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Aphids in Corn Research

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Abstract
Corn, Zea mays L., is the most abundant field crop in Iowa, and there are many insect pests associated with this field crop. Although aphids are not typically economically important in corn, recent observations have indicated several aphid species developing heavy populations in northwest Iowa and southwest Minnesota. Historically, the corn leaf aphid, Rhopalosiphum maidis (Hemiptera: Aphididae), has been the most abundant aphid species in corn; however, the bird cherry oat aphid, R. padi (Hemiptera: Aphididae), and several other species have also been detected. Recent observations show a shift to populations peaking later in the summer. Damage potential and management guidelines for aphids in corn are not well defined and this research is aimed at developing economic threshold and sampling protocols.

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Aphids in Corn Research

RFR-A1150

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Introduction

Corn, *Zea mays* L., is the most abundant field crop in Iowa, and there are many insect pests associated with this field crop. Although aphids are not typically economically important in corn, recent observations have indicated several aphid species developing heavy populations in northwest Iowa and southwest Minnesota. Historically, the corn leaf aphid, *Rhopalosiphum maidis* (Hemiptera: Aphididae), has been the most abundant aphid species in corn; however, the bird cherry oat aphid, *R. padi* (Hemiptera: Aphididae), and several other species have also been detected. Recent observations show a shift to populations peaking later in the summer. Damage potential and management guidelines for aphids in corn are not well defined and this research is aimed at developing economic threshold and sampling protocols.

Materials and Methods

We established plots at the Iowa State University Northwest Research Farm in O'Brien County, Iowa. The plot area did not have fall tillage in 2010, but was finished on May 2, 2011. The plot area received a fertilizer application (27-69-60) on October 29, 2010 and 120 pounds of 28 percent nitrogen on May 9, 2011. A pre-emergent herbicide (Harness Xtra @ 1.5 quarts per acre) was applied on May 7, 2011 and a post-emergent herbicide (Roundup WeatherMax @ 30 oz/acre) was applied on June 18, 2011.

The treatments were arranged in a randomized complete block design with four replications of Roundup Ready corn (Pioneer PO115XR). Plots were planted in 30-in. rows at a seeding rate of 35,600 per acre on May 3. Each plot was 12 rows wide and 44 ft long. Ten treatments were evaluated (Table 1). Foliar treatments were made using a backpack sprayer and TeeJet flat fan nozzles (TJ 8002VS) with 13.9 gallons of water/acre at 30 lb of pressure per square inch. The pretassel application was made on July 8 and July 25; the at tassel and the R1 applications were made on July 25, and the R3 applications were made on August 8.

Estimation of aphid populations and cumulative aphid days. Plots were sampled weekly from June through August. Plots were sampled for all aphid stages (i.e., adults, nymphs and winged aphids). The number of plants sampled in each plot started at twenty and decreased to ten plants per plot by the end of the August. Cumulative aphid days were calculated for each plot to estimate seasonal aphid exposure with the following equation:

$$\sum_{n=1}^{\infty} = \left(\frac{x_{i-1} + x_i}{2} \right) \times t$$

where x is the mean number of aphids on sample day i, x_{i-1} is the mean number of aphids on the previous sample day, and t is the number of days between samples i - 1 and i.

Yield and statistical analysis. Yields were determined by weighing grain with a grain hopper mounted inside the combine grain tank. Yields were corrected to 15.5 percent moisture and reported as bushels per acre. One-way analysis of variance (ANOVA) was used to determine treatment effects within each experiment. Means separation for all studies was achieved using a least significant difference test ($P \leq 0.10$) with a Student-Newman-Keuls pairwise comparison. All analyses were performed with SAS® software.

Results and Discussion

During the 2011 growing season, aphid populations were very low until August 11, which was after all the foliar applications were made. Aphid populations peaked between August 19–27. The two most abundant species were bird cherry oat aphid followed by corn leaf aphid. Other corn insects were patchy and not considered to contribute to yield loss. In addition, corn foliar diseases were not evident.

In 2011, seasonal pressure of aphids in corn was highly variable between treatments and ranged from 887 to 8,666 cumulative aphid days (Figure 1). There were significant differences between the Quadris application made at tassel and the Cobalt + Quadris application made at R3 ($\alpha = 0.10$; $P = 0.0263$; $F = 2.56$; $df = 8, 3$). The yield response was also variable between treatments (Figure 2). Yield was highest in the Cobalt + Quadris treatment made at tassel ($\alpha = 0.10$; $P = 0.0112$; $F = 3.03$; $df = 8, 3$).

Our recommendation for managing aphids in corn is to monitor populations just prior to tasseling through the end of August. Because an economic threshold has not been developed for populations after tasseling, foliar insecticides may be justified if aphid feeding and honeydew production are interfering with normal corn production.

Acknowledgements

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Table 1. List of treatments for the aphids in corn study at O'Brien County, IA.

Treatments	Rate	Target application
Untreated Control	-----	-----
Cobalt Advanced[1]	16 oz/ac	pretassel
Cobalt Advanced[2]	16 oz/ac	pretassel
Cobalt Advanced[1]	16 oz/ac	at tassel
Quadris[1]	12 oz/ac	at tassel
Cobalt Advanced + Quadris[1]	16 oz/ac 12 oz/ac	at tassel
Cobalt Advanced[1]	16 oz/ac	R1
Cobalt Advanced[3]	16 oz/ac	R3
Quadris[3]	12 oz/ac	R3
Cobalt Advanced + Quadris[3]	16 oz/ac 12 oz/ac	R3

[1]Foliar applications were made on July 25, 2011.
[2]Foliar applications were made on July 8, 2011.
[3]Foliar applications were made on August 8, 2011.

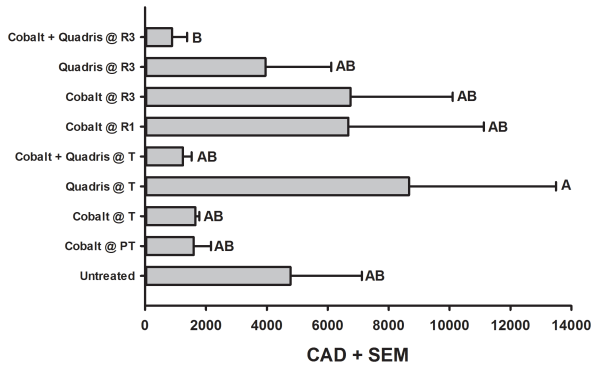

Figure 1. Mean separation of treatments (+ standard error of the mean) on cumulative aphid days (CAD). Means followed by the same letter do not differ (P≤0.10).

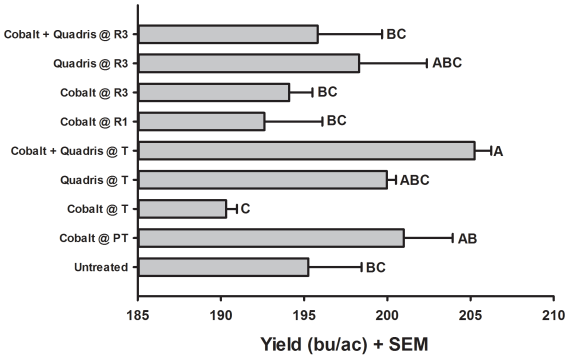

Figure 2. Mean separation of treatments on yield (+ standard error of the mean). Means followed by the same letter do not differ (P≤0.10).