Aphids in Corn Research

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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 plant. 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, corn leaf aphid, *Rhopalosiphum maidis* (Hemiptera: Aphididae), has been the most abundant aphid species in corn; however, bird cherry oat aphid, *R. padi* (Hemiptera: Aphididae), and other species also have been detected. Recent observations show a shift to populations peaking later in the summer. Injury 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

Plots were established at the ISU Northwest Research Farm in O'Brien County, Iowa. Treatments were arranged in a randomized complete block design with four replications of Roundup Ready corn (Pioneer P0407 brand). Plots were planted in 30-in. rows at a seeding rate of 36,000/acre on May 26. Each plot was 8 rows wide and 35 ft long. In 2014, 11 treatments were evaluated (Table 1). Foliar treatments were made using a custom sprayer and TeeJet flat fan nozzles (TJ 8002) with 15.5 gallons of water/acre at 40 pounds of pressure/square in. All treatments were treated with a low rate of Asana XL and Headline EC with a target of V5 applied on June 18. The tassel and R1 treatment applications were made on July 28; a threshold R5 treatment application was made on August 18; and a 500 aphids/plant application was made on August 27. Two additional planned treatments at increasing aphid thresholds were not made (Table 1).

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 20 and decreased to 10 plants/plot by the end of the August. Cumulative aphid days (CAD) 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/acre. One-way analysis of variance (ANOVA) was used to determine treatment effects within each experiment. Means separation for CAD and yield was achieved using a least significant difference test (alpha = 0.10). All analyses were performed with SAS® software.

Results and Discussion

During the 2014 growing season, aphid populations were very low, but began to colonize the plots starting in late July and into August. Aphid populations peaked in the untreated control on August 13. 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 2014, seasonal pressure of aphids in corn was variable between treatments and ranged from 130 to 1,506 CAD (Table 1). There were significant differences in CAD among treatments (P = 0.0385; F = 2.18; df = 10, 3). The treatment with the highest CAD was treatment 9. There also were yield differences among treatments (P = 0.00078; F = 2.90; df = 10, 3) (Table 1). Yield was highest in the Seeker treatment with a rate of 2.6 fl oz/acre (241 bushels/acre).

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 pollination or grain fill.

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Table 1. List of treatments for the aphids in corn study at O'Brien County, IA in 2014.

Treatment	Rate[a]	CAD ± SEM[b]	CAD-LSD[c]	Yield ± SEM[d]	Yield-LSD[e]
1. Untreated control[f]	-----	655.47 ± 188.12	ABC	197.37 ± 7.06	BCD
2. Cobalt Advanced EC[fghi]	16 fl oz	653.29 ± 83.31	ABC	193.72 ± 7.05	D
3. Cobalt Advanced EC[fg]	16 fl oz	129.52 ± 28.60	AB	202.64 ± 5.80	ABCD
4. Seeker SE[fg]	2.1 fl oz	544.69 ± 116.86	AB	198.10 ± 2.71	BCD
5. Seeker SE[fg]	2.6 fl oz	569.04 ± 130.46	AB	208.70 ± 5.55	A
6. Warrior II CS[fg]	1.6 fl oz	1133.93 ± 397.23	CD	193.44 ± 2.19	D
7. Lorsban Advanced EC[fg] +	16 fl oz				
Warrior II CS[fg]	1.6 fl oz	253.88 ± 86.40	AB	206.54 ± 4.71	AB
8. Cobalt Advanced EC[fh]	16 fl oz	689.24 ± 200.31	BC	199.41 ± 4.65	ABCD
9. Cobalt Advanced EC[fi]	16 fl oz	1506.19 ± 487.56	D	200.71 ± 5.18	ABCD
10. Cobalt Advanced EC[f]	16 fl oz	569.77 ± 140.12	AB	204.92 ± 4.45	ABC
11. Cobalt Advanced EC[f]	16 fl oz	736.07 ± 202.84	BC	196.04 ± 4.26	CD

[a]Foliar product rates are given as formulated product/acre.
[b]CAD ± SEM; cumulative aphid days ± standard error of the mean.
[c]CAD-LSD; least significant different mean separation test for cumulative aphid days.
[d]Yield ± SEM; yield in bushels/acre ± standard error of the mean.
[e]Yield-LSD; least significant different mean separation test for yield.
[f]A foliar application of Asana XL and Headline EC was made on June 18, 2014.
[g]Foliar applications were made on July 28, 2014.
[h]Foliar applications were made on August 18, 2014.
[i]Foliar applications were made on August 27, 2014.