

Evaluation of fungicide seed treatment efficacy against three *Plasmopara halstedii* (downy mildew) races in inoculated field trials

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Introduction

- Sunflower downy mildew, caused by *Plasmopara halstedii*, is an economically important disease in the Northern Great Plains (NGP) (1).
- New resistance genes and novel fungicides are being tested for efficacy against the pathogen.
- *Plasmopara halstedii* (1) has historically been able to evolve to confer virulence to resistance genes and develop insensitivity to fungicides (1). These evolution events are considered to be independent, but we are often asked if fungicide's efficacy differs to different physiological races of *P. halstedii*.
- Both ineffective management of downy mildew and the cost of labeling and using fungicides carries high economic consequences.
- Consequently, we believed that field efficacy data of fungicide seed treatments against multiple pathogen races was needed.

Objective

- Evaluate the field efficacy of two labeled fungicides; azoxystrobin (Dynasty) and acibenzolar-S-methyl (Bion), and one experimental fungicide; oxathiapiprolin, against three different races of *P. halstedii*.

Materials and Methods

- Three field trials were conducted in 2015 at the North Dakota AES- Fargo. Each field trial was arranged as a RCBD with six reps. Trials were separated by two border rows. Plots were 25ft x 2.5ft and spaced 30 inches apart from adjacent plots. Seeding rates were ~35,000 seeds acre⁻¹ (50 seeds plot⁻¹).
- Seeds of a susceptible hybrid were treated with the different fungicide treatments and rates.
- Three different isolates of *P. halstedii* were used; each isolate was used to inoculate its respective trial.
 1. Race not virulent on *Pl₆* gene (710)
 2. Race virulent on *Pl₆* gene (734)
 3. Race virulent on *Pl₈* gene (710+)
- *P. halstedii* zoospores were suspended in water at concentrations of ~6.8 x 10⁶ zoospores linear ft⁻¹ and applied to treatment rows.
- Incidence data was collected at V10 stage by visually examining sunflower plants for symptoms and signs consistent with systemic infection by *P. halstedii* (Figs. 1 and 2).

Results

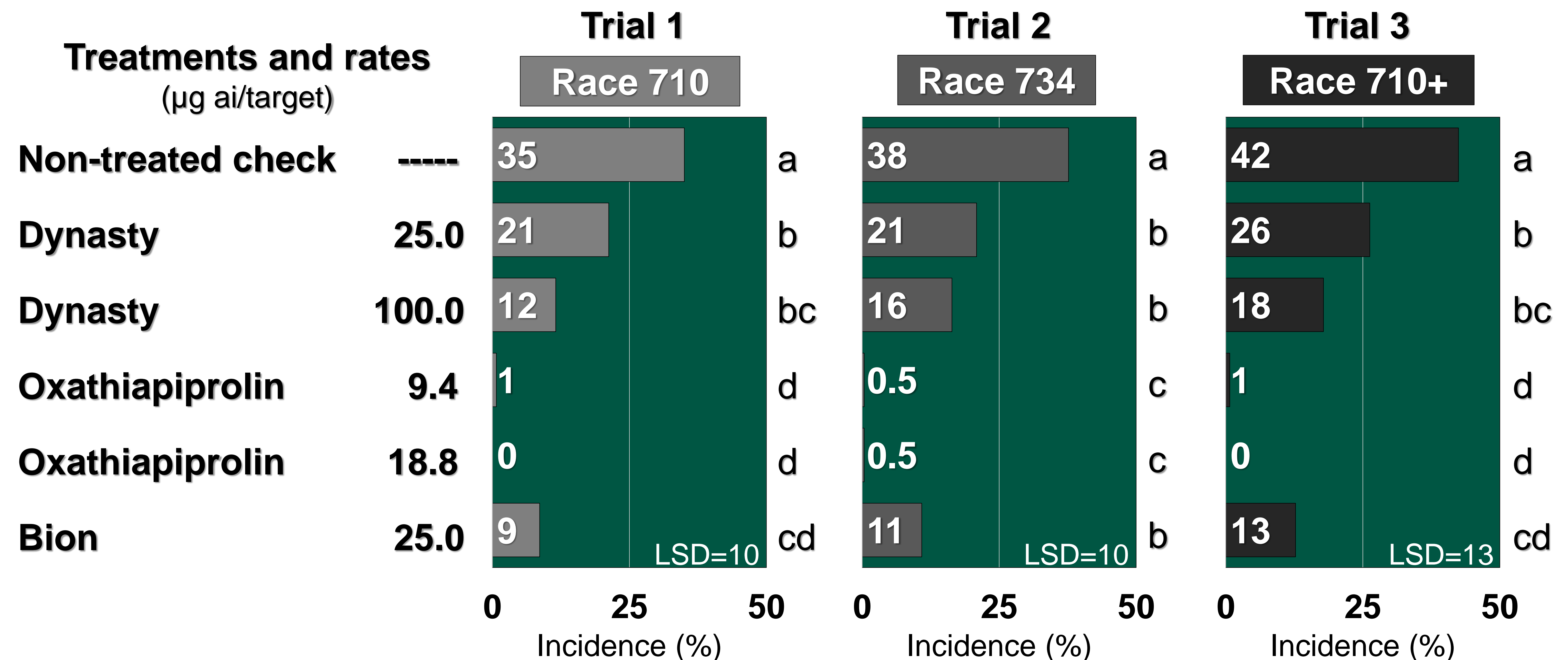


Figure 1. Average incidence levels and mean separations for three downy mildew field trials (1-3). Bars with the same letter are not significantly different based on Fisher's protected least significant difference test ($\alpha=0.05$).

Conclusions

- All treatments containing fungicides had significantly lower incidence levels compared to the non-treated check.
- Both oxathiapiprolin treatments had significantly lower incidence levels when compared to both Dynasty treatments.
- All fungicide treatments performed similarly in each of the three trials. Based off these results, it can be concluded that different *P. halstedii* races do not affect fungicide efficacy.

Literature Cited

1. Gulya, T., Kandel, H., McMullen, M., Knodel, J., Berglund, D., Mathew, F., Lamey, H.A., Nowatzki, J., and Markell, S. 2013. Prevalence and incidence of sunflower downy mildew in North Dakota between 2001 and 2011. Online. Plant Health Progress doi:10.1094/PHP-2013-0522-01-RS.

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Figure 2. Healthy, non-infected sunflower (A). Sunflower systemically infected with *P. halstedii* (B).

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