



EFFICACY OF EMERGING AND EXISTING INSECTICIDES FOR CONTROL OF APHIDS AND WHITEFLIES IN SOUTHEAST ARKANSAS COTTON

Jeremy K. Greene and Chuck Capps¹

RESEARCH PROBLEM

The cotton aphid, *Aphis gossypii*, and the banded-winged whitefly, *Trialeurodes abutilonea*, were noteworthy “secondary” pests during 2001, and populations of both pests dramatically increased in transgenic *Bt* cotton (NuCOTN33B). Our trials addressed the effectiveness of several new insecticides when compared with existing materials.

BACKGROUND INFORMATION

Since the introduction of cotton containing genetic information from *Bacillus thuringiensis* (*Bt*), producers growing the transgenic crop have been dealing with insect pests that infrequently required attention in the past. Some of these pests were traditionally considered “secondary pests”, i.e., secondary to the boll weevil (*Anthonomus grandis*), to the tobacco budworm complex (*Heliothis virescens*), and to the cotton bollworm (*Helicoverpa zea*). Pests such as aphids and whiteflies have always been “secondary” to major pests, but over the years, there has been much research and debate over population levels needed to justify their control. In *Bt* cotton, aphids and whiteflies continue to receive additional attention because of their destructive potential in the low-spray environment of this crop. When chemical control of these pests is warranted, information about the effectiveness of new and existing products is needed. During 2001, we conducted insecticide efficacy trials for the cotton aphid, *Aphis gossypii*, and the banded-winged whitefly, *Trialeurodes abutilonea*, in southeast Arkansas.

¹ Extension entomologist and pest management technical support specialist, Southeast Research and Extension Center, Monticello.

MATERIALS AND METHODS

Plots of cotton (NuCOTN33B) planted on 4 June 2001 in loam soil at the Southeast Branch Experiment Station near Rohwer, Arkansas, consisting of four 38-inch rows by forty feet. Treatments were randomly assigned to plots and were replicated four times. Standard field preparation, fertilization, and irrigation procedures were followed using Arkansas Recommendations (Chapman et al., 2000).

Insecticides were applied on 6, 10, 12, 17, and 20 July for the aphid trials (I and II) and on 14 and 21 August and on 11 September 2001 for the whitefly trial. Insecticides and field-use rates for the aphid trials were dicrotophos (Bidrin 8, Amvac, Los Angeles, CA, 0.33 and 0.50 lb ai/acre); bifenthrin (Capture 2, FMC, Philadelphia, PA, 0.05 lb [ai]/acre); thiacloprid (Calypso 4, Bayer, Kansas City, MO, 0.036 and 0.047 lb ai/acre); imidacloprid/cyfluthrin (Leverage 2.7, Bayer, 0.0634 lb ai/acre); oxamyl (Vydate 3.77, DuPont, Wilmington, DE, 0.33 lb ai/acre); imidacloprid (Provado 1.6F, Bayer, 0.0125 and 0.047 lb ai/acre); thiamethoxam (Centric 25WG, Syngenta, Greensboro, NC, 0.0237 and 0.0473 lb ai/acre); dimethoate (Dimethoate 4EC, Helena, 0.25 lb ai/acre); and acetamiprid (Assail 70WP, Aventis Crop Science, Research Triangle Park, NC, 0.0374 and 0.05 lb ai/acre). Insecticides and field-use rates for the whitefly trial were bifenthrin (Capture 2, FMC, 0.05 lb ai/acre); thiacloprid (Calypso 4, Bayer, 0.036 and 0.047 lb ai/acre); imidacloprid/cyfluthrin (Leverage 2.7, Bayer, 0.0634 lb ai/acre); imidacloprid (Provado 1.6F, Bayer, 0.047 lb ai/acre); thiamethoxam (Centric 25WG, 0.0473 lb ai/acre); acephate (Orthene 97, Valent, Walnut Creek, CA, 0.75 lb ai/acre); and acetamiprid (Assail 70WP, 0.05 and 0.075 lb ai/acre). Insecticides were applied using a 4-row CO₂-powered plot boom attached to a hi-cycle sprayer calibrated to apply 10 GPA at 42 psi. Insect populations were estimated by counting/approximating all aphids or whitefly adults found on the underside of each of 10 leaves (uppermost large leaf) in each plot. Data were processed using Agriculture Research Manager (ARM) (Gylling Data Management, Inc., Brookings, SD), and means were separated using Least Significant Difference (LSD) procedures following significant F tests and Analysis of Variance (ANOVA).

RESULTS AND DISCUSSION

Aphid Trials

On 2 July, pre-treatment (PT) counts of aphid populations resulted in an average of ca. 20 aphids per leaf (Table 1). By 3 days after the first treatment of insecticides (3DAT1), aphid numbers had reached 73 aphids per leaf in the untreated control (UTC). All products, except for Dimethoate and Capture, provided significant control of aphids 3DAT1, while both rates of Assail and Centric provided the best control. Kharboutli and Allen (2000) reported similar results with efficacy of Centric on aphids in trials in southeast Arkansas. During mid-July, the cotton aphid fungus, *Neozygites fresenii*, caused an epidemic, and aphid numbers “crashed.” By 7DAT2, aphid numbers were

less than 8 aphids per leaf in the UTC plots. In the second aphid trial, PT counts resulted in an average of ca. 38 aphids per leaf (Table 2). Three days after the first treatment (3DAT1), Centric, Bidrin, and Vydate all significantly reduced aphid numbers, but only Centric provided extended control at 5DAT1. By 5DAT2 (mid-July), populations of aphids were greatly reduced throughout the test area.

Whitefly Trial

On 13 August, PT counts of banded-winged whitefly populations resulted in an average of 76 adult whiteflies per leaf (Table 3). By 2 days after the first application of insecticides (2DAT1), whitefly numbers decreased to 46 whitefly adults per leaf in the UTC. All materials provided significant control of whitefly adults 2DAT1, while the highest rate of Assail provided the best control. A recent comparable trial (unpublished) reported similar positive results with efficacy of Assail on silverleaf whiteflies, *Bemisia argentifolii* (Natwick and Deeter 2001). By 7DAT1, populations of adult whiteflies had rebounded, and no product provided significant extended suppression. Two days after the second treatment (2DAT2), Leverage, Assail, Centric, and Capture all provided significant control of whitefly adults. By 8DAT2, Assail and Centric were the only materials that provided significant suppression of whiteflies.

PRACTICAL APPLICATION

Overall, the newer insecticides, acetamiprid (Assail) and thiamethoxam (Centric), provided excellent control of both aphids and whiteflies, while the performance of some existing compounds was inadequate.

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DISCLAIMER

The mention of trade names in this report is for informational purposes only and does not imply an endorsement by the University of Arkansas Cooperative Extension Service.

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Kharboutli, M.S., and C.T. Allen. 2000. Comparison of insecticides for cotton aphid control. *In*: D.M. Oosterhuis (ed.). University of Arkansas Agricultural Experiment Station Special Report 198:128-130.

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Table 1. Average number of aphids per 10 leaves.

Treatment	PT	3DAT1	7DAT2
UTC	23.1 ab ²	72.85 a	7.88 ab
Centric 0.0237 lb ai/acre	13.8 b	11.88 cd	3.92 c
Centric 0.0473 lb ai/acre	18.4 ab	11.63 cd	5.35 bc
Dimethoate 0.25 lb ai/acre	21.7 ab	66.13 a	10.38 a
Bidrin 0.5 lb ai/acre	17.9 ab	36.35 b	3.65 c
Provado 0.047 lb ai/acre	16.3 ab	23.15 bcd	5.25 bc
Calypso 0.036 lb ai/acre	21.6 ab	28.88 bc	4.57 bc
Calypso 0.047 lb ai/acre	13.9 b	34.40 b	5.00 bc
Bidrin 0.33 lb ai/acre + Provado 0.0125 lb ai/acre	19.6 ab	33.08 b	4.60 bc
Leverage 0.0634 lb ai/acre	25.9 a	31.48 b	3.45 c
Capture 0.05 lb ai/acre	21.2 ab	72.97 a	4.92 bc
Assail 0.0374 lb ai/acre	23.9 ab	12.23 cd	2.50 c
Assail 0.05 lb ai/acre	17.2 ab	6.53 d	2.20 c

² Treatment means within a column followed by same letter do not differ significantly (P >0.05, LSD).

Table 2. Average number of aphids per 10 leaves.

Treatment	PT	3DAT1	5DAT1	5DAT2
UTC	44.3 a ²	76.25 a	41.13 a	0.55 ab
Centric 0.0473 lb ai/acre	38.2 a	8.35 c	4.57 b	0.58 ab
Bidrin 0.33 lb ai/acre	40.8 a	39.88 b	36.75 a	0.57 ab
Vydate 0.33 lb ai/acre	40.3 a	51.88 b	47.75 a	0.30 b

² Treatment means within a column followed by same letter do not differ significantly (P >0.05, LSD).

Table 3. Average number of whitefly adults per 10 leaves.

Treatment	PT	2DAT1	7DAT1	2DAT2	8DAT2
UTC	76.97 a ²	46.05 a	44.63 a	47.75 a	68.75 b
Calypso 0.036 lb ai/acre	65.13 a	15.45 c	48.88 a	31.88 ab	51.50 b
Calypso 0.047 lb ai/acre	70.25 a	12.40 cd	68.38 a	32.13 ab	55.50 b
Leverage 0.0634 lb ai/acre	68.18 a	11.10 cde	58.50 a	15.25 b	59.50 b
Provado 0.047 lb ai/acre	94.90 a	11.30 cde	64.00 a	28.88 ab	66.88 b
Assail 0.05 lb ai/acre	76.38 a	5.75 de	66.75 a	18.00 b	13.82 c
Assail 0.075 lb ai/acre	81.55 a	3.28 e	41.50 a	13.63 b	11.57 c
Centric 0.0473 lb ai/acre	82.20 a	6.95 de	62.50 a	18.13 b	15.25 c
Capture 0.05 lb ai/acre	70.05 a	30.75 b	64.38 a	22.13 b	119.88 a
Orthene 0.75 lb ai/acre	70.25 a	6.97 de	68.13 a	32.13 ab	49.50 b

² Treatment means within a column followed by same letter do not differ significantly (P >0.05, LSD).