# Evaluation of Insecticides On Cotton Fleahopper and Beneficial Arthropod Populations

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## Introduction

Although a number of insecticides provide adequate control of cotton fleahoppers, *Pseudatomoscelis seriatus* (Reuter), information regarding their impact on beneficial arthropod populations is generally lacking. An experiment was initiated in 2009 concurrently with a cotton fleahopper insecticide efficacy trial to determine which products were the least and most detrimental to natural enemy populations. Presented herein are results from the first year of the study.

## Materials and Methods

- **Test Site:** Commercial field near El Campo, TX; Phytogen 440 WRF on 39" rows.
- **Expermental Design:** RCB with 8 treatments (Table 1) and 4 reps – each plot measured 12 rows by 50 ft, but only center eight rows treated.
- **Application Parameters**: Spider-Trac with 4X hollow-cone nozzles (2 nozzles per row) @ 40 psi to produce a total volume of 5.1 GPA; applications made on 20 and 28 May.
- **Cotton fleahopper sampling**: *see manuscript for details*.
- **Beneficial arthropod sampling:** Entire length of one row in each plot sampled with a Keep-It-Simple-Sampler (KISS) on 20 May (pretreat), 26 May (6 DAT-1), 2 June (5 DAT-2), and 9 June (12 DAT-2). No. of spiders, ladybird beetles, lacewings, minute pirate bugs, big-eyed bugs, damsel bugs, and syrphid flies recorded.
- **Aphid sampling**: No. of aphids on the 4th fully-expanded leaf below the terminal of 10 plants from the center two rows of each plot counted on 9 June (12 DAT-2).

**Table 1.** Insecticide treatments with corresponding rates of application.

| Treatment | Class | Product per acre |
|---|---|---|
| Bidrin 8E (dicrotophos) | Organophosphate (OP) | 3.2 fl-oz |
| Bidrin XP (dicrotophos + bifenthrin) | OP + Pyrethroid | 1.6 + 2.6 fl-oz |
| Centric 40WG (thiamethoxam) | Neonicotinoid | 1.25 oz |
| Discipline 2EC (bifenthrin) | Pyrethroid | 5.2 fl-oz |
| Intruder 70WP (acetamiprid) | Neonicotinoid | 1.0 oz |
| Orthene 97S (acephate) | OP | 8.0 oz |
| TrimaxPro 4.44 (imidacloprid) | Neonicotinoid | 1.25 fl-oz |
| Non-treated control | N/A | N/A |

## Results & Discussion

- All tested products provided adequate cotton fleahopper control (*see manuscript for details*).
- Spiders and ladybird beetles were the most prevalent predators encountered in the study, accounting for 76 to 99% of the total abundance of predators on each sampling date (Fig. 1).
- Ladybird beetles became more prominent as the study progressed (Fig. 1) - largely due to reproduction (Fig. 2).
- Compared with the non-treated control, none of the insecticides appeared to have a detrimental impact on beneficial arthropod populations (Table 2).
- On the final assessment date, Bidrin XP and Discipline 2EC had significantly more predators than the non-treated control (Table 2). Coincidentally, the greatest numbers of aphids also were associated with these two products, although only Discipline 2EC separated out statistically.
- Numerically, Intruder 70WP had the fewest numbers of predators and aphids (Table 2).

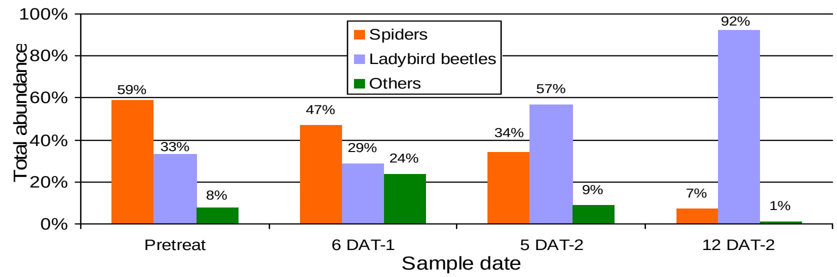


**Figure 1.** Overall (across all treatments) composition of predators collected with a Keep-It-Simple Sampler.

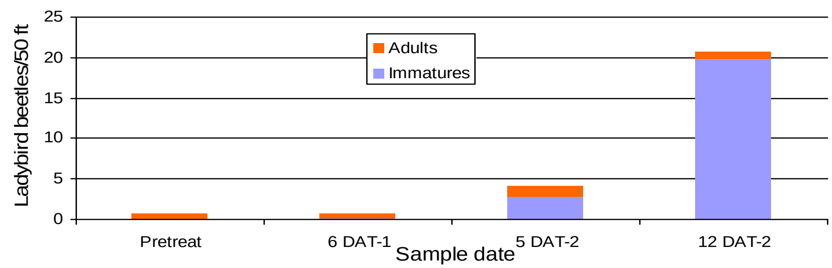


**Figure 2.** Overall (across all treatments) mean number of ladybird beetles per 50 row ft sampled with a Keep-It-Simple-Sampler.

**Table 2.** Mean numbers of predators and aphids in a cotton field treated with various insecticides for cotton fleahopper control.

| Treatment | Predators per 50 row ft [a] | | | | Aphids per leaf [b] |
|---|---|---|---|---|---|
| | Pretreat (19 May) | 6 DAT-1 (26 May) | 5 DAT-2 (2 June) | 12 DAT-2 (9 June) | 12 DAT (9 June) |
| Bidrin 8E | 2.8 a | 3.8 a | 9.0 a | 15.3 a | 2.8 a |
| Bidrin XP | 2.5 a | 2.5 a | 5.0 a | 49.0 b | 7.9 a |
| Centric 40WG | 2.3 a | 3.0 a | 7.0 a | 10.3 a | 3.1 a |
| Discipline 2EC | 2.3 a | 1.8 a | 5.5 a | 67.0 b | 29.8 b |
| Intruder 70WP | 1.5 a | 2.3 a | 6.3 a | 5.5 a | 1.0 a |
| Orthene 97S | 2.5 a | 2.0 a | 14.5 b | 15.3 a | 5.5 a |
| Trimax Pro 4.44 | 2.8 a | 3.8 a | 5.0 a | 14.8 a | 5.1 a |
| Non-treated | 2.3 a | 2.3 a | 7.0 a | 15.0 a | 5.0 a |

Within a column, values followed by different letters are significantly different (ANOVA, Tukey-Kramer test, $P$=0.05).
[a] Sampled w/ Keep-It-Simple-Sampler; includes spiders, ladybird beetles, lacewings, minute pirate bugs, big-eyed bugs, damsel bugs, & syrphid flies.
[b] Mean number of aphids on the 4th fully expanded leaf below the terminal of 10 plants.

## Summary

Based solely on the numbers of predators found in the insecticide-treated and non-treated plots, none of the products appeared to have a detrimental impact on beneficial arthropod populations. However, given the apparent relationship between aphid densities and natural enemy abundance, additional studies are needed to fully understand the mechanisms by which these insecticides impact natural enemy populations.

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