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Soybean aphid efficacy evaluation program for the North Central Region

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Introduction

Soybean aphid, *Aphis glycines*, is a significant pest on soybean, *Glycine max* (L.), and is capable of reducing yield by at least 25% in Iowa. Since 2005, our program has evaluated foliar and seed-applied insecticides for soybean aphid. The general protocol has remained the same since 2005, and includes evaluating 20-35 different insecticides per year. We summarize the general trends observed during the last six years.

Materials and Methods

We evaluate insecticide efficacy on at least one Iowa State University (ISU) Research Farm (Fig. 1) per year. Each insecticide is compared to multiple entries with at least four replications comprised of small plots (3m by 16.7m) within a randomized complete block design. Insecticide performance is compared to an untreated control, as well as an 'aphid free' control that is the result of a mixture of an organophosphate and pyrethroid applied when aphid populations reach ~10 or more aphids per plant. Soybean aphid populations are monitored throughout the season. Insecticides are applied to foliage with a backpack sprayer (Fig. 2) at either the economic threshold (250 aphids per plant) or, if aphid populations are not expected to exceed this threshold, within the first 2 weeks of August. Cumulative aphid days (CAD) are calculated to provide a measure of seasonal aphid exposure experienced in each plot, and plots are harvested with a small plot combine. A summary of CAD and yield are published in an ISU Yellow Book publication each year.

Figure 1. The soybean aphid efficacy evaluation program was conducted at the Northwest Farm in 2005-2006, Johnson Farm in 2009-2010, and the Northeast Farm in 2005-2010.

Conclusions

Our results indicate that since 2005 a timely application of a foliar insecticide can significantly reduce aphid populations (Fig. 3A) and protect yield (Fig. 3B). This long term study also indicates that organophosphates and pyrethroids provide comparable benefits in terms of reducing aphid populations and protecting yield (Fig. 3). Figure 4 demonstrates how insecticides performed when aphid populations exceeded the economic injury level in 2007. Our results also suggest that a seed treatment alone can reduce or delay aphid populations in soybean, and increase yield under heavy aphid pressure compared to an untreated control (Fig. 5).

Figure 2. Foliar applications are made with a CO_2 pressurized backpack sprayer.

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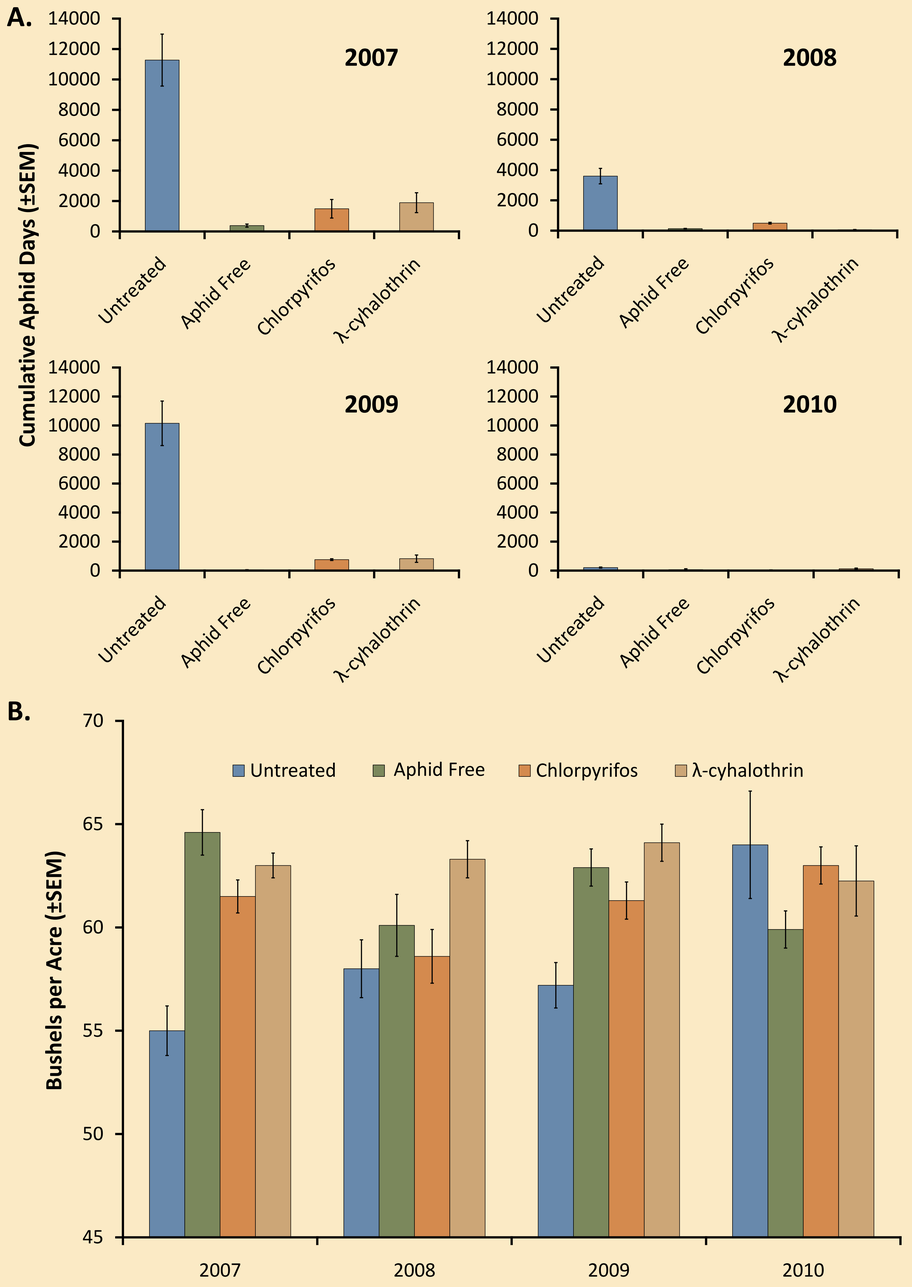

Figure 3. Comparison of two insecticide classes (organophosphate and pyrethroid) on soybean exposure to aphids (i.e., CAD), and yield during years with varying aphid populations. Trade names used for chlorpyrifos included Lorsban 4E or Lorsban Advanced (Dow AgroSciences); and tradenames for λ-cyhalothrin included Warrior or Warrior II (Syngenta). The 'aphid free' treatments consisted of tank-mix of an organophosphate and pyrethoid applied up to three times per year to keep plants free of aphids.

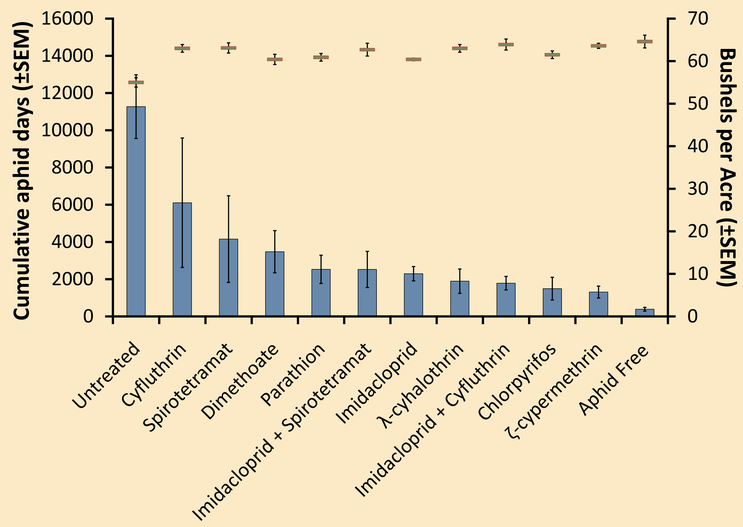

Figure 4. A subset of insecticides applied to soybean foliage in 2007 when aphids exceeded the economic injury level. CAD (± standard error of the mean) are displayed as bars for each treatment, and yield (bushels per acre ± standard error of the mean) are displayed as symbols.

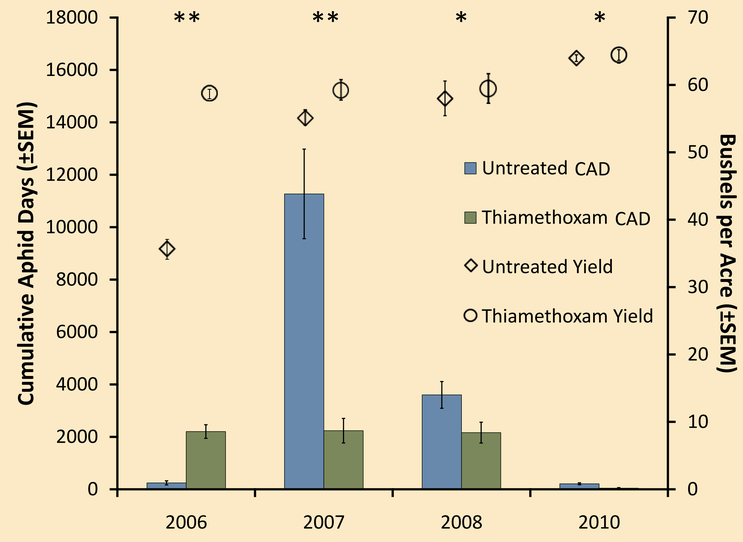

Figure 5. Comparison of untreated controls and plots that received only seed-applied insecticide (Thiamethoxam [Cruiser or CruiserMaxx Beans]) during years with varying aphid populations. CAD (± standard error of the mean) are displayed as bars for each treatment, and yield (bushels per acre ± standard error of the mean) are displayed as symbols. Years with a ** show a significant difference between plots that received no insecticide (untreated) and those that received only thiamethoxam, in regards to both CAD and yield; while years with a * show a significant difference between treatments in regards to CAD only (P<0.05).