Foliar fungicide impact on soybean yield in 2021

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The NC State Soybean Extension Program evaluated a variety of foliar fungicide treatments in 2021 with several goals that included to 1.evaluate currently available foliar fungicides, 2.compare these to older fungicides, 3.compare multiple application timings to single applications to determine the impact on yield and seed quality and 4.evaluate foliar fungicide impact on soybean yield in diverse yield environments. Treatments were entered by either agricultural companies or the NC Soybean Producers Association (Table 1). If the treatment was entered by a company, the company choose product rate and timing. Treatments were arranged in a randomized complete block design with 6 replications/site. These products were evaluated at 4 sites across the state in 2021 (Figure 1). Dates for various management activities for each site is available in Table 2. Treatments were applied with a CO_2-pressuized backpack sprayer. Wide row spacing was used (30-36 in) to minimize plot damage from applications. A variety that was moderately susceptible to frogeye leaf spot (AG59XF0) was used at all sites. Data collected included visual ratings for remaining green material at harvest (if present), grain yield (corrected to 13% moisture), seed damage, and seed with purple stain. Despite our efforts to use production practices that resulted in high soybean yield, the yield range was relatively narrow with sites averaging 38 to 59 BPA (Table 2). Seed damage was quantified using the USDA grading standards (Figure 2). Data was analyzed in SAS and results are presented by individual environment.

Thank you to the following Agents who hosted these trials: Andrew Baucom (Union Co), MiKayla Graham (Union Co), Tim Hambrick (Yadkin Co), and Jalynne Waters (Washington Co). Thank you to the following growers who hosted these trials: Greg Moxley, Manning Bros. Farms, and Cox & Watson AG. We also appreciate the Upper Coastal Plain Research Station for hosting this trial in 2021.

Table 1. Foliar fungicide products and timings evaluated by the NC State Soybean Extension Program in 2021.

Product	Rate (oz/A)	Application Timing
Aproach Prima	6.8	R3
Delaro	8	R1
Miravis Top	13.7	R3
Priaxor	4	R1
Priaxor	4	R3
Priaxor	4	R5
Priaxor	4 + 4	R1+R3
Priaxor	4 + 4	R3+R5
Priaxor	4 + 4	R1+R5
Revytek	8	R3
Stratego YLD	4	R1

Table 2. Average trial yield and management dates at individual sites.

Site	Average Yield	Planting Date	R1 Applications	R3 Applications	R5 Applications	Harvest Date
Edgecombe	44 BPA	5/6/2021	7/12/201	8/10/2021	9/3/2021	11/2/2021
Union	38 BPA	4/27/2021	7/15/2021	7/30/2021	8/11/2021	10/13/2021
Washington	59 BPA	4/28/2021	7/13/2021	8/10/2021	9/3/2021	10/21/2021
Yadkin	56 BPA	4/21/2021	7/14/2021	8/10/2021	9/9/2021	11/9/2021

Table 3. P-values for foliar fungicide impact on grain yield, seed damage, seed with purple stain, and remaining green material.

Site	Grain Yield	Seed Damage	Purple Seed Stain	Remaining Green Material
Edgecombe	<0.001	0.88	0.45	<0.001
Union	0.33	0.48	<0.001	*
Washington	0.15	0.93	0.18	*
Yadkin	0.51	0.44	<0.001	*

*No visual differences in treatments at harvest

Figure 1. Foliar fungicide testing sites in 2021

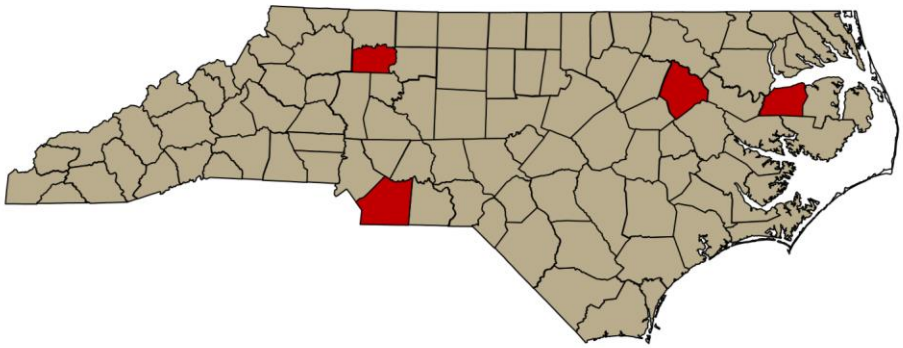
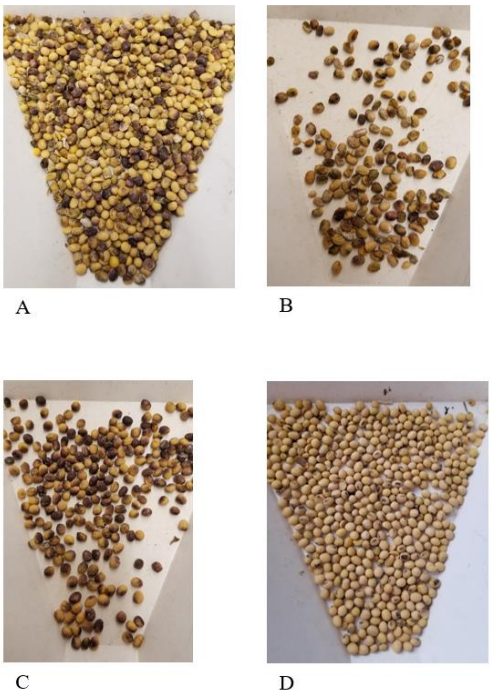


Figure 2. Damage quantification process by weight following the USDA grading standards. A- Whole subsample B- Removed damaged seed C- Removed purple seed stain D-Remaining clean subsample



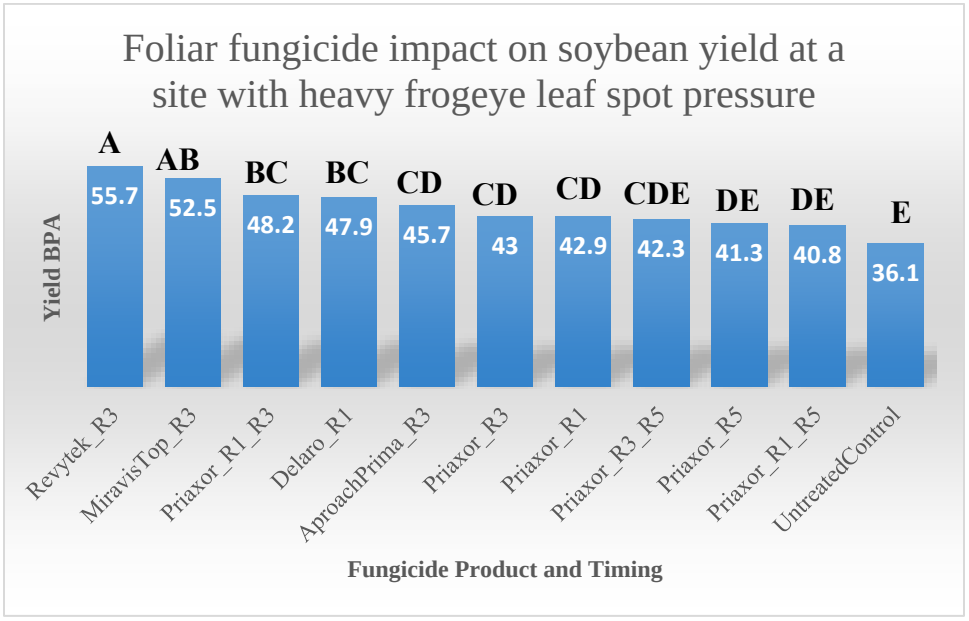
Edgecombe County

Disease Pressure: Very high frogeye leaf spot pressure at this site (Figure 3).

Figure 3. Soybeans in the untreated check at the Edgecombe County site on 10/4/2021.

Yield: Fungicides had a large impact on soybean yield at this location (Table 3).

Figure 4. Fungicide impact on soybean yield at the Edgecombe County location with heavy frogeye leaf spot pressure.



*Values with the same letter are not significantly different at a 90% confidence level.
*Stratego YLD yield not reported due to an error in the field by the Soybean Extension Team

Seed Damage and Seed with Purple Stain: There was no impact of foliar fungicides on seed damage or seed with purple stain at this location (Table 3). Seed damage averaged 14% across treatments and seed with purple stain <1% across treatments.

Remaining Green Material: At this location there were evident treatment differences in remaining green material at harvest. Visual ratings were obtained from the combine cab and Revytek had significantly higher remaining green material (26%) than the other treatments (<6%).

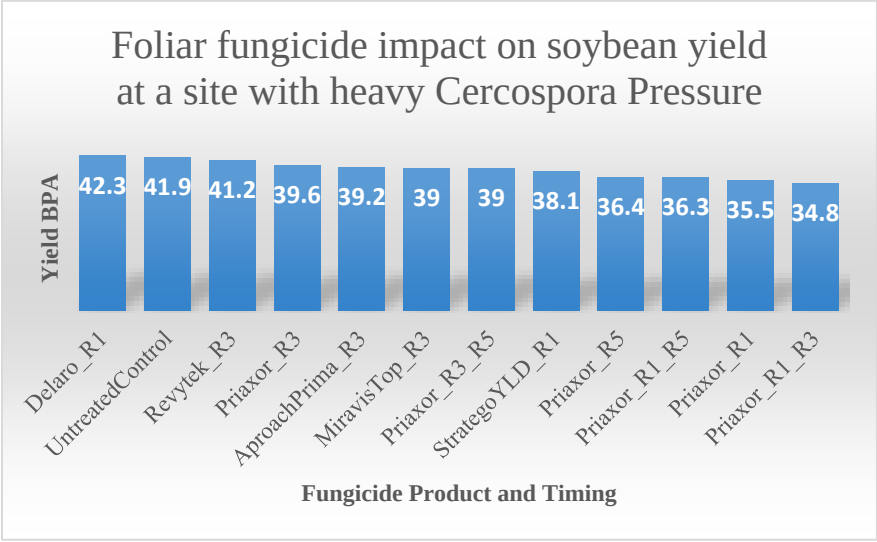
Union County

Disease Pressure: Very heavy Cercospora pressure with no visual differences between treatments. Visual symptoms of heavy disease pressure were not evident until after mid-August. Charcoal rot was also confirmed on some plants earlier in the season.

Figure 5. Union County trial on 9/27/2021.

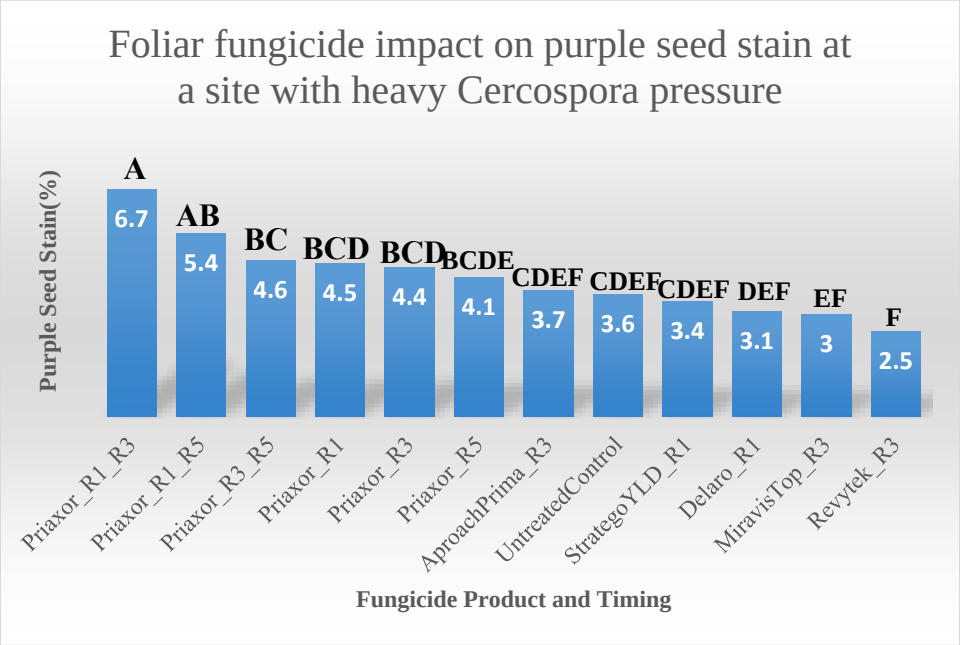
Yield: No impact of foliar fungicides on soybean yield at this location (Table 3). Previously literature has reported inconsistent impact of foliar fungicides on Cercospora pressure.

Figure 6. Fungicide impact on soybean yield at the Union County location with heavy Cercospora pressure.



Seed Damage and Seed with Purple Stain: Foliar fungicides did not impact seed damage (average 6.5%) at this location but did impact purple seed stain

Figure 7. Foliar fungicide impact on soybean purple seed stain at a site with heavy Cercospora pressure.



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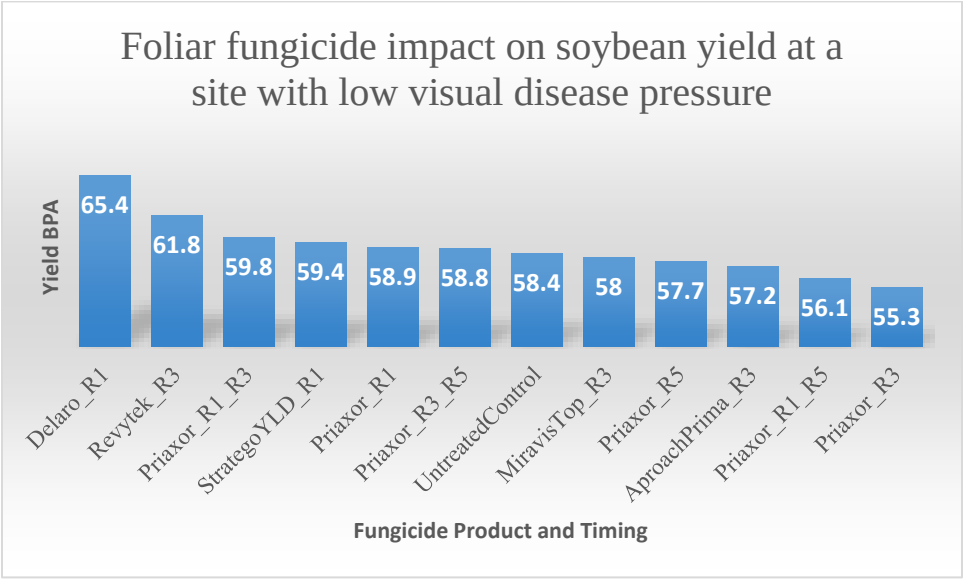
Washington County

Disease pressure: Minimal disease pressure at this site although some frogeye leaf spot and Cercospora were observed.

Figure 8. Washington County trial on September 14, 2021.

Yield: Foliar fungicides trended towards impacting yield at this site, but there were not statistical differences between treatments (Table 3).

Figure 9. Foliar fungicide impact on soybean yield at a site with low visual disease pressure.



Seed Damage and Seed with Purple Seed Stain: There was no impact of foliar fungicides on seed damage or seed with purple stain at this location (Table 3). Seed damage averaged 6% across treatments and seed with purple stain was <1% across treatments.

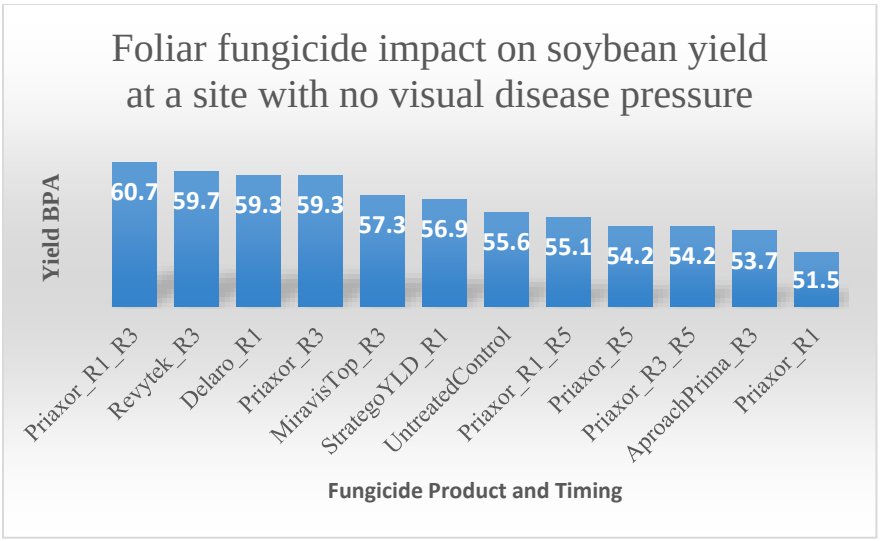
Yadkin County

Disease pressure: No visual disease pressure present at this site.

Figure 10. Yadkin County trial on 9/9/2021.

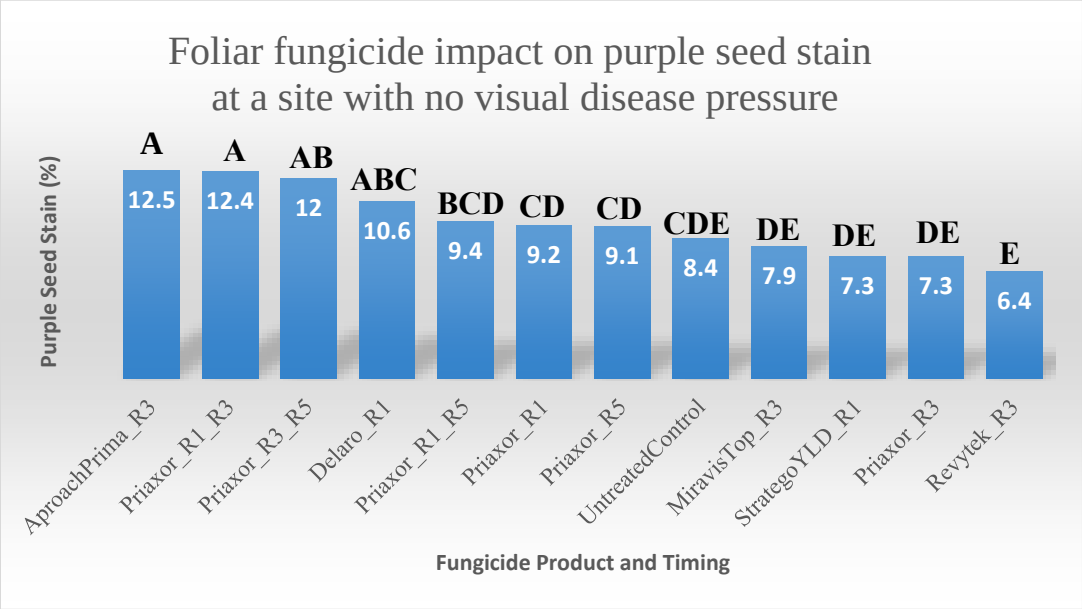
Yield: Foliar fungicide did not impact soybean yield at this site (Table 3).

Figure 11. Foliar fungicide impact on soybean yield at a site with no visual disease pressure.



Seed Damage and Seed with Purple Stain: Foliar fungicides did not impact damage at this site (seed damage averaged 3%). Foliar fungicides did impact purple seed stain (Table 3), with some having more than the untreated control.

Figure 12. Foliar fungicide impact on soybean purple seed stain at a site with no visual disease pressure.



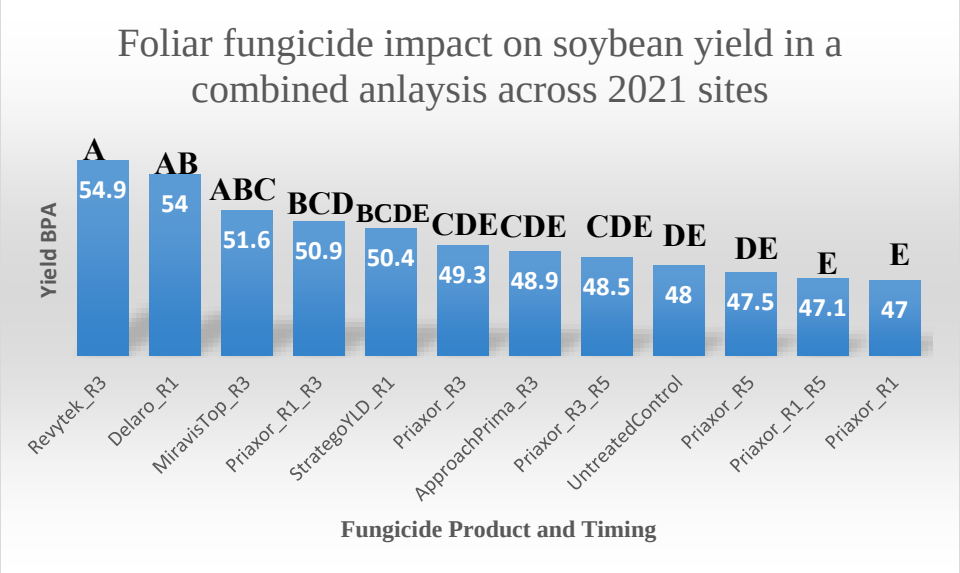
*Values with the same letter are not significantly different at a 90% confidence level.

Combined Analysis

Table 4. P-values for foliar fungicide impact on grain yield, seed damage, seed with purple stain, and remaining green material and the interaction with site for a combined analysis over 2021 sites.

Dependent Variable	P-Value for Treatment	P-Value for Treatment*Site Interaction
Grain Yield	0.01	0.12
Damage	0.79	0.87
Purple Seed Stain	0.06	<0.001

Yield: Foliar fungicide use impact on soybean yield in a combined analysis across 2021 sites (Table 4).



*Values with the same letter are not significantly different at a 90% confidence level.

Seed damage and Seed with Purple Stain: In a combined analysis over environments, foliar fungicides did not impact seed damage but did affect purple seed stain (Table 4). There was an interaction between site and treatment for the impact on purple seed stain meaning the response was different at different sites.