

Suppression of Entomopathogens of Soybean Aphid by Foliar Fungicides

K. Koch¹, D. Ragsdale¹, B. Potter², and J. Kurle³

¹ Dept. of Entomology, University of Minnesota, St. Paul, MN 55108. Southwest Research and Outreach Center, Lamberton, MN 56152. ³Dept. of Plant Pathology, University of Minnesota, 55108.

Introduction

Population growth of the soybean aphid, *Aphis glycines*, is governed largely by weather and natural enemies such as entomopathogenic fungi (EF), (Fig. 1) natural enemies important in suppressing soybean aphid populations. The effects of EF include direct effects on aphid density during the growing season or effects on aphid survival on overwintering hosts. Previous research conducted in Minnesota on potato, demonstrated a clear detrimental effect on EF when plots were repeatedly treated with fungicide. Green peach aphid populations in potato increased to extremely high densities due to the suppression of EF. In 2005, we began a study to evaluate the potential interaction between fungicides and the impact these materials have on EF.

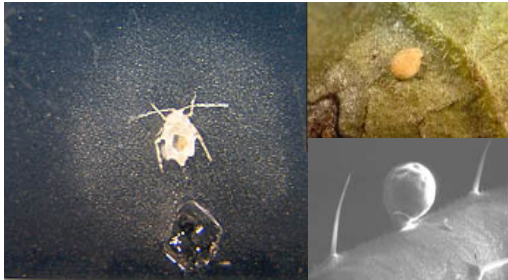


Fig. 1. a) Infected aphid on water agar surrounded by spore EF, b) Mummified soybean aphid c) Spore of EF attached to leg of soybean aphid.

Methods

The effect of fungicide applications on populations and prevalence of mycoses of the soybean aphid were investigated in 2005 at two locations in Minnesota. Applications of the fungicides, Quilt, Stratego, Headline + Folicur, and Headline + Folicur + Bravo were made at growth stage R1-R2 and subsequent application at 14-day intervals. Aphid density, prevalence of mycoses, and species composition of EF infecting soybean aphid were sampled during plant growth stages R3 through R5.

Results

Both inoculum and aphids were present at Rosemount, but the environmental conditions at Rosemount were not conducive for disease development even at peak aphid densities. The weather was hot, dry with relative humidities too low to allow for infection to occur. In contrast, at Lamberton late in the growing season all conditions were favorable for infection to occur when aphid populations were at peak density. As a result, an epizootic occurred at Lamberton.

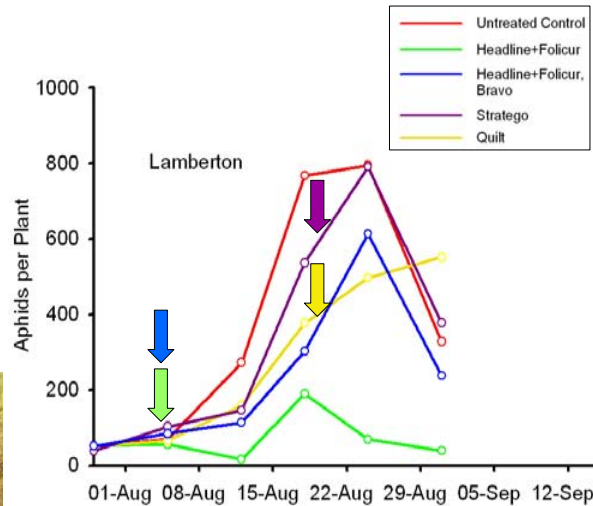


Fig. 2. Aphid density in plots treated with fungicide at Lamberton, Minnesota 2005. Fungicide applications were made on 22 Jul; 5 Aug and 19 Aug for the first, second, or third application. Headline and Headline+Folicur treatments were applied on 8/05). Stratego and Bravo treatments were applied on 8/19

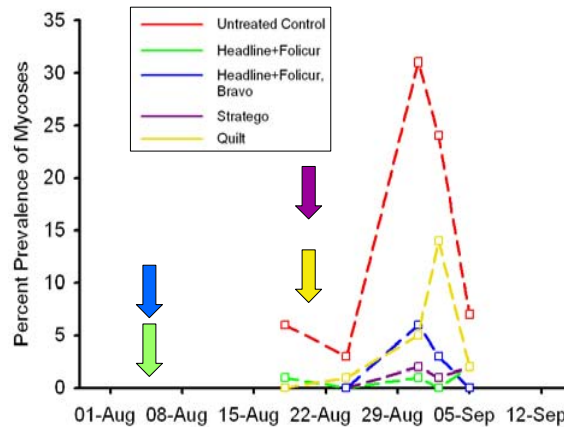


Fig. 3. Prevalence of fungal-infected aphids at Lamberton, Minnesota 2005. Down arrows indicate approximate date of the last two fungicide applications.

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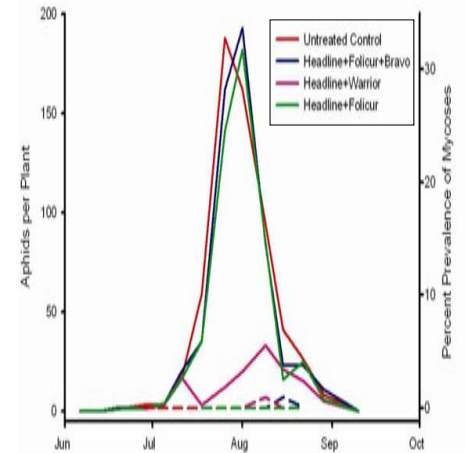


Fig. 4. Aphid density and prevalence of mycoses observed at Rosemount during 2005. Solid lines indicate aphid density in plots treated with fungicide at Rosemount, Minnesota 2005. Dashed line indicates prevalence of fungal-infected aphids.

Results

At Lamberton,

- 1) fungicides suppressed prevalence of fungal-infected aphids by over 90% (Fig.3).
- 2) The epizootic consisted of infections by the fungal entomopathogens *Pandora neoaphidis* (90%), *Conidiobolus thromboides* (9%) and *Zoopthora radicans* (1%). 90% of the infections were *Pandora neoaphidis*,
- 3) The prevalence of EF-infected aphids was reduced by all fungicide applications.
- 4) The relationship between EF prevalence and aphid numbers was inconsistent; i.e. the greatest reduction in prevalence was not associated with the highest aphid populations or greatest frequency of fungicide application.

At Rosemount

- 1) Aphid density among fungicide only treatments was not different from the untreated control (Fig. 4).
- 2) Mortality of soybean aphids caused by EF at Rosemount never exceeded 5% even in untreated control (Fig. 4).

Conclusions

- 1) Fungicides delayed onset and suppressed overall prevalence of aphid infecting pathogens.
- 2) Environment strongly influenced the prevalence of entomopathogenic fungi.
- 3) A clear relationship between fungal infection rates and aphid populations was not observed