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EFFICACY OF SELECTED INSECTICIDES FOR CONTROL OF COTTON APHID (APHIS GOSSYPII) AND BANDEDWINGED WHITEFLY (TRIALEURODES ABUTILONEA) IN COTTON -- 2005

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Abstract

Field experiments were conducted in 2005 at a single location in Arkansas to evaluate efficacy of selected insecticides to control the cotton aphid (*Aphis gossypii*). At 3 DAT, Intruder (acetamiprid) at 0.0175 lb ai/a + Dyne-amic (non-ionic spray adjuvant) at 1 pt/a, Intruder (acetamiprid) at 0.025 lb ai/a + Dyne-amic (non-ionic spray adjuvant) at 1 pt/a, Centric (thiamethoxam) at 0.031 lb ai/a, Trimax (imidachloprid) at 0.047 lb ai/a, Trimax (imidachloprid) at 0.031 lb ai/a, and Carbine (flonicamid) at 0.06 lb ai/a + Mustang Max (zeta-cypermethrin) at 0.02 lb ai/a all significantly differed from the untreated check. Of these treatments, Intruder (acetamiprid) at 0.0175 lb ai/a + Dyne-amic (non-ionic spray adjuvant) at 1 pt/a and Intruder (acetamiprid) at 0.025 lb ai/a + Dyne-amic (non-ionic spray adjuvant) at 1 pt/a were numerically the best treatments, but they did not significantly differ from the other treatments which were significantly different from the untreated check.

Field experiments were conducted in 2005 at a single location in Arkansas to evaluate efficacy of selected insecticides to control the bandedwinged whitefly (*Trialeurodes abutilonea*). At 3 DAT, Intruder (acetamiprid) at 0.04375 lb ai/a, Experimental 1, Experimental 2, Orthene (acephate) at 1 lb ai/a, and Centric (thiamthoxam) at 0.05 lb ai/a all significantly differed from the untreated check. Of these treatments, Orthene (acephate) at 1 lb ai/a was numerically the best treatment, but it did not significantly from the other treatments, which were significantly different from the untreated check except for Experimental 1. At 7 DAT, no treatments significantly differed from the untreated check. For seasonal totals of whiteflies, all treatments significantly differed from the untreated check except Capture (bifentrhin) at 0.0782 lb ai/a. Orthene (acephate) at 1 lb ai/a was significantly better than all other treatments except Intruder (acetamiprid) at 0.04375 lb ai/a.

INTRODUCTION

The cotton aphid, *Aphis gossypii*, has recently become a major pest in the US cotton belt. Early season infestations can result in plant discoloration and disfigurement, and late season infestations can cause “sticky cotton” and sooty mold (Wells, 1998). During the 2003 growing season, an estimated 600,000 acres were infested with aphids, of which 200,000 acres were treated. There was no loss attributed to aphid infestation (Williams, 2003). The current threshold for aphids in Arkansas is to treat “when populations are building and aphid colonies are present on approximately 50% of the plants” (Greene, 2005).

“The bandedwinged whitefly *Trialeurodes* abutilonea (Haldeman), is found in most of the US cotton belt but is only rarely a pest in cotton” (Hendrix, 2001). During the 2003 growing season, an estimated 350,000 acres were infested with whiteflies, of which 12,000 acres were treated. There was no loss attributed to whitefly infestation (Williams, 2003). The current threshold for whiteflies in Arkansas is to “treat infested areas when 50% of the plants are infested” (Greene, 2005).

RESEARCH PROBLEM

The widespread implementation of transgenic Bt cotton has led to pests once considered “secondary” to now be more serious (Greene, 2002). The high reproductive rate and rapid life cycle of the cotton aphid have provided the insect with an increased ability to develop resistance to insecticides

(Robertson, 2004). The bandedwinged whitefly is usually present in cotton at low populations, rarely achieving damaging levels (Hendrix, 2002).

When these pests do reach populations levels that require treatment, current data on available products is needed to determine appropriate management decisions. These studies utilized selected rates of various insecticides currently recommended for control of these pests, as well as selected rates of several insecticides no presently recommended for their control (Greene, 2002). The aphid test consists of the following treatments: Currently recommended – Intruder (acetamiprid), Centric (thiamthoxam), Trimax (imidachloprid), and Bidrin (dicrotophos); Not currently recommended – Carbine (flonicamid) and Mustang Max (zeta-cypermethrin). The whitefly test consists of the following treatments: Currently recommended – Intruder (acetamiprid), Capture (bifenthrin), Orthene (acephate), and Centric (thiamethoxam); Not currently recommended – Experimental 1 and Experimental 2.

MATERIALS AND METHODS

The aphid test was conducted at Desha County, AR in 2005. Stoneville 5599 was planted on 27 April. The field was planted and afterwards subdivided into plots of 4 rows on 38 inch spacing and 50 feet in length. Plots were set up in a randomized complete block with four replications. Treatments were made according to statewide threshold recommendations. Treatments were applied with a CO_2 backpack applicator using a 4 row boom with 19 inch nozzle spacing. The nozzles used for application were Tee-Jet TXVS 6. Operating pressure was 40 pounds per square inch and 10 gallons per acre of volume. The single treatment was made on 10 June. Treatments included: an untreated check, Intruder (acetamiprid) at 0.0175 lb ai/a + Dyne-amic (non-ionic spray adjuvant) at 1 pt/a, Intruder (acetamiprid) at 0.025 lb ai/a + Dyne-amic (non-ionic spray adjuvant) at 1 pt/a, Carbine (flonicamid) at 0.06 lb ai/a, Carbine (flonicamid) at 0.04 lb ai/a, Centric (thiamethoxam) at 0.031 lb ai/a, Centric (thiamethoxam) at 0.025 lb ai/a, Trimax (imidachloprid) at 0.047 lb ai/a, Trimax (imidachloprid) at 0.031 lb ai/a, Bidrin (dicrotophos) at 0.33 lb ai/a, Carbine at 0.06 lb ai/a + Mustang Max (zeta-cypermethrin) at 0.02 lb ai/a, and Mustang Max (zeta-cypermethrin) at 0.02 lb ai/a. Observations were conducted on 13 June at 3 DAT, 20 June at 10 DAT, and 23 June at 13 DAT. In each plot, aphids were counted on five leaves using a 1 square inch hand lense. Each time the third unfurled leaf was counted, with the hand lense positioned at the base of the petiole. Data were analyzed using Agricultural Research Manager Version 7 using Analysis of Variance and LSD (P=0.10).

The whitefly test was conducted at Lonoke County, AR in 2005. DPL 444 was the variety used. The field was planted and afterwards subdivided into plots of 4 rows on 38 inch spacing and 50 feet in length. Plots were set up in a randomized complete block with four replications. Treatments were made according to statewide threshold recommendations. Treatments were applied with a CO_2 backpack applicator using a 4 row boom with 19 inch nozzle spacing. The nozzles used for application were Tee-Jet TXVS 6. Operating pressure was 40 pounds per square inch and 10 gallons per acre of volume. The single treatment was made on 19 August. Treatments included: an untreated check, Intruder (acetamiprid) at 0.04375 lb ai/a, Experimental 1, Experimental 2, Capture (bifenthrin) at 0.0782 lb ai/a, Orthene (acephate) at 1 lb ai/a, and Centric (thiamthoxam) at 0.05 lb ai/a. Observations were conducted on 22 August at 3 DAT and 25 August at 6 DAT. In each plot, total whiteflies were counted on five leaves. Data were analyzed using Agricultural Research Manage Version 7 using Analysis of Variance and LSD (P=0.10).

RESULTS AND DISCUSSION

In the aphid test, observing total aphids per square inch on 5 leaves per plot at 3 DAT, Intruder (acetamiprid) at 0.0175 lb ai/a + Dyne-amic (non-ionic spray adjuvant) at 1 pt/a, Intruder (acetamiprid) at 0.025 lb ai/a + Dyne-amic (non-ionic spray adjuvant) at 1 pt/a, Centric (thiamethoxam) at 0.031 lb ai/a, Trimax (imidachloprid) at 0.047 lb ai/a and at 0.031 lb ai/a, and Carbine (flonicamid) at 0.06 lb ai/a + Mustang Max (zeta-cypermethrin) at 0.02 lb ai/a all significantly differed from the untreated check. The two rates of Intruder (acetamiprid) + Dyne-amic (non-ionic spray adjuvant) were numerically the best treatments in the study, however they were only significantly better than the untreated check, Centric (thiamethoxam) at 0.025 lb ai/a, and Mustang Max (zeta-cypermethrin) at 0.02 lb ai/a. At 10 DAT, no treatment was significantly better than the untreated check, however Carbine (flonicamid) at 0.06 lb ai/a + Mustang Max (zeta-cypermethrin) at 0.02 lb ai/a and Mustang Max (zeta-cypermethrin) alone at 0.02 lb ai/a were statistically worse than all other treatments. It should be noted that at 10 DAT, the overall aphid

population was considerably less than at 3 DAT. At 13 DAT, no treatments significantly differed from one another. It should also be noted that the overall aphid population was considerably less than at 3 DAT and 10 DAT. In addition, a large population of lady beetles was seen in the field at both 10 DAT and 13 DAT.

In the whitefly test, observing total whiteflies per leaf on 5 leaves per plot at 3 DAT, Intruder (acetamiprid) at 0.04375 lb ai/a, Experimental 1, Experimental 2, Orthene (acephate) at 1 lb ai/a, and Centric (thiamethoxam) at 0.05 lb ai/a all performed significantly better than the untreated check. Capture (bifenthrin) at 0.0782 lb ai/a performed statistically equal to the untreated check. At 6 DAT, no treatments significantly differed from one another. In regard to season totals of whiteflies, Intruder (acetamiprid) at 0.04375 lb ai/a, Experimental 1, Experimental 2, Orthene (acephate) at 1 lb ai/a, and Centric (thiamethoxam) at 0.05 lb ai/a all performed significantly better than the untreated check and Capture (bifenthrin) at 0.0782 lb ai/a. Orthene (acephate) at 1 lb ai/a performed significantly better than all treatments except Intruder (acetamiprid) at 0.04375 lb ai/a in regard to season totals.

PRACTICAL APPLICATION

Intruder (acetamiprid) tank mixed with Dyne-amic (non-ionic spray adjuvant), Carbine (flonicamid), Centric (thiamethoxam) at 0.031 lb ai/a, and Trimax (imidachloprid) have shown to be highly effective in controlling aphids. Mustang Max (zeta-cypermethrin) alone has shown to be ineffective in controlling aphids.

Intruder (acetamiprid), Experimental 1, Experimental 2, Orthene (acephate), and Centric (thiamethoxam) have shown to be highly effective in controlling whiteflies. Capture (bifenthrin) has shown to be ineffective in controlling whiteflies.

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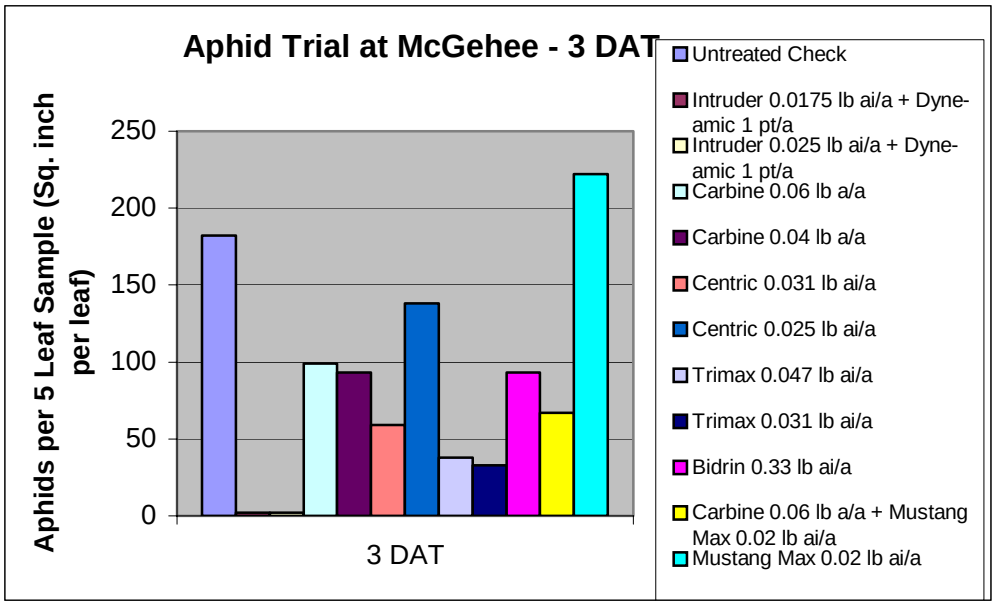
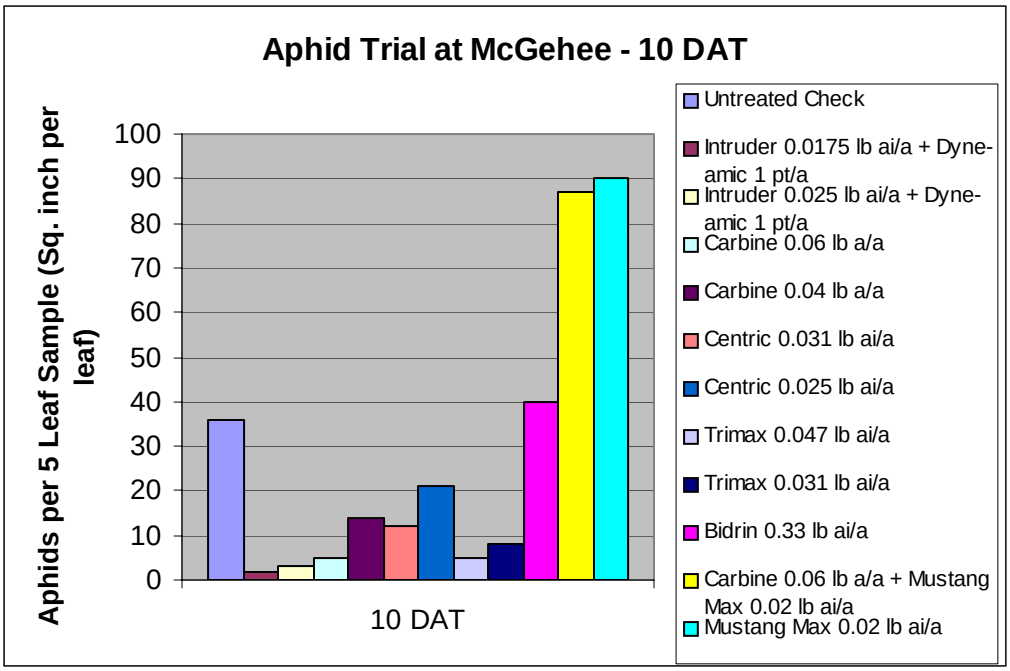
Table 1. Efficacy of Selected Insecticides for Control of Cotton Aphid (Aphis gossypii)
Application Date: 10 June
Evaluation Date: 13 June (3 DAT), 20 June (10 DAT), 23 June (13 DAT)
Evaluation Method: Aphids were counted using a 1 square inch hand lense. The lense was used on 5 leaves per plot, each time using the third unfurled leaf on the plant.

Treatment and Rate	Rate Lb ai/a	Aphids 3 DAT	Aphids 10 DAT	Aphids 13 DAT
Untreated Check	N/A	182 ab	36 b	19 a
Intruder (Acetamiprid) + Dyne-amic (non-ionic spray adjuvant)	0.0175 lb ai/a 1 pt/a	2 d	2 b	2 a
Intruder (Acetamiprid) + Dyne-amic (non-ionic spray adjuvant)	0.025 lb ai/a 1 pt/a	2 d	3 b	1a
Carbine (Flonicamid)	0.06 lb ai/a	99 bcd	5 b	6 a
Carbine (Flonicamid)	0.04 lb ai/a	93 bcd	14 b	5 a
Centric (Thiamethoxam)	0.031 lb ai/a	59 cd	12 b	4 a
Centric (Thiamethoxam)	0.025 lb ai/a	138 abc	21 b	9 a
Trimax (Imidachloprid)	0.047 lb ai/a	38 cd	5 b	2 a
Trimax (Imidachloprid)	0.031 lb ai/a	33 cd	8 b	8 a
Bidrin (Dicrotophos)	0.33 lb ai/a	93 bcd	40 b	15 a
Carbine (Flonicamid) + Mustang Max (Zeta-cypermethrin)	0.06 lb ai/a 0.02 lb ai/a	67 cd	87 a	19 a
Mustang Max (Zeta-cypermethrin)	0.02 lb ai/a	222 a	90 a	18 a

Means followed by same letter do not significantly differ (P=.10, Student-Newman-Keuls)




Aphid Trial at McGehee - 10 DAT
Aphids per 5 Leaf Sample (Sq. inch per leaf)
100
90
80
70
60
50
40
30
20
10
0
10 DAT
Untreated Check
Intruder 0.0175 lb ai/a + Dyne-amic 1 pt/a
Intruder 0.025 lb ai/a + Dyne-amic 1 pt/a
Carbine 0.06 lb a/a
Carbine 0.04 lb a/a
Centric 0.031 lb ai/a
Centric 0.025 lb ai/a
Trimax 0.047 lb ai/a
Trimax 0.031 lb ai/a
Bidrin 0.33 lb ai/a
Carbine 0.06 lb a/a + Mustang Max 0.02 lb ai/a
Mustang Max 0.02 lb ai/a

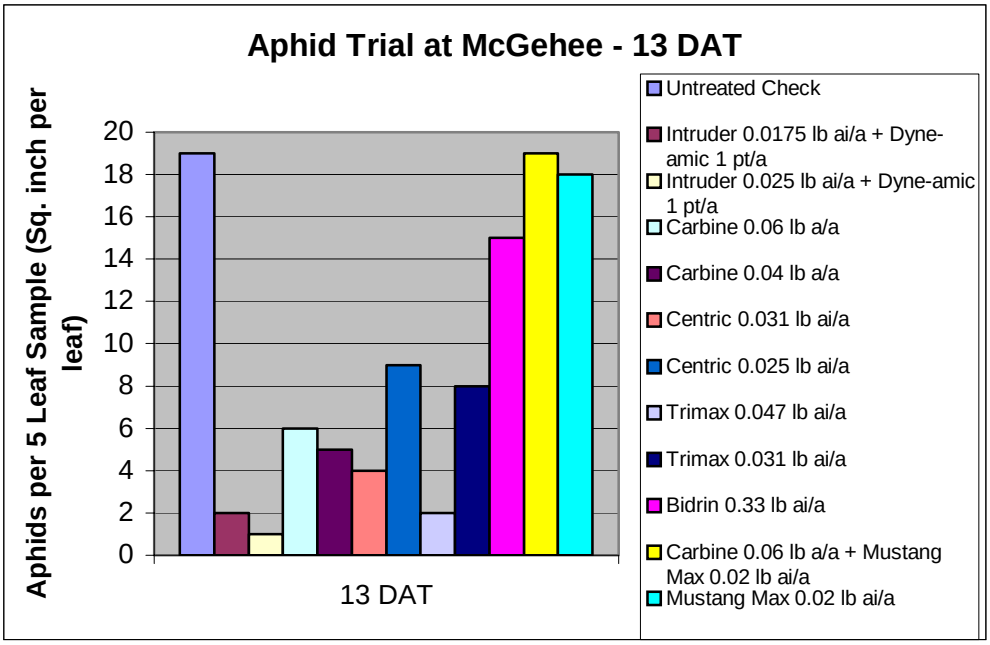
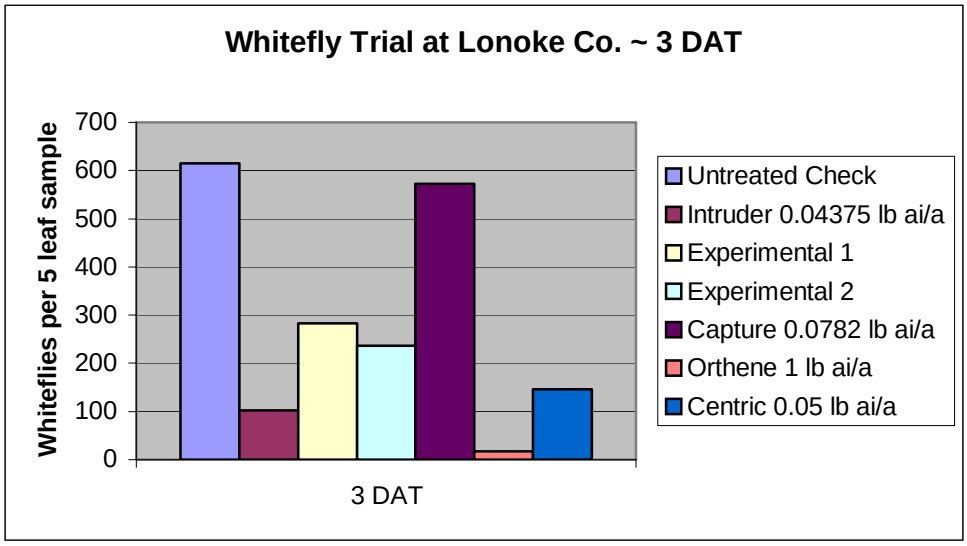
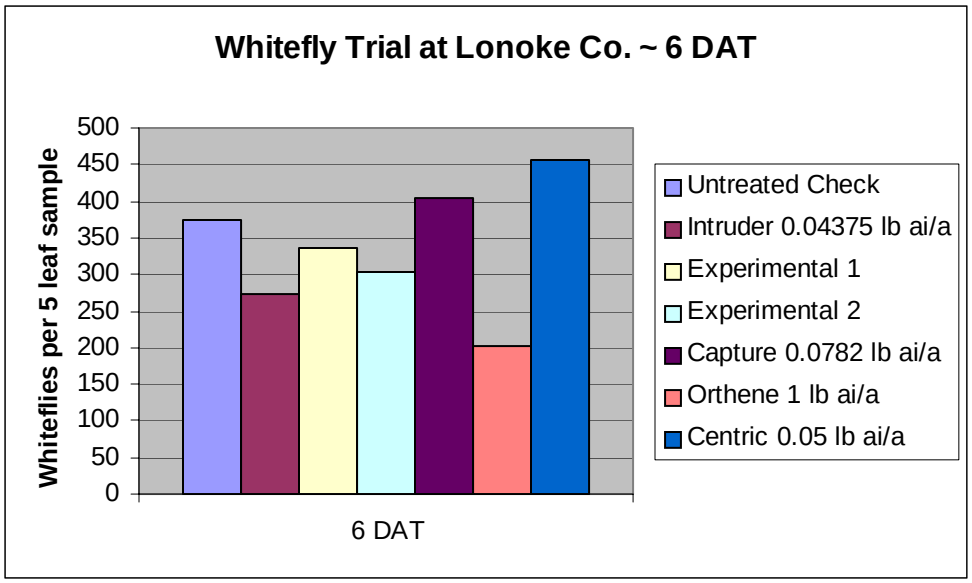

Aphid Trial at McGehee - 13 DAT
Aphids per 5 Leaf Sample (Sq. inch per leaf)
20
18
16
14
12
10
8
6
4
2
0
13 DAT
Untreated Check
Intruder 0.0175 lb ai/a + Dyne-amic 1 pt/a
Intruder 0.025 lb ai/a + Dyne-amic 1 pt/a
Carbine 0.06 lb a/a
Carbine 0.04 lb a/a
Centric 0.031 lb ai/a
Centric 0.025 lb ai/a
Trimax 0.047 lb ai/a
Trimax 0.031 lb ai/a
Bidrin 0.33 lb ai/a
Carbine 0.06 lb a/a + Mustang Max 0.02 lb ai/a
Mustang Max 0.02 lb ai/a

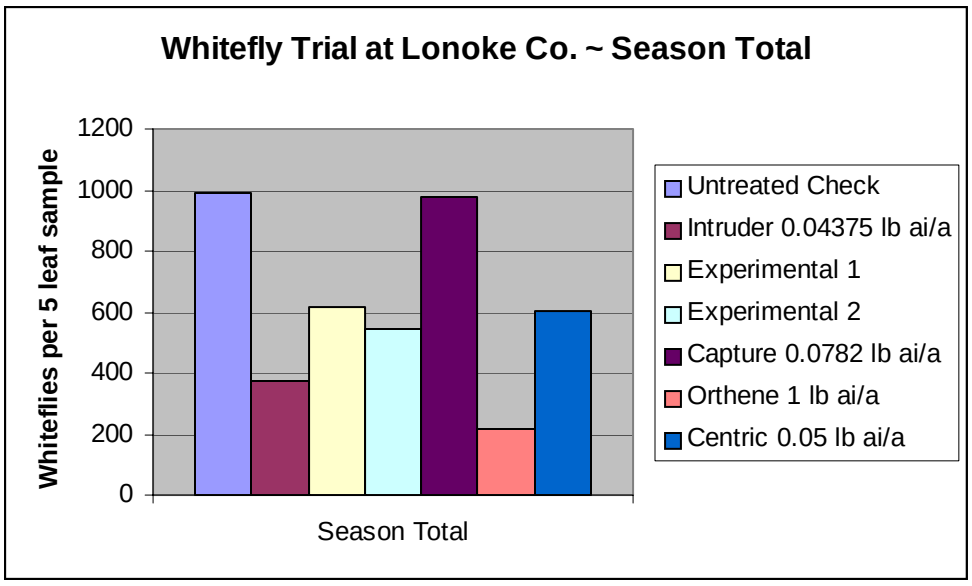
Table 2. Efficacy of Selected Insecticides for Control of Bandedwinged Whitefly (Trialeurodes abutilonea)
Application Date: 19 August
Evaluation Date: 22 August (3 DAT), 25 August (6 DAT)
Evaluation Method: Total whiteflies were counted on five leaves per plot.

Treatment and Rate	Rate	Whiteflies 3 DAT	Whiteflies 6 DAT	Whiteflies Season Totals
Untreated Check	N/A	615 a	374 a	989 a
Intruder (Acetamiprid)	0.04375 lb ai/a	102 bc	272 a	374 bc
Experimental 1	N/A	283 b	336 a	618 b
Experimental 2	N/A	237 bc	304 a	541 b
Capture (Bifenthrin)	0.0782 lb ai/a	573 a	404 a	978 a
Orthene (Acephate)	1 lb ai/a	17 c	201 a	217 c
Centric (Thiamethoxam)	0.05 lb ai/a	146 bc	456 a	602 b

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)




Whitefly Trial at Lonoke Co. ~ 6 DAT
Whiteflies per 5 leaf sample
500
450
400
350
300
250
200
150
100
50
0
6 DAT
Untreated Check
Intruder 0.04375 lb ai/a
Experimental 1
Experimental 2
Capture 0.0782 lb ai/a
Orthene 1 lb ai/a
Centric 0.05 lb ai/a


Whitefly Trial at Lonoke Co. ~ Season Total
Whiteflies per 5 leaf sample
1200
1000
800
600
400
200
0
Season Total
Untreated Check
Intruder 0.04375 lb ai/a
Experimental 1
Experimental 2
Capture 0.0782 lb ai/a
Orthene 1 lb ai/a
Centric 0.05 lb ai/a