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FIELD CORN: *Zea mays* L. (DeKalb 62–95)

Evaluation of Foliar Insecticides for the Control of Western Bean Cutworm in Field Corn, 2018

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Corn (hybrid, maize, sweet) | *Zea mays*

Western bean cutworm (WBC) | *Striacosta albicosta* (Smith)

Corn earworm (CEW) | *Helicoverpa zea* (Boddie)

The objectives of this field trial were to evaluate the efficacy of single applications of foliar insecticides at preventing feeding damage by the western bean cutworm (WBC), an important pest of corn and dry beans that has undergone a rapid range expansion into the eastern Corn Belt during the last 18 yr. This study was conducted within the historic range of WBC, at the University of Nebraska-Lincoln's Henry J. Stumpf International Wheat Center in Perkins County, NE (40.856851°N, –101.701335°W). An RCB design with a total of 16 treatments (including an untreated check) and four replications was used. Plots measured 20 ft (8 rows) wide × 35 ft long. The trial was planted on 5 May 2018 using a commercial 8-row planter at 32,000 seeds/acre at an approximate depth of 1.40–1.75 inches in 30-inch rows. The seeds planted were DKC62-95 (Monsanto Company, St. Louis, MO), non-Bt hybrid with RR2 herbicide tolerance. Irrigation, fertilization, and weed management inputs in plots followed standard agronomic practices for the region, with no insecticide applications other than the experimental treatments.

Plots were scouted weekly for the presence of WBC eggs and larvae following the onset of moth flight on 28 Jun. All foliar insecticide treatments were applied on 24 Jul using a backpack sprayer with an 8.3-ft handheld boom. Insecticides were delivered at 15-gpa carrier volume through six TeeJet AIXR 11002 air induction flat fan nozzles spaced 20 inches apart with 40 psi pressure maintained with a CO_2 propellant. Applications were made to a 10 × 30 ft area in the middle four rows of each plot with a single pass at 3 mph. At the time of treatment, 17% of plants were infested with an egg mass or larvae and 90% of plants had tasseled.

On 20 Aug (27 days after application), 10 ears were randomly chosen and removed along with the husks from central part of each plot. The ears were husked and examined in the laboratory to determine the amount of feeding damage, measured in square centimeters, to aborted kernels at the ear tip and to harvestable kernels. The presence of WBC and CEW larvae and secondary fungal infection in the ears was also recorded. On 1 Nov, a standardized subsample of ears (1/1,000 of an acre) from each plot were hand-harvested and shelled to calculate yield. Total grain weight and % moisture measurements were recorded and standardized to 56 lbs per bushel and 15.5% moisture.

Damage to aborted kernels, harvestable kernels, and both kernel types (total damage) were analyzed separately using mixed model ANOVA (PROC MIXED, SAS v. 9.4) with treatment as a fixed effect and block as a random effect. Yield data were then analyzed using a mixed model ANOVA with treatment as a fixed effect and block as a random effect. For all analyses, mean separations were obtained using Tukey's test (α = 5%). Damage data were square root-transformed to meet the assumptions of normality, while the Satterthwaite approximation was used when necessary to determine degrees of freedom due to heteroscedasticity. Untransformed means are presented.

Although 82.2% of the 45 larvae encountered during ear assessments were WBC and 17.8% were CEW, feeding damage from WBC and CEW larvae were combined in these analyses. Mean feeding damage in UTC plots ranged from 0.50 to 1.45 cm^2 with a mean of 1.07 cm^2 for aborted ear tip kernels, from 0.00 to 1.58 cm^2 with a mean of 0.85 cm^2 for harvestable kernels, and from 0.50 to 3.03 cm^2 with a mean of 1.92 cm^2 for total kernel damage. All foliar insecticide treatments failed to significantly reduce ear feeding damage to aborted ear tip kernels, harvestable kernels, and both kernel types compared with the UTC (Table 1). Similarly, significant differences in yield were not observed.

The efficacy and residual activity of the foliar insecticide treatments tested in this study may have been negatively affected by inclement weather, including a hail event prior to applications that damaged corn plants throughout the study area. Results from past trials conducted at this site have shown that fungal infection is related to WBC infestation, and over half (68.2%) of plots had ears with fungal infection in this study.

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Table 1.

Treatment/formulation	Rate (fl oz/acre)	Total number of WBC larvae collected	Total number of CEW larvae collected	Mean feeding damage to aborted kernels per ear (cm^2)	Mean feeding damage to harvestable kernels per ear (cm^2)	Mean total feeding damage per ear (cm^2)	Overall proportion of ears infested with larvae	Overall proportion of ears with fungal infection	Yield (bu/acre)
Untreated check	–	9	1	1.07a	0.85a	1.92a	0.43	0.05	185.35a
Asana XL 0.66EC	5.8	4	1	0.53a	0.61a	1.13a	0.43	0.00	199.11a
Besiege 1.252SC	6	0	0	0.71a	0.32a	1.03a	0.23	0.00	216.15a
Besiege 1.252SC	9	1	1	0.26a	0.51a	0.76a	0.15	0.03	200.48a
Blackhawk 36WG	2.2	2	0	0.45a	0.31a	0.76a	0.15	0.00	205.48a
Blackhawk 36WG	3.3	2	1	1.72a	0.54a	2.26a	0.33	0.05	196.58a
Brigade 2EC	3	2	0	0.98a	0.61a	1.59a	0.30	0.05	191.17a
Brigade 2EC	6.4	3	0	0.71a	0.39a	1.11a	0.20	0.00	211.20a
Hero 1.24EC	5	4	0	0.7a	0.26a	0.96a	0.23	0.08	209.90a
Intrepid 2F	8	2	1	1.44a	1.07a	2.51a	0.40	0.00	186.50a
Mustang Maxx 0.8EC	1.76	1	1	0.72a	0.22a	0.93a	0.20	0.15	207.48a
Mustang Maxx 0.8EC	4	1	0	1.34a	0.53a	1.86a	0.28	0.03	211.54a
Prevathon 0.43SC	10	0	1	0.52a	0.42a	0.94a	0.10	0.05	221.52a
Prevathon 0.43SC	14	0	0	0.18a	0.12a	0.30a	0.08	0.00	223.25a
Steward 1.25EC	10	2	0	0.69a	0.43a	1.12a	0.20	0.03	210.42a
Warrior II 2.08CS	1.8	4	1	1.09a	0.69a	1.79a	0.35	0.03	223.94a
$P > F$				0.20	0.41	0.16	–	–	0.13

Data were collected 27 days after application, when corn ears were at the early dent stage (R5).

Means within columns followed by the same letter are not significantly different ($P > 0.05$).

Data for the proportion of ears infested with larvae and the proportion of ears with fungal infection were not analyzed statistically.