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Effects of Seed and Foliar Insecticides on Corn Flea Beetles and Stewart's Disease of Corn

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Abstract
Stewart's disease of corn, caused by the bacterium *Pantoea (Erwinia) stewartii*, is a disease extremely important disease to seed and sweet corn producers because of the substantial economic losses it can cause. In the seed corn industry, zero tolerance phytosanitary regulations greatly limit the ability of seed corn to be exported from fields where Stewart's disease has been found. In 1999 and 2000, the prevalence of Stewart's disease in seed production fields in Iowa was 58%. For seed corn companies to export this seed, they would need to perform costly grow-out tests or enzyme-linked immunosorbent assay to verify that the seed was free of *P. stewartii*. To date, management practices for Stewart's disease rely primarily on seed insecticides to reduce early season feeding by the corn flea beetle (*Chaetocnema pulicaria*). Use of foliar insecticides during the growing season is a common practice, but it has not been determined whether combinations of seed and foliar insecticides can provide adequate protection to increase yields. The goals of this study were to determine the efficacy of using seed and foliar insecticides to reduce the incidence of Stewart's disease and to increase yields in seed cornfields. This study also was conducted at the Pioneer Research Farm in Johnston, Iowa.

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Introduction

Stewart's disease of corn, caused by the bacterium *Pantoea (Erwinia) stewartii*, is a disease extremely important disease to seed and sweet corn producers because of the substantial economic losses it can cause. In the seed corn industry, zero tolerance phytosanitary regulations greatly limit the ability of seed corn to be exported from fields where Stewart's disease has been found. In 1999 and 2000, the prevalence of Stewart's disease in seed production fields in Iowa was 58%. For seed corn companies to export this seed, they would need to perform costly grow-out tests or enzyme-linked immunosorbent assay to verify that the seed was free of *P. stewartii*. To date, management practices for Stewart's disease rely primarily on seed insecticides to reduce early season feeding by the corn flea beetle *(Chaetocnema pulicaria)*. Use of foliar insecticides during the growing season is a common practice, but it has not been determined whether combinations of seed and foliar insecticides can provide adequate protection to increase yields. The goals of this study were to determine the efficacy of using seed and foliar insecticides to reduce the incidence of Stewart's disease and to increase yields in seed cornfields. This study also was conducted at the Pioneer Research Farm in Johnston, Iowa.

Materials and Methods

The experimental design was a randomized complete block with 4 replications and 12 treatments (Table 1). Plots measured eight rows by 50 feet, with 30-inch row spacing. Seed was sown on May 1, 2001 at a density of 28,000 plants/acre. Incidence (the number of plants with Stewart's disease symptoms/the total number of plants examined) measurements were taken seven times during the growing season (Figure 1). The field was harvested on October 1, 2001, at which time, moisture, and yield measurements were obtained.

Results and Discussion

All treatments were better than the control (no seed, no foliar insecticide) in reducing the incidence of Stewart’s disease (Figure 1). Combinations of the insecticide seed treatment (Gaucho or Adage) plus three applications of Warrior gave the best results in reducing the incidence of Stewart's disease.

No significant differences were observed in yield measurements; however, the highest observed yields were obtained when both seed and foliar insecticides were used (Table 2).

This information will help development of management models for reducing the effects of Stewart's disease while also minimizing the timing and numbers of insecticide treatments required to manage both corn flea beetles and Stewart's disease. This should help provide tremendous economic savings to the producer.

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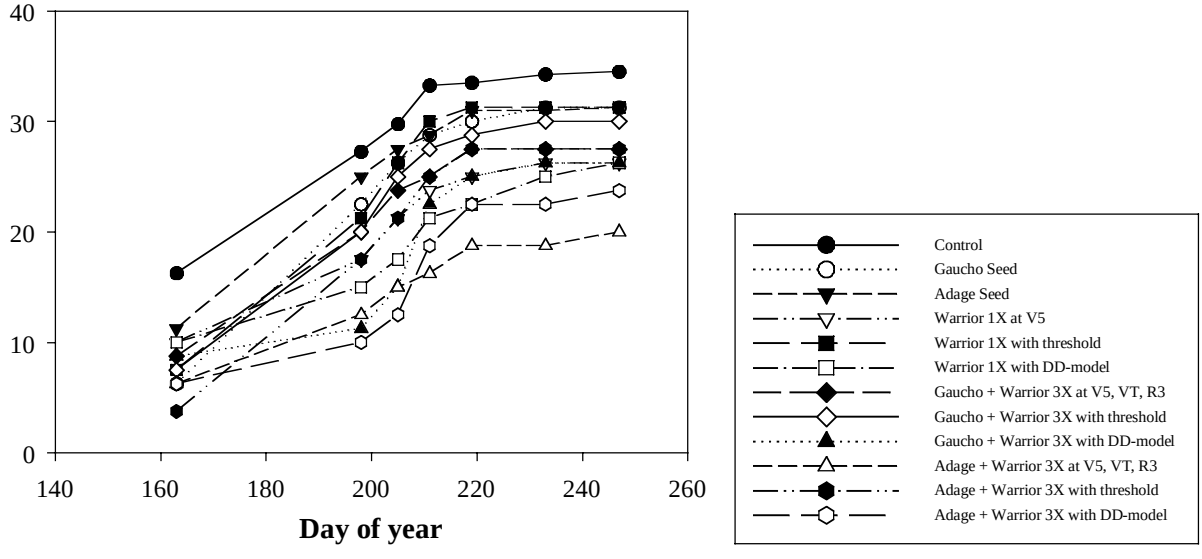
Table 1. Treatment combinations used in the seed and foliar insecticide studies in 2001 at the Southeast Farm, Crawfordsville, Iowa.

Treatment	Type of treatment
Control	No seed and foliar insecticides
Gaucho	Seed
Adage	Seed
Warrior 1× at V5 GS	Foliar
Warrior 1× using corn flea beetle threshold	Foliar
Warrior 1× using degree-day model	Foliar
Gaucho + Warrior 3× at V5, VT, R3 GS	Seed and foliar
Gaucho + Warrior 3× using corn flea beetle threshold	Seed and foliar
Gaucho + Warrior 3× using degree-day model	Seed and foliar
Adage + Warrior 3× at V5, VT, R3 GS	Seed and foliar
Adage + Warrior 3× using corn flea beetle threshold	Seed and foliar
Adage + Warrior 3× using degree-day model	Seed and foliar

Table 2. Yield data from insecticide experiments conducted at Crawfordsville, Iowa in 2001. Yield measurements were obtained for three rows of an eight-row plot. Plots were harvested on October 1, 2001.

Treatment	Yield (bu/acre)
Control	62.05 a[a]
Gaucho	66.40 a
Adage	71.65 a
Warrior 1× at V5 GS	60.85 a
Warrior 1× using corn flea beetle threshold	59.85 a
Warrior 1× using degree-day model	63.55 a
Gaucho + Warrior 3× at V5, VT, R3 GS	67.13 a
Gaucho + Warrior 3× using corn flea beetle threshold	63.78 a
Gaucho + Warrior 3× using degree-day model	64.55 a
Adage + Warrior 3× at V5, VT, R3 GS	69.98 a
Adage + Warrior 3× using corn flea beetle threshold	69.05 a
Adage + Warrior 3× using degree-day model	78.85 a

[a] Means with the same letters are not significantly different ($P \leq 0.05$) based on the Waller Duncan K-ratio test.



Incidence of Stewart's d

Figure 1. In Incidence of Stewart's disease of corn at Crawfordsville, Iowa during 2001. Treatment included combinations of seed and foliar insecticides, plus appropriate controls.