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The Importance and Management of Phoma Black Stem in Sunflowers

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Introduction

Since 2009, Phoma black stem (*Phoma macdonaldii*) has been found in 68% of NSA surveyed fields, infecting an average of 44% of plants within fields (unpublished data). The pathogen overwinters inside infected debris, and in the spring and summer, spores spread via wind, rain, and insects. Phoma black stem appears on the stem at the base of a petiole as a black circular lesion, usually several centimeters long. Lesions are superficial, with minimal movement into the pith of sunflower stems. This differs from economically important sunflower stem diseases like Phomopsis (*Diaporthe*/*Phomopsis* spp.) and white mold (*Sclerotinia sclerotiorum*), which cause lodging and limited nutrient/water movement. Yield losses attributed by Phoma black stem are less than these other stem diseases. Management of the disease is often disregarded because yield losses are not believed to be economically significant, however, in 2017 fungicide applications of Headline during a natural epidemic of Phoma black stem resulted in nearly a 400 pound per acre increase in yield. The objective of this research is to evaluate fungicide efficacy and timing for management of Phoma black stem.

Materials and Methods

To evaluate fungicide timing, two trials were established in May 2018 using two hybrids in Davenport, ND. The fungicide pyraclostrobin (Headline, BASF, Research Triangle Park, NC at 6fl ox/A) was applied singly or in combination at three growth stages: late vegetative stage (V8-V12), budding stage (R1), and flowering stage (R5). The treatments for each timing trial were non-treated control, V8-V-12, R1, R5, V8-V12 + R1, V8-V12 + R5, R1 + R5, and V8-V12 + R1 + R5. To evaluate fungicide efficacy, third trial was established in May 2018 at Davenport, ND. Nine fungicides within the DMI, SDHI, and QoI modes of action were applied at R1. Treatments included a non-treated control, pyraclostrobin (Headline, BASF, Research Triangle Park, NC at 6fl oz/A), azoxystrobin (Quadris, Syngenta Crop Protection LLC., Greensboro, NC at 6fl oz/A), picoxystrobin (Aproach, Dupont Agricultural Products, Wilmington, DE at 6fl oz/A), tebuconazole (Folicur, Bayer CropScience LP, Research Triangle Park, NC at 4fl oz/A), pydiflumetofen (Miravis, Syngenta Crop Protection LLC., Greensboro, NC at 10.3fl oz/A), boscalid (Endura, BASF, Research Triangle Park, NC at 8oz wt/A), two applications of floupyram + tebuconazole (Luna Experience, Bayer CropScience LP, Research Triangle Park at 9fl oz/A and 12.8fl oz/A), fluxapyroxad + pyraclostrobin (Priaxor, BASF, Research Triangle Park, NC at 4fl oz/A), and metconazole (Quash, Valent, Walnut Creek, CA at 4oz wt/A).

All trials were planted in four-row plots with fungicide applications occurring on the middle two rows with a three nozzle boom at 20 GPA and designed as an RCBD with four replications. Disease was evaluated visually using a disease severity index (DSI), calculated by multiplying incidence (number of stems infected) and severity (mean number of stem lesions) on ten arbitrarily selected plants in each plot. The trial was conducted with no artificial pathogen inoculation nor supplemental irrigation.

Results and Conclusions

A natural Phoma black stem epidemic occurred in Davenport, ND with 100% incidence in non-treated control plots for all trials. A statistically lower DSI was observed for all fungicide timings when compared to the non-treated control in the Hybrid 1 timing trial (Figure 1). In this trial, applications at V8-V12 and R1 had statistically ($P \leq 0.05$) lower DSI than R5 applications. For the Hybrid 2 timing trial, fungicide applications at V8-V12 and R1 had statistically ($P \leq 0.05$) lower DSI than the non-treated control (Figure 3). All timing combinations for both Hybrid 1 and 2 had statistically ($P \leq 0.05$) reduced DSI. There were no statistical differences in yield between fungicide treatments for Hybrid 1 (Figure 2), but for Hybrid 2, applications at R5 and V8-V12 + R1 have statistically ($P \leq 0.10$) higher yield than non-treated control plots (Figure 4).

Results of the efficacy trial demonstrated that all fungicides had statistically ($P \leq 0.05$) lower DSI than the non-treated control (Figure 5). Differences among fungicides were observed. However, yield differences were not found (Figure 6).

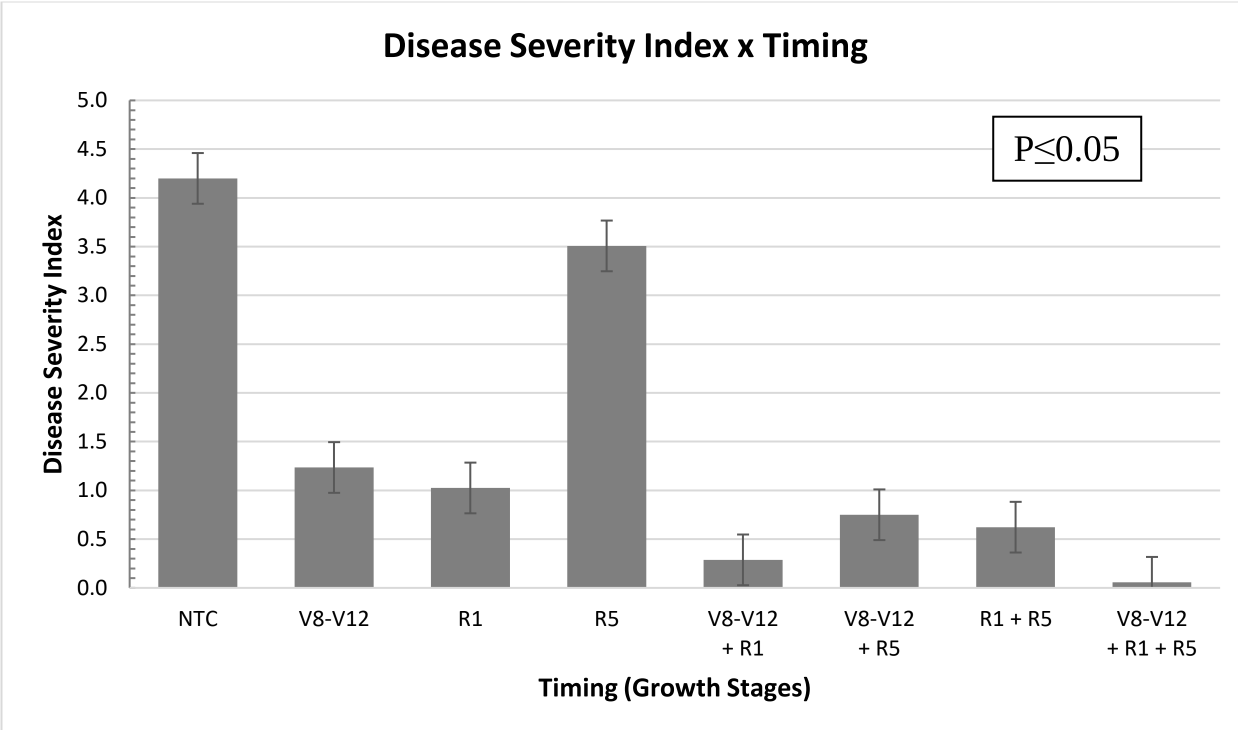

Figure 1. Phoma Black Stem Disease Severity Index Results for Hybrid 1 of Timing Trial – Davenport, ND. All fungicide applications were Headline at 6fl oz/acre. Disease Severity Index is calculated as incidence (number of stems) multiplied by severity (average number of lesions per stem) of ten arbitrarily selected plants within a plot.

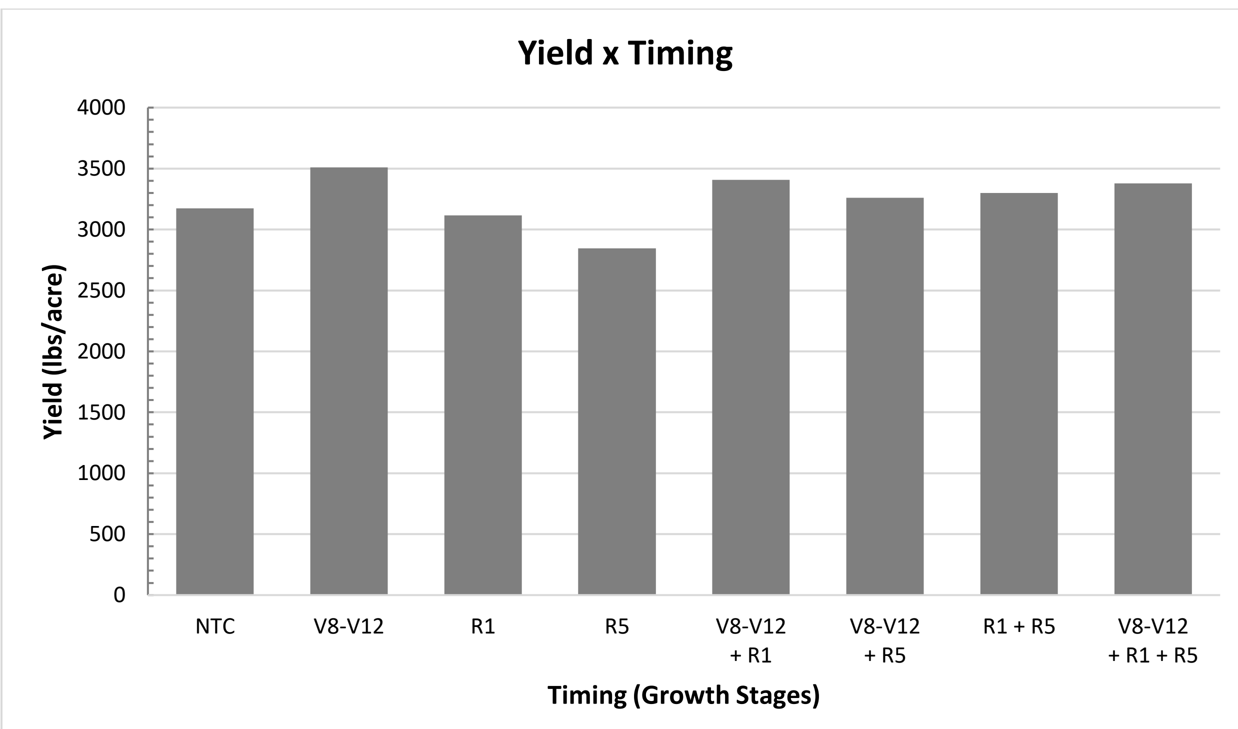

Figure 2. Yield Results for Hybrid 1 of Timing Trials – Davenport, ND

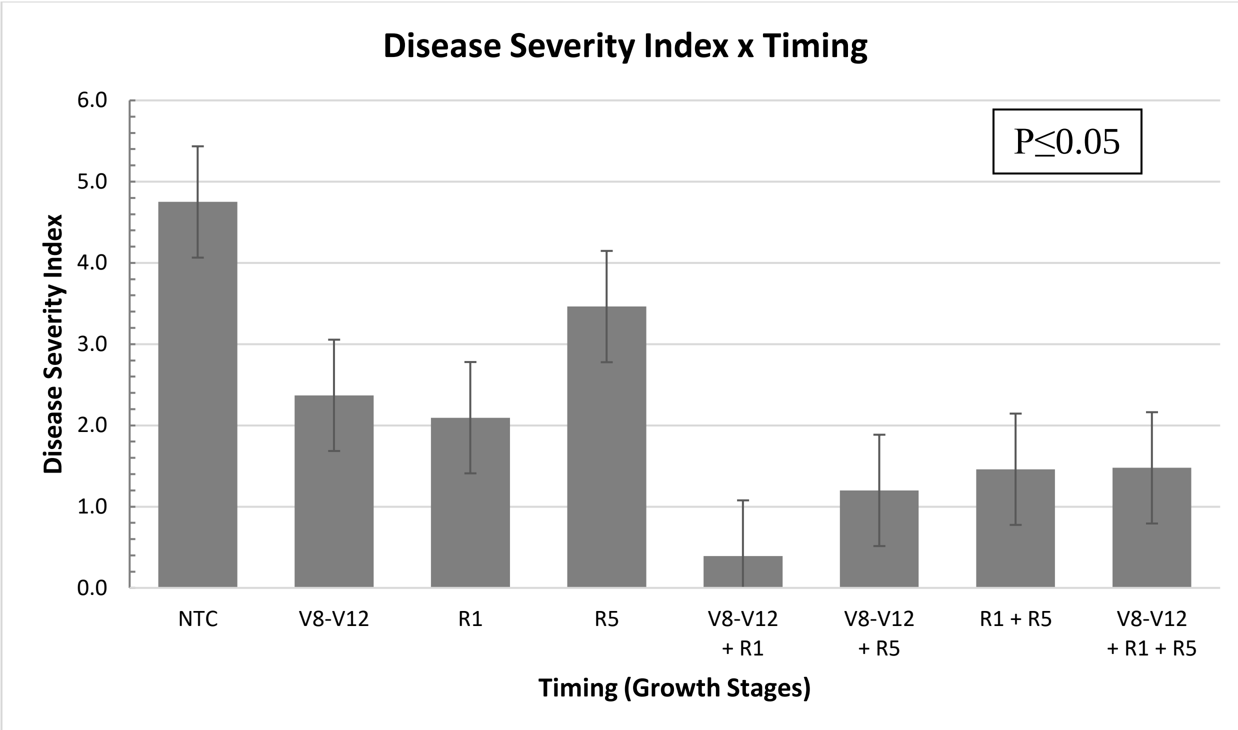

Figure 3. Phoma Black Stem Disease Severity Index Results for Hybrid 2 of Timing Trial – Davenport, ND. All fungicide applications were Headline at 6fl oz/acre. Disease Severity Index is calculated as incidence (number of stems) multiplied by severity (average number of lesions per stem) of ten arbitrarily selected plants within a plot.

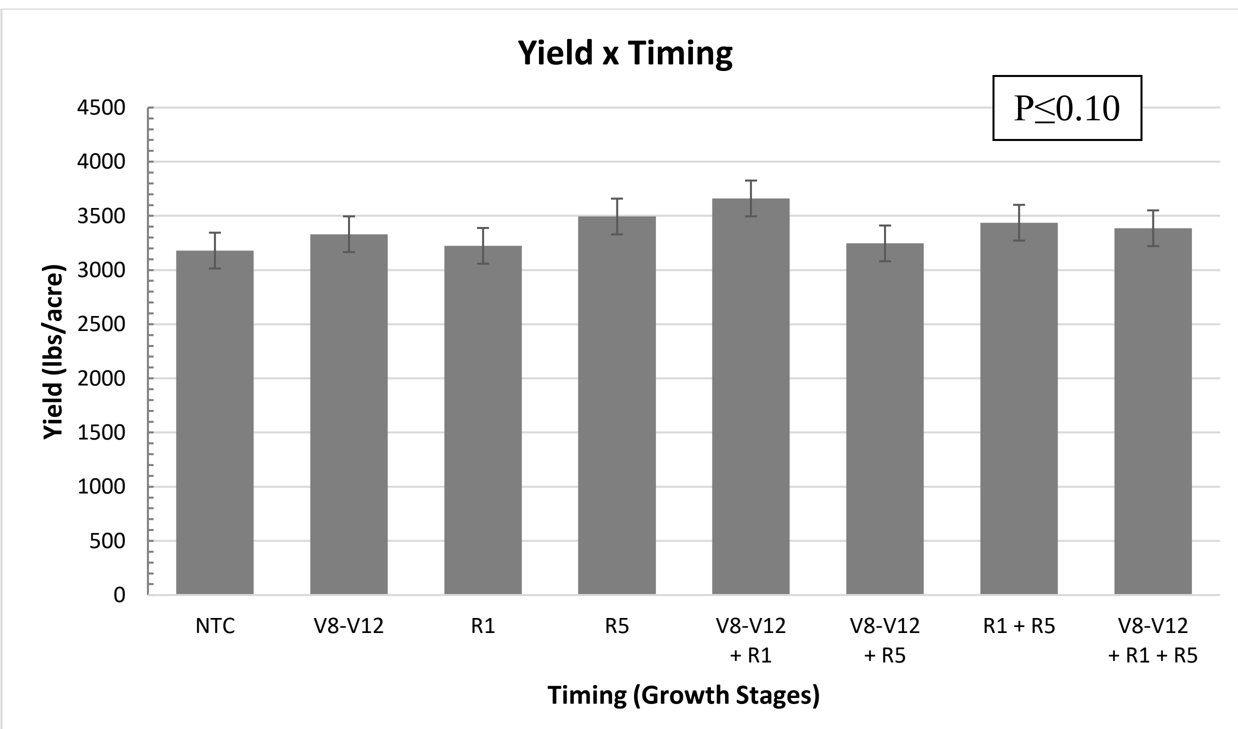

Figure 4. Yield Results for Hybrid 2 of Timing Trials – Davenport, ND

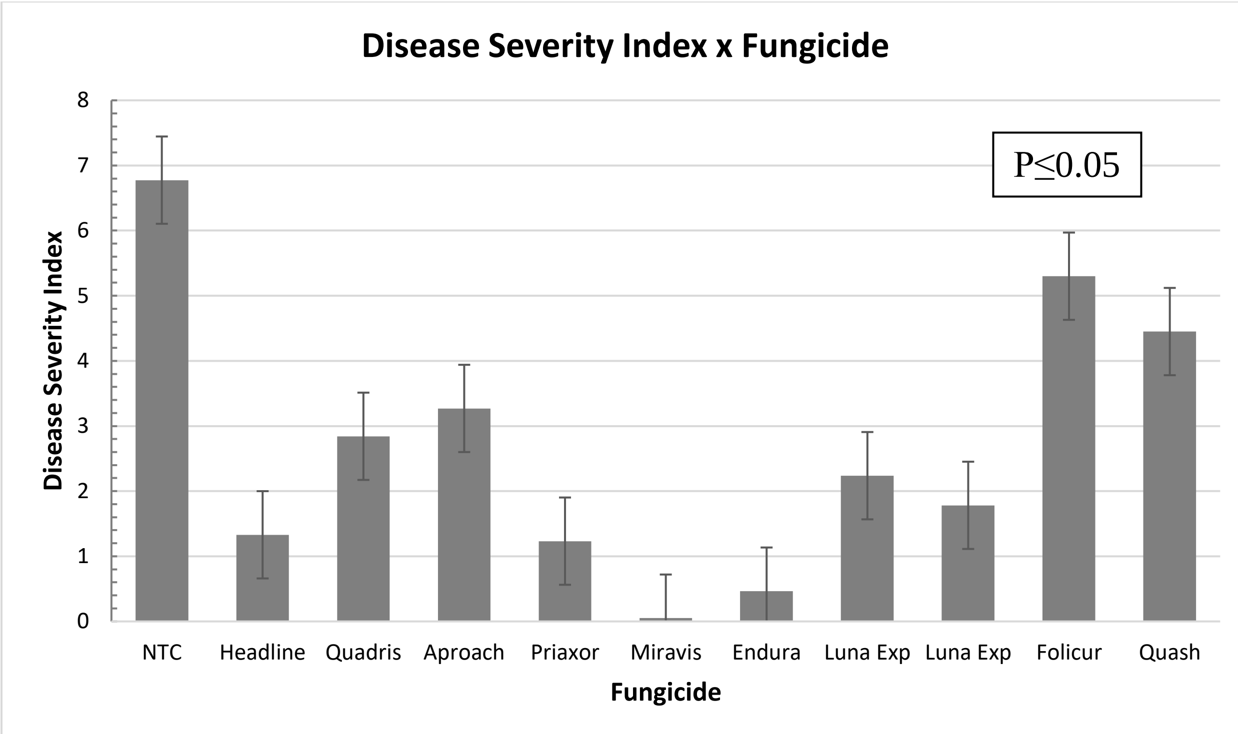

Figure 5. Phoma Black Stem Disease Severity Index Results for Efficacy Trials – Davenport, ND. All fungicide applications were made at the R1 growth stage. Disease Severity Index is calculated as incidence (number of stems) multiplied by severity (average number of lesions per stem) of ten arbitrarily selected plants within a plot.

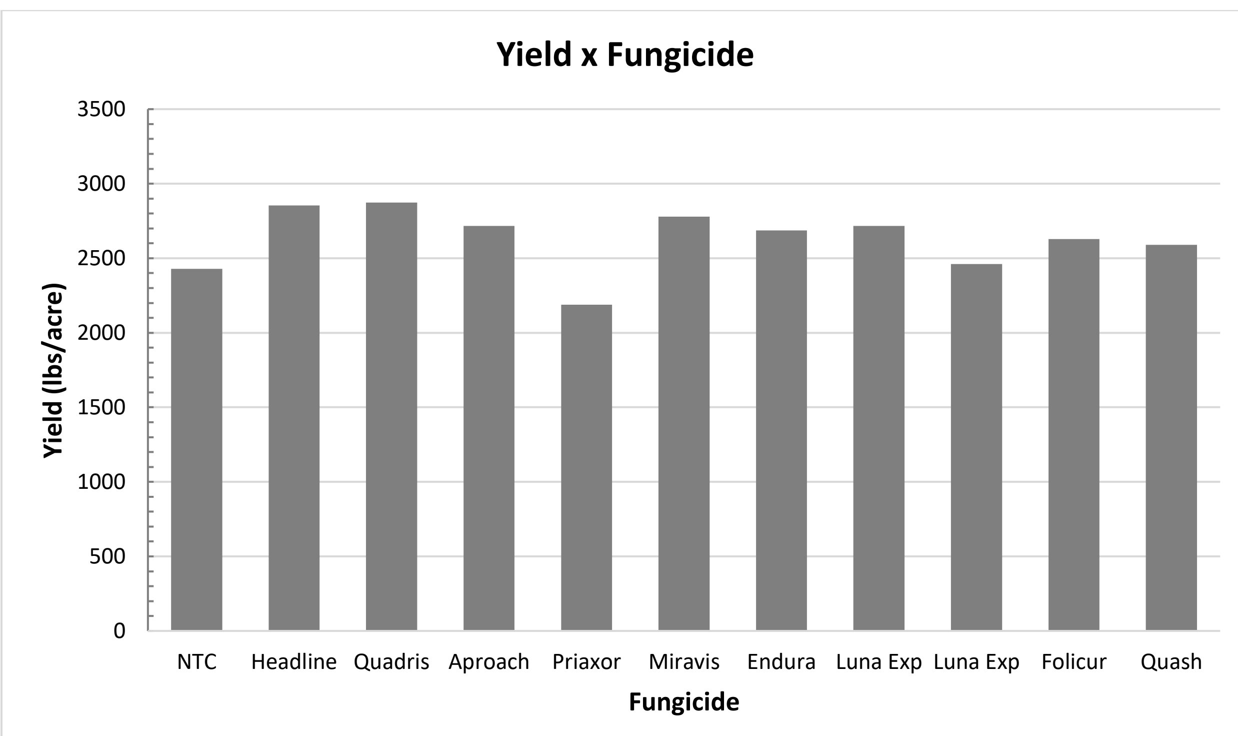

Figure 6. Yield Results for Efficacy Trials – Davenport, ND.

References

Schwartz, H. F., and Markell, S. G. 2016. Phoma Black Stem. Pages 37-38 in: Compendium of Sunflower Diseases and Pests. Harveson, R.M., Markell, S.G., Block, C. C., and Gulya T. J. eds. APS Press, St. Paul, MN.

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