Public-Private Partnership to Evaluate Aphid-Resistant Soybean

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Introduction

The soybean aphid (*Aphis glycines* Hemiptera: Aphididae) is the most economically important insect pest of soybean in the North Central United States. Soybean aphid outbreaks can reduce yield by 40 percent. Foliar insecticides still are the most used management strategy by farmers to protect yield loss when aphid population reaches the economic threshold of 250 aphids/plant. However, resistance to pyrethroid already has been reported, thus there is a need for alternative management strategies. Soybean varieties containing Resistance to *Aphis glycines* genes (*Rag* genes) can be an effective strategy to suppress aphids. A pyramid of two *Rag* genes (e.g., *Rag1+Rag2*) offers more protection against aphids than a single *Rag* gene. Despite their effectiveness, *Rag* varieties are not widely used by soybean producers, partly due to their limited commercial availability. This project partnered with Corteva™ Agriscience to evaluate elite soybean varieties with and without aphid resistance as a means to combat soybean aphid outbreaks.

Materials and Methods

The impact of host plant resistance on aphid population and yield was evaluated. Four Corteva™ varieties (relative maturity 2.6) were tested in a randomized complete block design with four replicate blocks. Varieties included a *Rag1+Rag2* variety and its susceptible isoline (*rag1+rag2*) as well as a *Rag1+Rag3* variety and its susceptible isoline (*rag1+rag3*). All varieties were glyphosate-tolerant. Seeds were planted in 30-in. rows at 140,000 seeds/acre May 4. Plots were 12 rows x 40 ft long. Aphids were scouted at least twice monthly from June through September. The number of aphids/plant was converted to cumulative aphid days (CAD) to estimate the seasonal exposure of plants to aphids. Soybean seeds were harvested September 30. Seed yield was estimated and compared among all treatments.

Results and Discussion

Seasonal aphid exposure. Aphid populations did not exceed the economic threshold in 2020 (Figure 1). Nonetheless, soybean variety had a significant affect ($P < .05$) on aphid populations. Without using insecticides, the resistant varieties had significantly fewer CAD than the susceptible varieties (Figure 2) indicating effective aphid control. The two resistant lines did not significantly differ in CAD.

Yield. Seed yield was not significantly affected by any treatment ($F_{3,9} = 2.65$, $P = .112$) (Figure 3). The aphid-resistant variety *Rag1+Rag2* had the highest seed yield with 84.87 bushels/acre followed by its susceptible isoline (*rag1+rag2*) at 80.40 bushels/acre. The *Rag1+Rag3* variety yielded 74.74 bushels/acre, followed by its susceptible isoline (*rag1+rag3*) with 70.89 bushels/acre. Aphid populations did not reach economic threshold in 2020 and likely did not cause yield loss.

Acknowledgements

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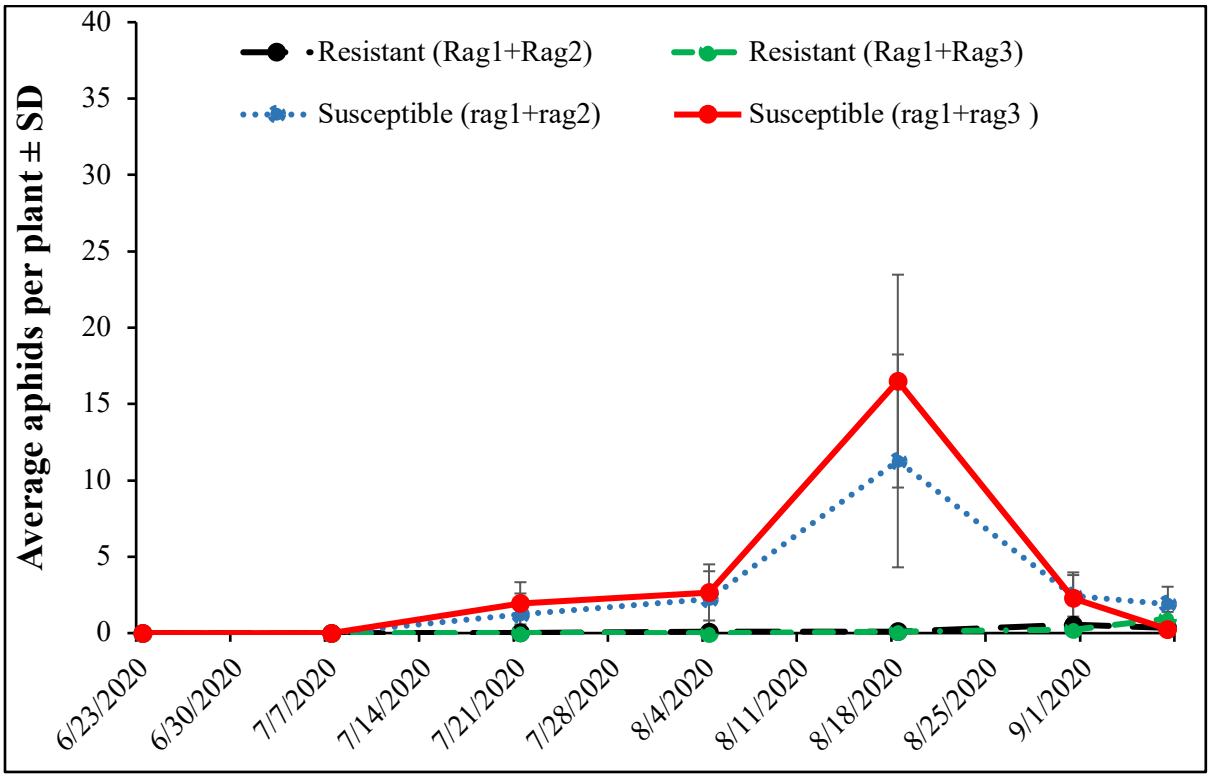

Figure 1. Aphid populations for each of the four Corteva™ Agriscience varieties. Aphid populations did not exceed the economic threshold (250 aphids/plant) on the susceptible varieties in 2020. *Rag*-varieties had fewer aphids.

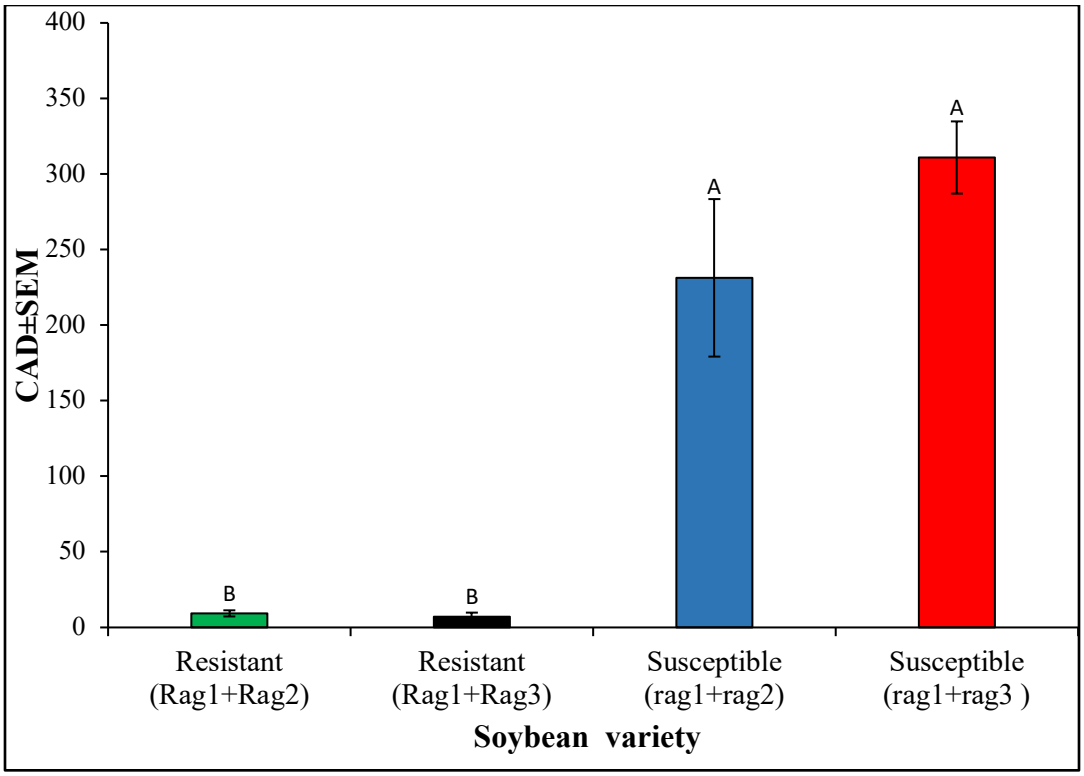

Figure 2. Season-long exposure of plants to soybean aphids (CAD) for each of the four Corteva™ Agriscience varieties. Soybean variety had a significant affect on CAD. *Rag* varieties experienced significantly lower CAD compared with aphid-susceptible varieties.

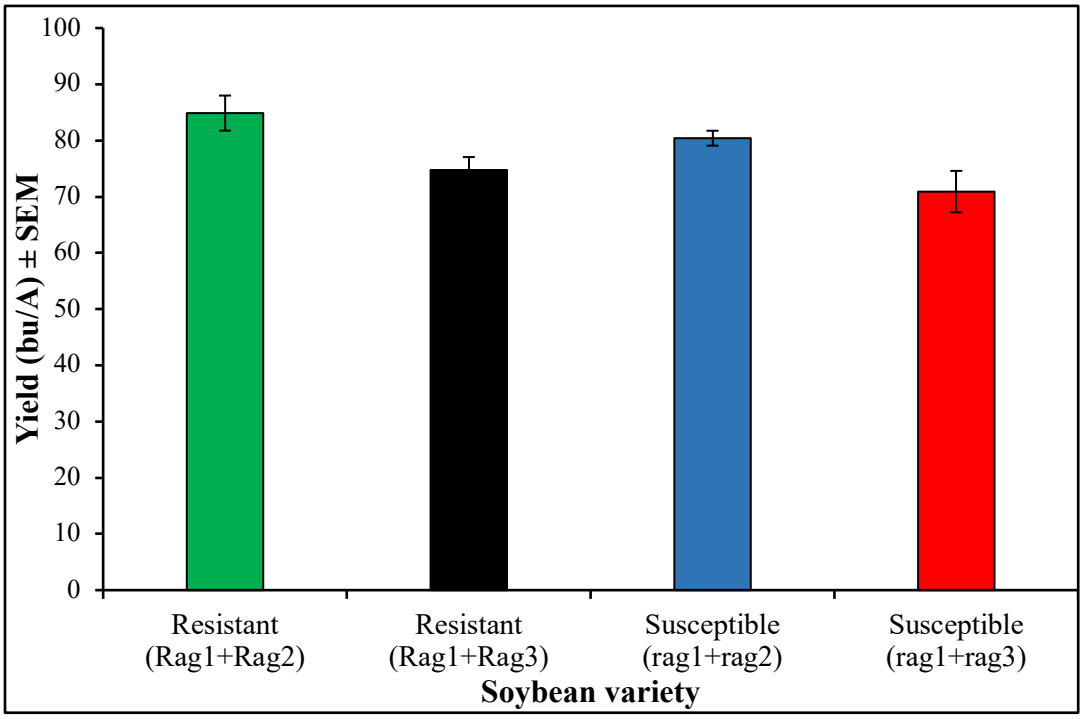

Figure 3. Yield for each of the four Corteva™ Agriscience varieties. No yield differences were detected among any treatment.