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Fungicide Management for Phoma Black Stem in Sunflowers

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Summary

In 2017, trials were conducted that investigated the effect timing of fungicide application had Phoma black stem. That research was presented at the 40th Annual Sunflower Research Forum in 2018 and can be found in the Searchable Database of Research Forum Papers on the National Sunflower Association's website under the title "Management of Phoma black stem with fungicide" (Gilley et al. 2018). In 2018, additional trials were established to evaluate fungicide efficacy and timing for management of Phoma black stem, and that research was presented at the 41st Annual Sunflower Research Forum in 2019 and can be found in that database titled "The Importance and Management of Phoma black stem" (Hansen et al. 2019). The research trials presented in this paper are the 2019 results of the study investigating the efficacy and timing of fungicides on the management of Phoma black stem.

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macdonaldii*) has been found in 68% of NSA surveyed fields, infecting an average of 44% of plants within fields (unpublished data).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. Trials in 2018 were established to investigate fungicide efficacy and fungicide timing on the

management of Phoma black stem. Results in 2018 indicated fungicides applied at V8-V10 or R1 growth stages reduced Phoma black stem infections, and fungicides within FRAC 7 (succinate dehydrogenase inhibitors, SDHI), FRAC 11 (quinone outside inhibitors, QoI) and FRAC 3 (demethylation inhibitors, DMI) reduced Phoma black stem infections. 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 differing only by hybrid were established in May 2019 in Davenport, ND. Two Nuseed hybrids were used: N4HM354 and Camaro II. 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 (NTC), V8-V12, R1, R5, V8-V12 + R1, V8-V12 + R5, R1 + R5, and V8-V12 + R1 + R5. To evaluate fungicide efficacy, a third trial was established in May 2019 at Davenport, ND. Ten fungicides within the DMI, SDHI, and QoI modes of action were applied at R1. Treatments included a NTC, pyraclostrobin (Headline, BASF, Research Triangle Park, NC, 6fl oz/A), azoxystrobin (Quadris, Syngenta Crop Protection LLC., Greensboro, NC, 6fl oz/A), picoxystrobin (Aproach, Dupont Agricultural Products, Wilmington, DE, 6fl oz/A), tebuconazole (Folicur, Bayer CropScience LP, Research Triangle Park, NC, 4fl oz/A), pydiflumetofen (Miravis, Syngenta Crop Protection LLC., 10.3fl oz/A), boscalid (Endura, BASF, 8oz wt/A), two applications of floupyram + tebuconazole (Luna Experience, Bayer CropScience LP, 9fl oz/A and 12.8fl oz/A), fluxapyroxad + pyraclostrobin (Priaxor, BASF, 4fl oz/A), metconazole (Quash, Valent, Walnut Creek, CA at 4oz wt/A) and pyraclostrobin + fluxapyroxad + mefentrifluconazole (Revytek, BASF, 8fl oz/ac) .

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 diseased plants) and severity (average number per diseased plant) on ten arbitrarily selected plants in each plot at the R8 growth stage (back of the head is yellow and bracts are starting to turn yellow). The trial was conducted with no artificial pathogen inoculation nor supplemental irrigation. Analyses were conducted using a generalized linear model and Fisher's protected least significant different at $\alpha = 0.05$ was used to determine significant differences between treatments.

Results and Conclusions

High levels of Phoma black stem infections occurred at Davenport in 2019. Lower DSI was observed for the R1 timing than the V8-V10 and R5 timing in the N4HM354 timing trial (Figure 1). Also, the DSI value of a single fungicide application at R1 was statistically the same as all combination applications in that trial. Yield was not different for any treatment in the N4HM354 timing trial (Figure 2). The DSI values for all fungicide timing treatments were statistically different than the NTC in the Camaro II timing trial (Figure 3). All treatments that included an R1 application, either singly or in combination, had the same DSI values. No treatments were different for yield in the Camaro II timing trial (Figure 4).

Results of the efficacy trial indicated all fungicides, except for Folicur, had statistically lower DSI than the non-treated control (Figure 5). The DSI values for Miravis and Endura were statistically lower than all other fungicides, except Revytek. Yield differences were not found (Figure 6).

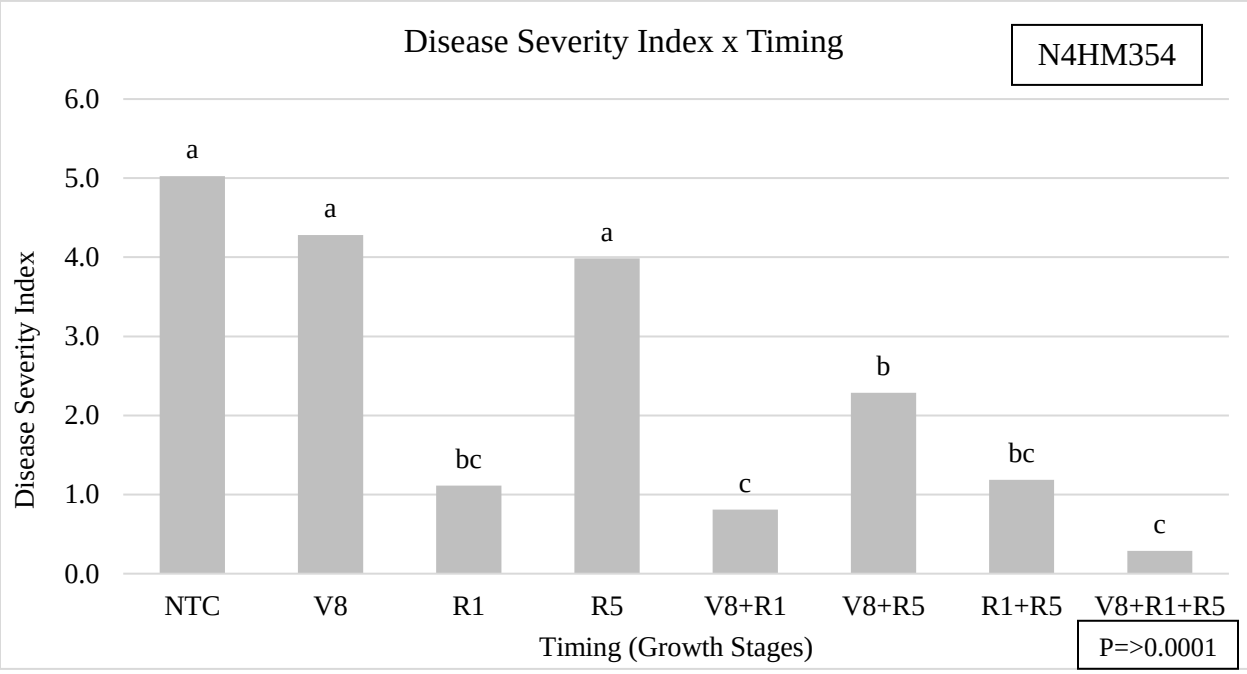

Figure 1. Phoma Black Stem Disease Severity Index Results for N4HM354 Timing Trial – Davenport, ND. All fungicide applications were Headline at 6fl oz/acre. Disease Severity Index is calculated as incidence (number of plants with at least one lesion) multiplied by severity (average number of lesions per diseased plant) of ten arbitrarily selected plants within a plot. Means with at least one common letter are not significantly different at $\alpha = 0.05$.

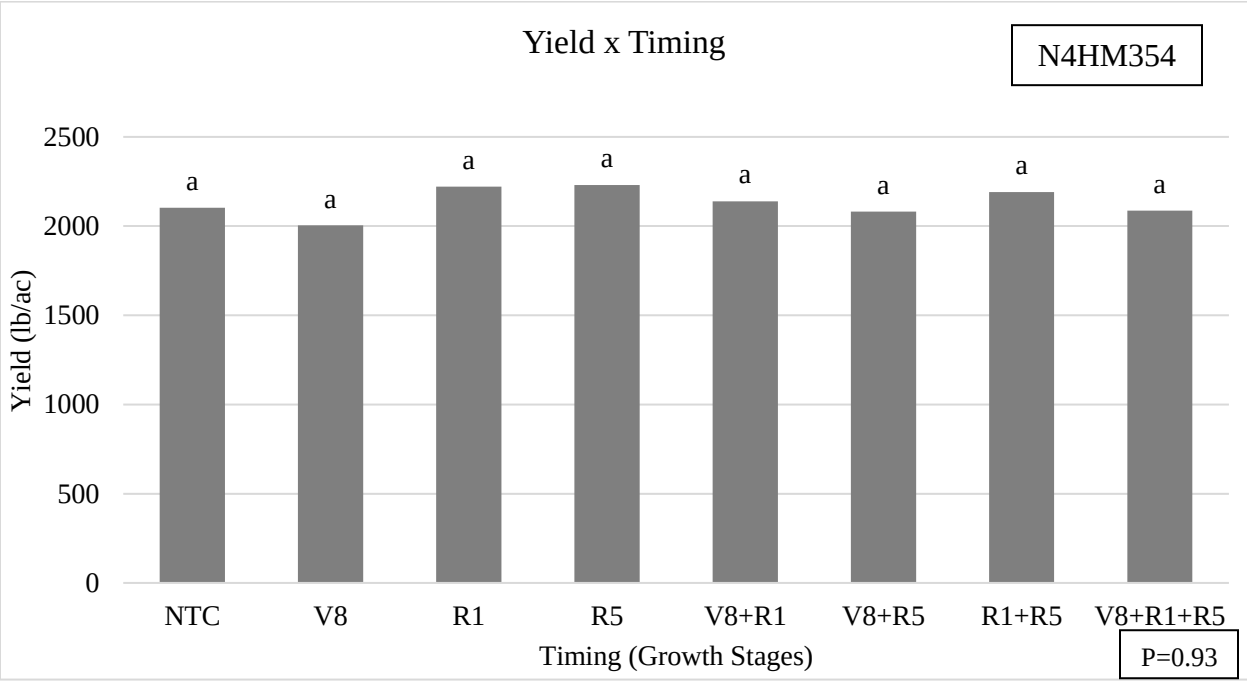

Figure 2. Yield Results for N4HM354 Timing Trials – Davenport, ND. Means with at least one common letter are not significantly different at $\alpha = 0.05$.

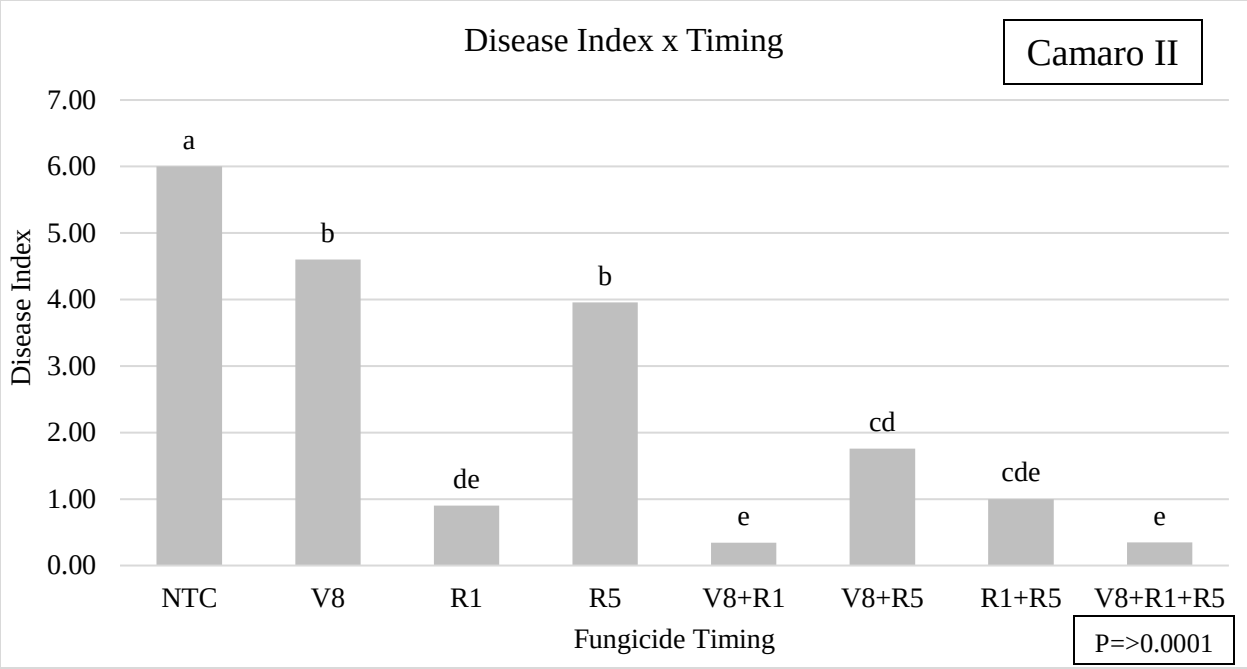

Figure 3. Phoma Black Stem Disease Severity Index Results for Camaro II Timing Trial – Davenport, ND. All fungicide applications were Headline at 6fl oz/acre. Disease Severity Index is calculated as incidence (number of plants with at least one lesion) multiplied by severity (average number of lesions per diseased plant) of ten arbitrarily selected plants within a plot. Means with at least one common letter are not significantly different at $\alpha = 0.05$.

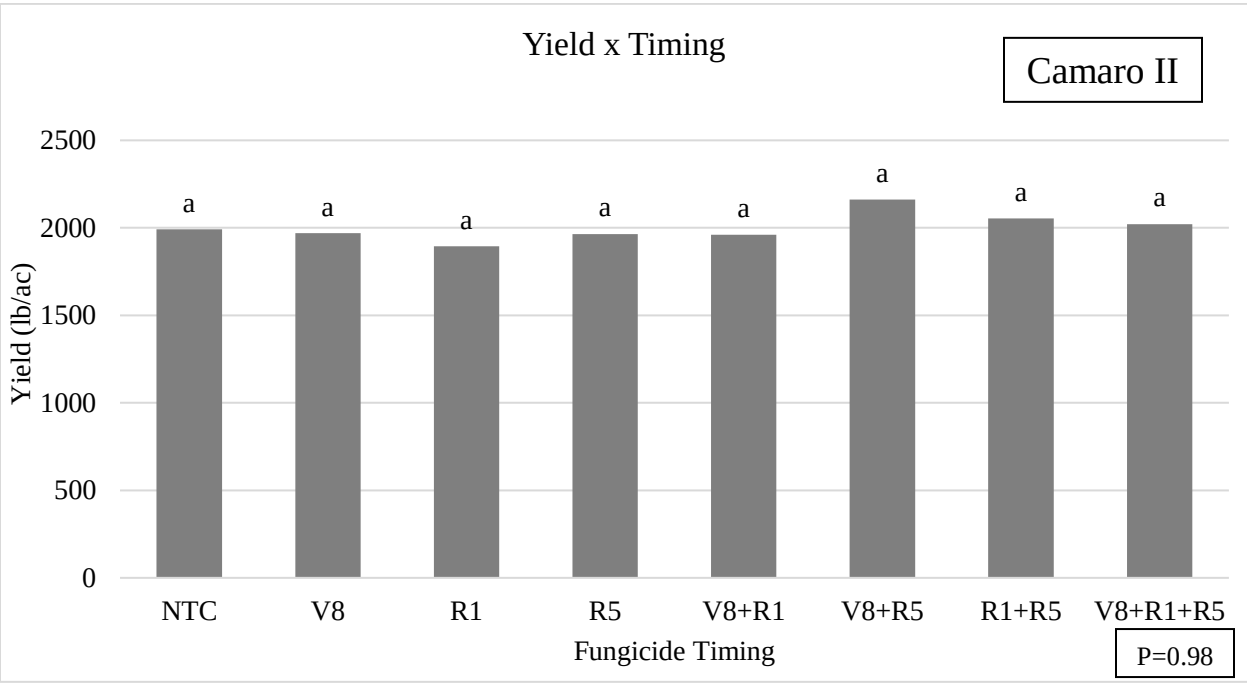

Figure 4. Yield Results for Camaro II Timing Trials – Davenport, ND. Means with at least one common letter are not significantly different at $\alpha = 0.05$.

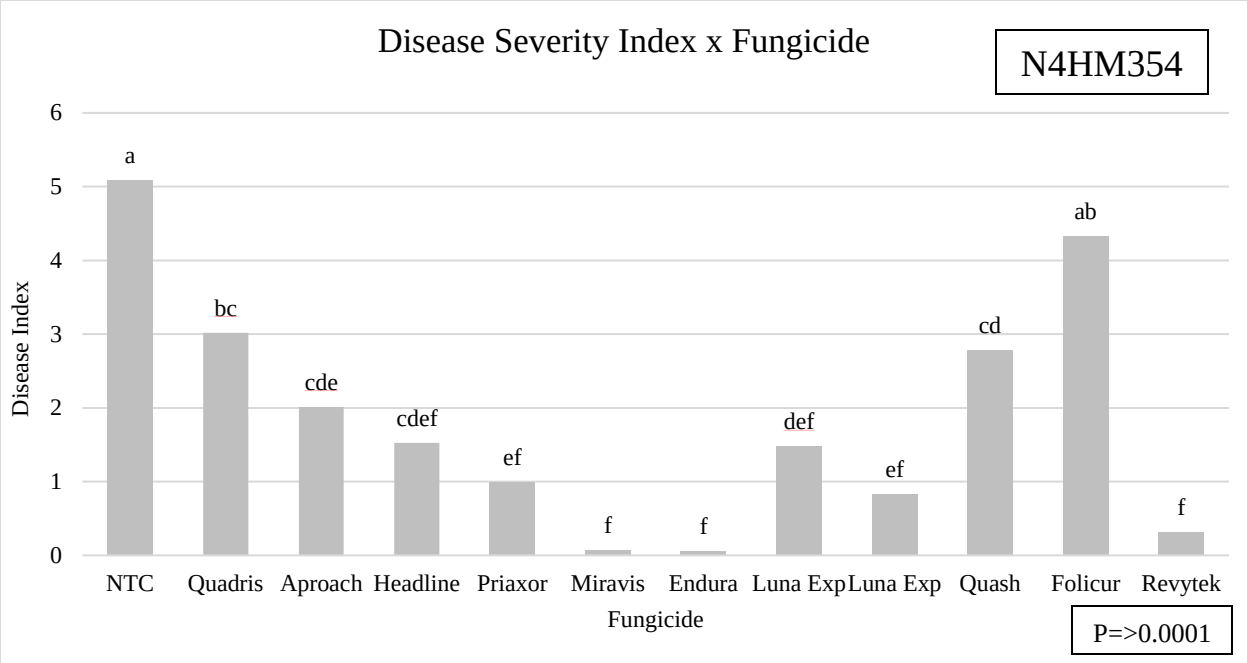

Figure 5. Phoma Black Stem Disease Severity Index Results for Efficacy Trials – Davenport, ND. All fungicide applications were made at the R1 growth stage. Disease Severity Index is calculated as incidence (number of plants with at least one lesion) multiplied by severity (average number of lesions per diseased plant) of ten arbitrarily selected plants within a plot. Means with at least one common letter are not significantly different at $\alpha = 0.05$.

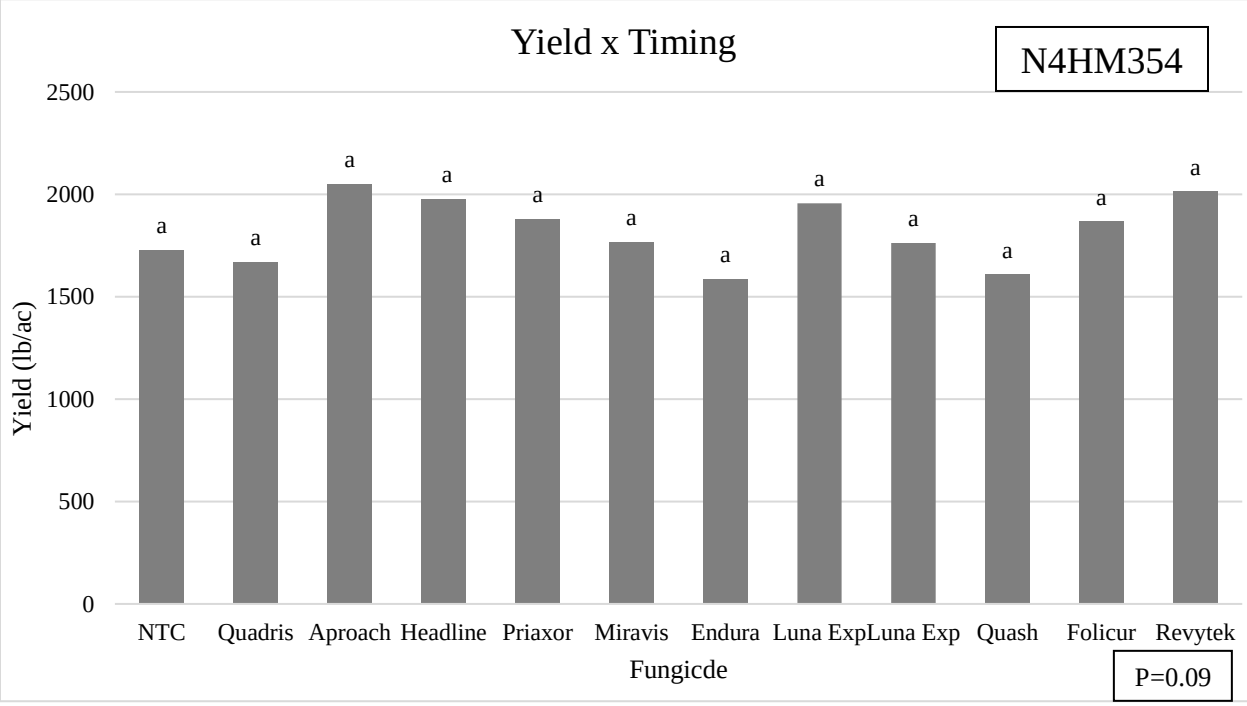

Figure 6. Yield Results for Efficacy Trials – Davenport, ND. Means with at least one common letter are not significantly different at $\alpha = 0.05$.

References

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