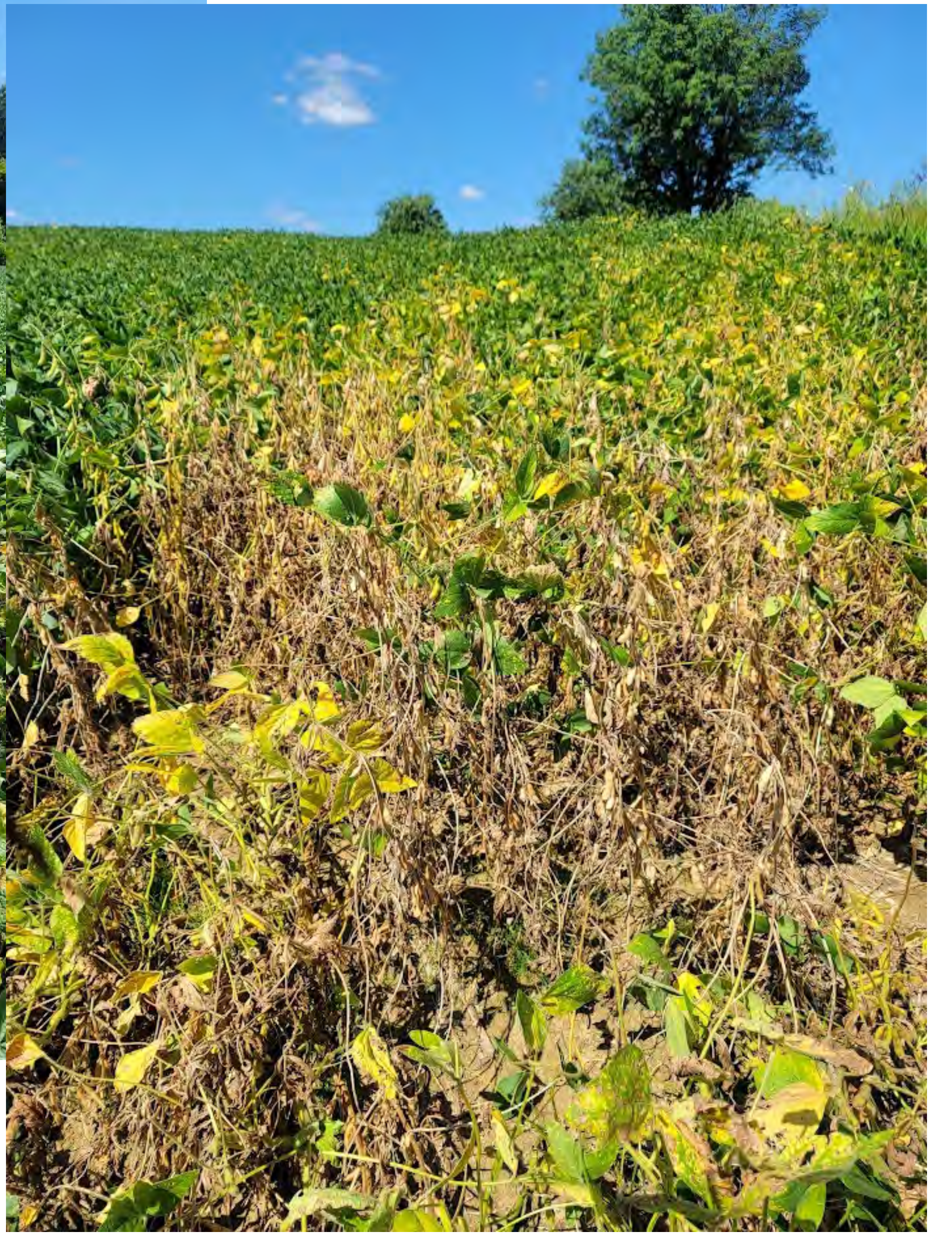
Symptoms appear after R3
Patches of plants – low lying or poorly drained soils
Root easily removed from soil
Center pith gray discoloration
Small microsclerotia – red in color

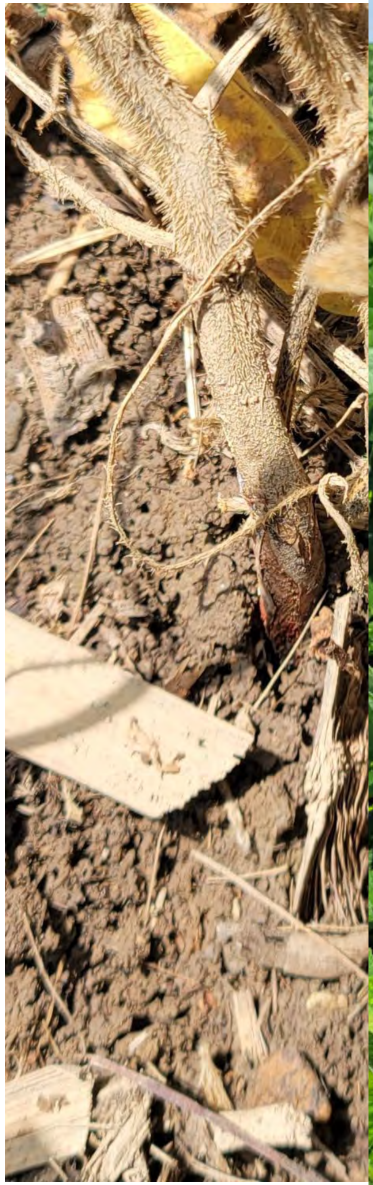
Red crown rot on soybean. Images: N. Kleczewski and S. Geisler.

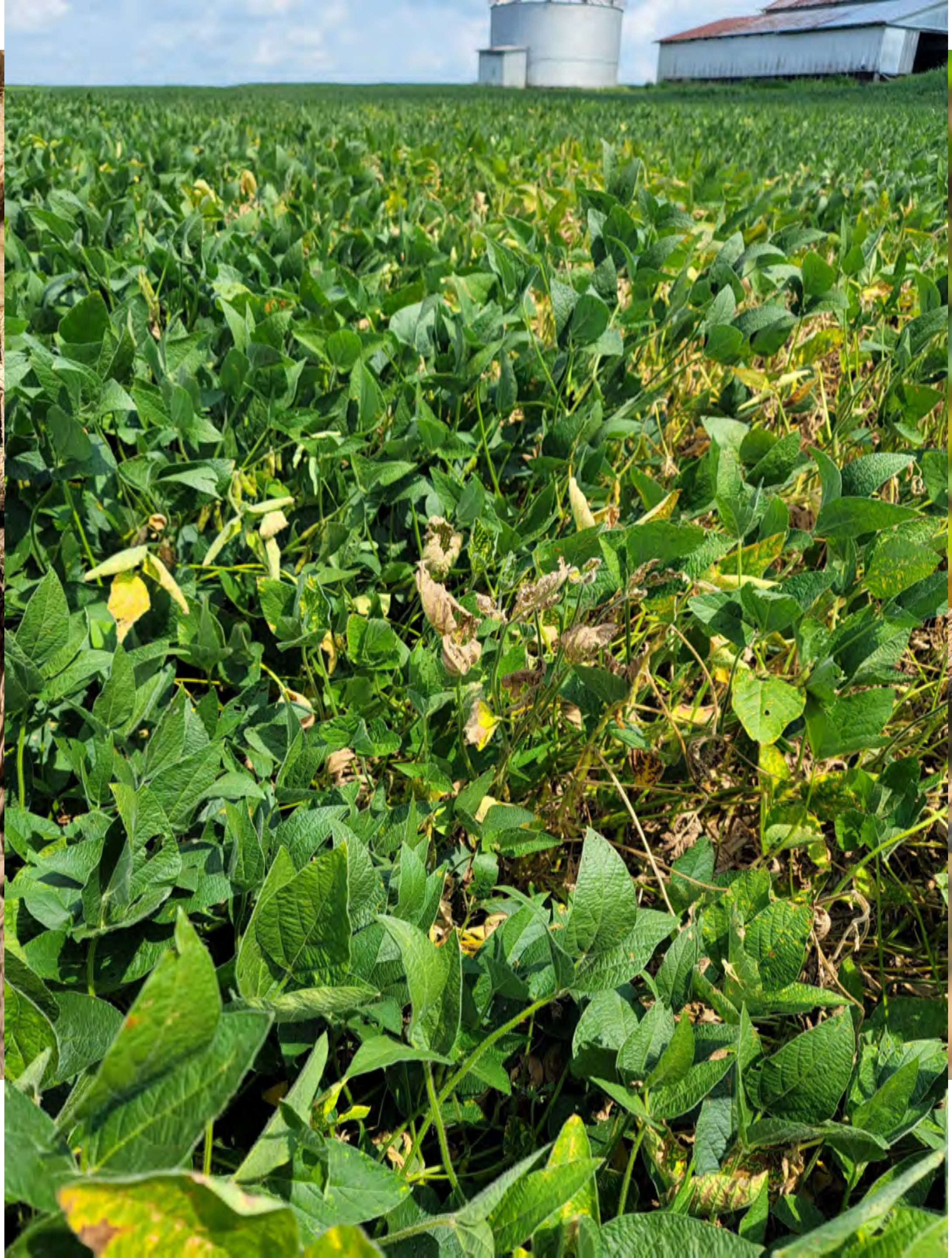
Gray discoloration of soybean stem interior symptomatic of red crown rot. *Images: N. Kleczewski and S. Geisler.*

Reddish spore-bearing structures and white hyphae on lower stems are late-season signs or red crown rot. *Image: S. Geisler CPN Publication*

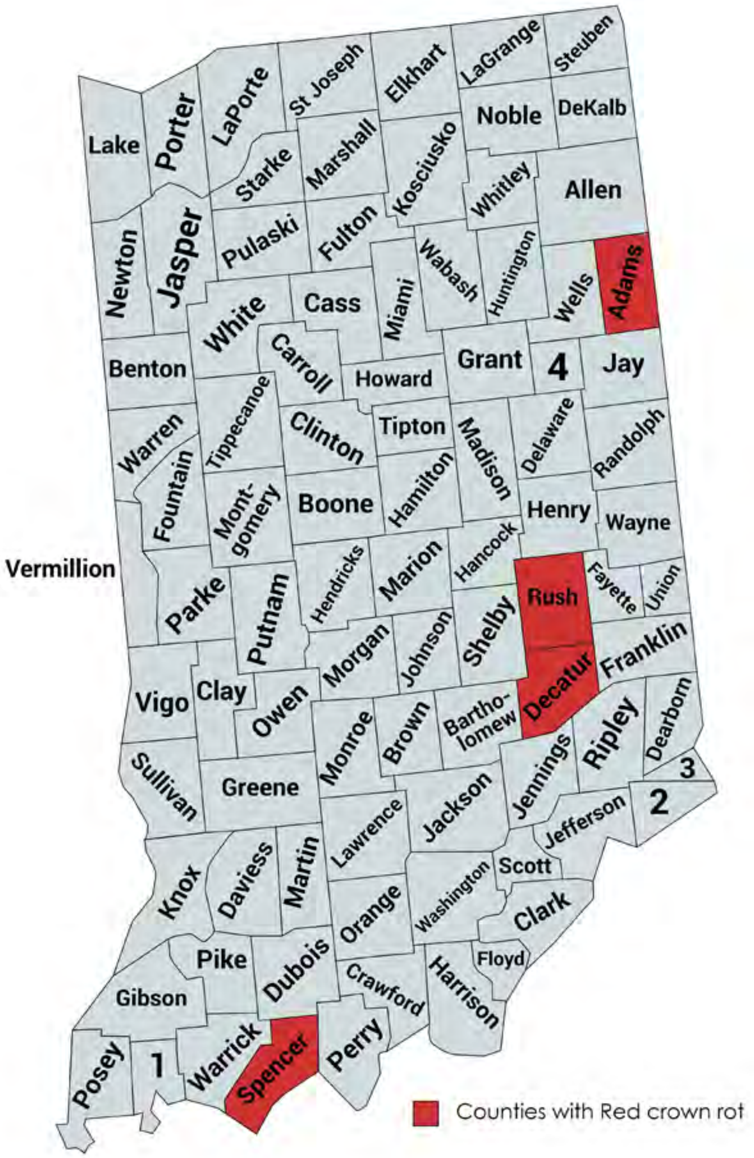
TELENKO FIELD CROP PATHOLOGY







TELENKO
FIELD CROP PATHOLOGY



Indiana counties that have confirmed red crown rot caused by *Calonectria illicola.* Decatur and Spencer in 2022. Rush and Adams 2023.