Comparison of aerial and chemigation insecticide applications for western bean cutworm management

*Andrea Rilaković[1], Ruby M. Anderson[1], Alisson da Silva Santana[3], Miloš Zarić[1], Jeffrey A. Golus[1], Greg R. Kruger[1,4], Ana M. Velez[2], and Julie A. Peterson[1]

[1] University of Nebraska-Lincoln, West Central Research Extension & Education Center, North Platte, NE; [2]University of Nebraska-Lincoln, Department of Entomology, Lincoln, NE; [3] Department of Crop Protection, School of Agriculture, São Paulo State University, Botucatu, Brasil; [4] BASF Corporation, Research Triangle Park, NC

Introduction

- Western bean cutworm (WBC), *Striacosta albicosta* (Smith), is an insect pest that can cause severe damage on corn ears by larval feeding.
- After hatching, 1st through 3rd instar larvae feed on tassel tissue and pollen, then they move down to feed on silk and developing kernels[1]. As a result, mature larvae are less vulnerable to foliar insecticides due to their protected position inside the corn ear, which makes their control challenging.

- Most growers apply insecticides by airplane in intensive corn production, but spray coverage is not uniform. However, some growers apply insecticides by irrigation systems (chemigation) despite the lack of information for its efficacy against this pest.
- Exposing this pest to sublethal dosages may cause insecticide resistance. Thus, good coverage of treated plants should be the goal of pesticide applications.

Objective

To determine which application method would provide better insecticide efficacy for WBC management in corn.

Materials & Methods

- First, second and third instars of WBC were exposed to the highest and lowest label rates of Brigade (bifenthrin) and Prevathon (chlorantraniliprole) (Table 1).
- Aerial application was simulated[2,3] in a spray chamber at 2 gal/ac delivery rate (Figure 1); chemigation was simulated at 0.25 ac-in (Figure 2).

Figure 1. Simulation of aerial application

Figure 2. Performing chemigation

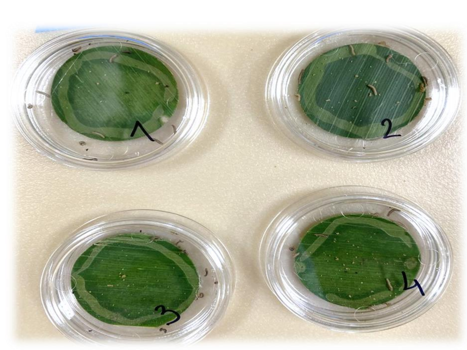


Figure 3. Larvae in Petri dish after application of insecticides

- After treatment, 20 first instars or 10 second or third instars were transferred to each Petri dish (four replicates per treatment) (Figure 3).
- Mortality was recorded 16 and 24 hours after infestation (plus 41 hours for 3rd instars).
- Larvae that did not move for at least a body length after gentle prodding with a paintbrush were considered dead.
- Data were analyzed by generalized linear mixed models (PROC GLIMMIX in SAS v. 9.4).
- When differences occurred, they were reported at the alpha=0.05 significance level with Tukey-Kramer adjustment.

Table 1. Treatment list.

Treatment #	Product	Insecticide Rate (fl oz/ac)	Application Type
1	Control	-	Aerial
2	Prevathon	(14) Low	Aerial
3	Prevathon	(20) High	Aerial
4	Brigade	(2.1) Low	Aerial
5	Brigade	(6.4) High	Aerial
6	Control	-	Chemigation
7	Prevathon	(14) Low	Chemigation
8	Prevathon	(20) High	Chemigation
9	Brigade	(2.1) Low	Chemigation
10	Brigade	(6.4) High	Chemigation

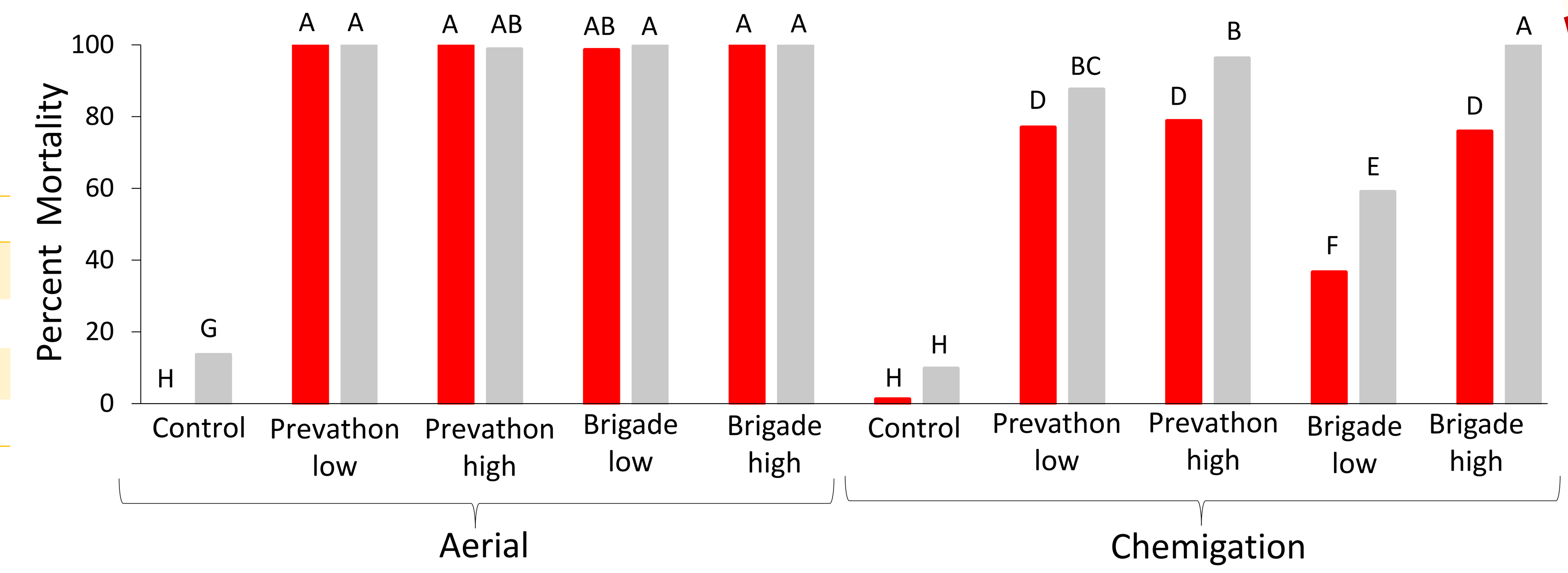
Results

Time after treatment: 16 hours 24 hours 41 hours

1st instar

GLMM Results

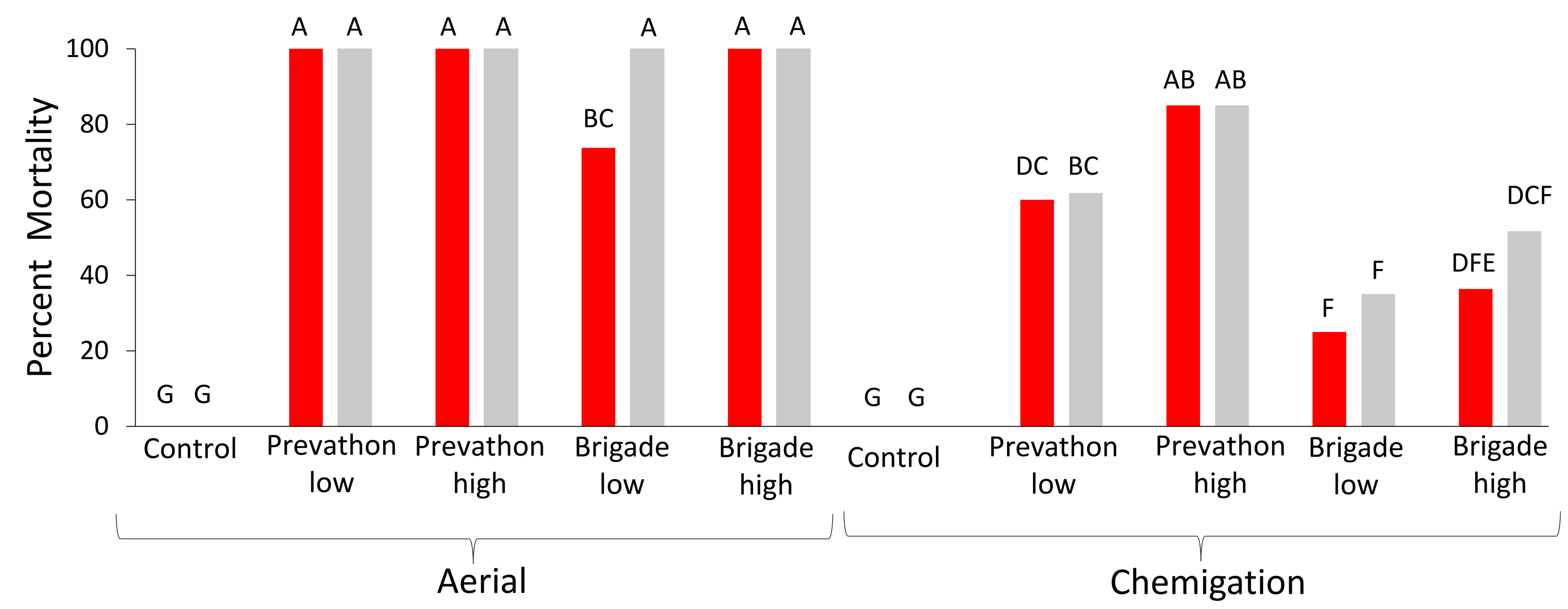
Effect	DF	F Value	Pr > F
Treatment	9	119.27	<.0001
Time	1	52.04	<.0001
Trt*Time	9	5.06	<.0001



2nd instar

GLMM Results

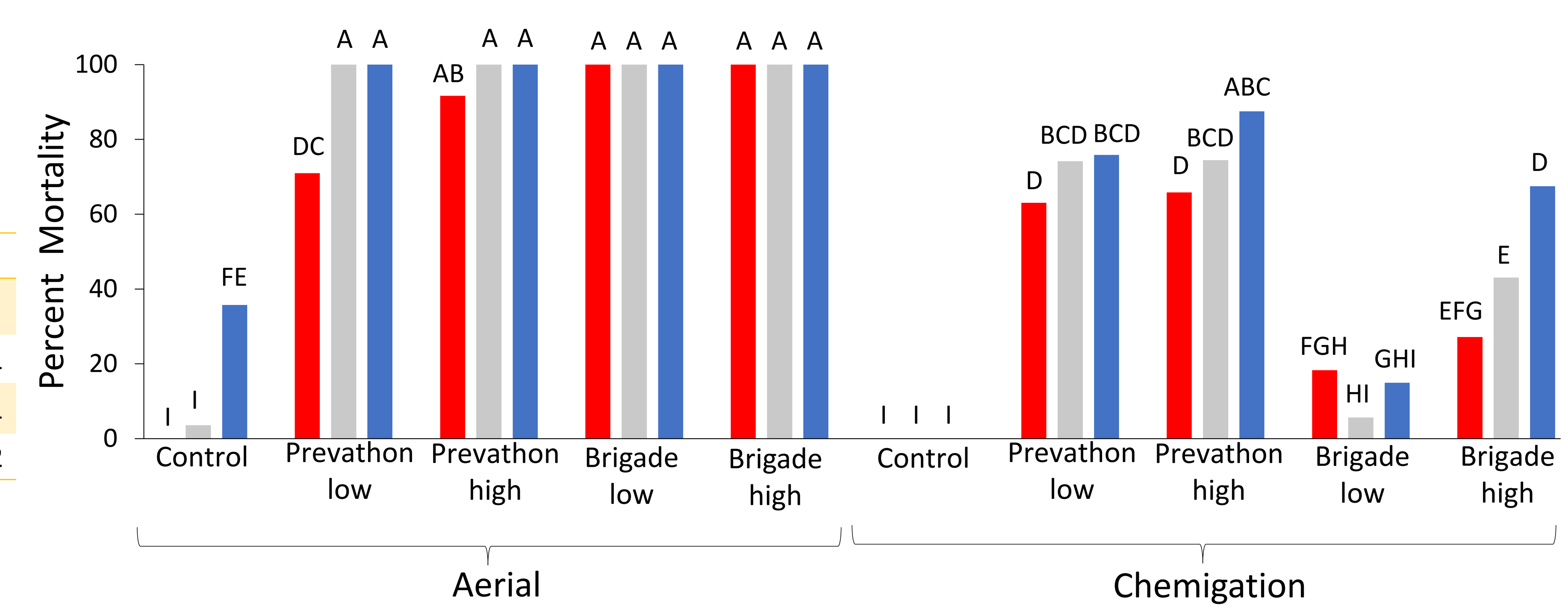
Effect	DF	F Value	Pr > F
Treatment	9	25.00	<.0001
Time	1	12.13	0.0009
Trt*Time	9	3.52	0.0015



3rd instar

GLMM Results

Effect	DF	F Value	Pr > F
Treatment	9	102.42	<.0001
Time	2	14.50	<.0001
Trt*Time	18	2.43	0.0032



Discussion & Conclusion

- Overall, results showed that aerial application provided better WBC control than chemigation under simulated conditions. However, results from chemigation field studies in 2020 and 2021 provided good control of WBC. Therefore, more field studies need to be performed to see which application method should be chosen given realistic and variable field conditions.
- Within chemigation, Prevathon treatments were effective at both high and low rates for all instars. Simulated chemigation with Brigade provided better control at the high rate compared to low, particularly for 1st instars and with mortality of 3rd instars no different than the control. These results support other indications that WBC may be evolving resistance to pyrethroid insecticides[2,4].

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