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CITRUS BLACKFLY[1] CONTROL WITH FOLIAR-APPLIED INSECTICIDES[2]

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Abstract. **Citrus blackfly,** Aleurocanthus woglumi **Ashby, has been considered a serious threat to the citrus industry in Florida. Thirteen insecticides were evaluated for its control. Azinphosmethyl, dimethoate, and phosmet provided superior control of 2nd and 3rd instars (100, 100, and 98%, respectively) and 4th instars (81, 100, and 83% respectively). All insecticides tested provided some degree of control.**

Citrus blackfly, *Aleurocanthus woglumi* Ashby, has been recognized as a potentially serious threat to the Florida citrus industry since its establishment in Jamaica in 1913 (12). Originally discovered in Asia, in Sri Lanka (Ceylon) and India (3, 4), it now occurs in Africa, South, Central, and North America, and the Caribbean Archipelago (4, 9, 12). In the United States it was first reported from Key West, Florida, in 1934, but was eradicated by 1937 (5). A second United States introduction was in Texas in 1955 (10) where it is now well established. The latest invasion was detected in Fort Lauderdale, Broward County, Florida on January 28, 1976, and subsequently became established in portions of Dade and Palm Beach Counties (6). A research program has been established to develop the information needed to support the regulatory and eradication efforts of State and Federal agencies, and to develop alternate strategies in case the eradication program is not successful. One of the goals of this research was to develop treatment methods which are both effective and safe for use in the highly urbanized areas of south Florida where this pest is primarily restricted to plants in back-yards or container nurseries. Recent research on certain types of foliar treatments (2, 6, 8, 11) have been published elsewhere and a history of chemical control has been summarized by Reinert and Neel (7). The specific purpose of the research reported here was to evaluate several insecticides applied by foliar spray for control of citrus blackfly.

Methods and Materials

In the first experiment (Oct., 1976), 28 container-grown orange trees (*Citrus sinensis* Osbeck) 1.4-1.5 m in height were field infested with citrus blackfly by placing them either under or adjacent to infested grapefruit (*C. paradisi* Macf.) or orange trees in residential yards in Ft. Lauderdale. Trees used for inoculation were chosen which had a high density of emerging adults so as to insure egg deposition on the test trees. Plants were returned to the research center after 72 hours by which time an egg deposition of 2-3 egg spirals/leaf had been obtained. Plants were maintained under overhead irrigation until the majority of the citrus blackfly population was either 2nd or 3rd instars. At that time populations were sampled and overall viability of the larvae was found to be ca. 100% in all of the trees used in this experiment.

Since insect populations were very uniform, the 7 treatments including the untreated check (insecticides and rates given in Table 1) were assigned to plants by a completely random design with each insecticidal treatment being assigned to 4 plants and 4 plants remaining untreated. Insecticides were applied as foliar sprays with a 7.6 liter compressed air sprayer at ca. 2.9 kg/cm^2. Emphasis was placed on thorough coverage of the entire plant.

The effect of each treatment was determined by evaluating the populations at 2 and 4 weeks after treatment. Samples of 8 infested leaves were removed from each test tree, placed in plastic bags ,and taken to the laboratory where the viability (% alive) of 2nd, 3rd, and 4th instars was determined using a dissecting microscope. Each individual larvae was probed, and if body fluids were present, it was considered to be alive.

In the second experiment (Apr., 1977), mature orange or grapefruit trees growing in home-owner yards and 2.5-3 m in height were selected. All trees in this test had at least 50% of their leaves infested with larval stages. Populations were sampled using the aforementioned procedures. Only infested leaves from near branch terminals were sampled, since in a developing population on a tree, the most viable population is found on the most recently developed leaves.

Trees with 80-100% living larvae were grouped into 4 blocks according to % alive/tree and the 8 insecticidal treatments, each of 0.6 g a.i./liter, and the untreated check (Table 2) were randomly assigned within each block. Insecticides were applied April 4-6, 1977, as foliar sprays with a hydraulic sprayer at 14.6 kg/cm^2. Trees were sprayed to the point of run-off. Populations were re-evaluated again at 2 and 4 weeks post-application. Data were adjusted to the untreated check by Abbotts' formula (1) and compared by Duncan's multiple range tests.

Results and Discussion

In these results, insecticidal efficacy for 2nd + 3rd combined and 4th instars have been reported separately since several treatments were noticeably less effective on the 4th

Table 1. Percentage control of citrus blackfly larvae on container grown citrus treated with insecticides by foliar spray on October 22, 1976, (4 replicates).

Insecticide	Rate g a.i./ liter	%[z] control of instars at weeks posttreatment			
		2 weeks		4 weeks	
		Instars		Instars	
		2+3	4	2+3	4
Dimethoate 4 EC	0.6	98.5a	94.7a	100a	100a
Azinphosmethyl 2EC	0.6	94.1a	70.8ab	100a	81.0ab
Oxydemetonmethyl 2EC	0.6	92.9a	53.3b	98.2a	38.7cd
Ethion 4EC	0.44	86.2ab	15.2c	97.3a	61.2bc
Ethion + Oil 0.63EC	0.44 + 0.84	71.6b	0c	96.9a	24.1de
Ethion + Oil 0.47EC	0.44 + 0.6	66.6b	0c	61.1b	10.9de
Untreated Check	0	0c	0c	0c	0e

[z]Adjusted by Abbott's formula to untreated checks. Means in a column not followed by the same letter are significantly different ($P=0.05$) by Duncan's multiple range test.

[1]Homoptera: Aleyrodidae.
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Table 2. *Percentage control* of citrus blackfly larvae on dooryard citrus treated with insecticides by foliar spray on April 4-6, 1977, (4 replicates).

Insecticide 0.6 g a.i./liter	Instars alive pretreatment %	%[z] control of instars at weeks posttreatment			
		2 weeks		4 weeks	
		Instars		Instars	
		2+3	4	2+3	4
Phosmet 50WP	86.3	98.6a	80.4ab	98.4a	82.7a
Diazinon 4EC	89.3	91,1a	94.8a	62.7bc	69.0ab
Methidathion 2EC	93.9	74.4ab	56.1c	81.8ab	93.0a
Carbophenothion 4EC	89.1	49.6bc	55.8c	77.9ab	56.0bc
Chlorpyrifos 2EC	89.4	66.2b	100a	52.1bcd	83.8a
Fenithrothion 8EC	86.8	71.0ab	71.1bc	26.3de	7.8e
Endosulfan 2EC	91.9	21.5d	14.2d	47.3cd	35.5cd
Chlorpyrifos-methyl 4EC	85.1	28.7cd	55.3c	13.8e	22.1de
Untreated Check	83.0	0d	0d	0e	0e

[z]Adjusted by Abbott's formula to untreated check. Means in a column not followed by the same letter are significantly different (P=0.05) by Duncan's multiple range test.

instar; this stage is often referred to as a pupa which becomes non-feeding late in the stadium.

Table 1 shows the results of the first experiment. All treatments provided significant control of 2nd and 3rd instars, but the ethion and ethion + oil treatments were not effective for control of 4th instars. Ethion without oil, however, provided significantly higher control as compared to the check at 4 weeks posttreatment. Dimethoate and azinphosmethyl provided control of all 3 life stages but oxydemetonmethyl only provided acceptable control of the earlier instars.

In the second experiment (Table 2), phosmet provided the best overall control. All treatments provided significant control of a life state at least once during the test. In general, fenithrothion, endosulfan, and chlorpyrifos-methyl were not effective treatments even though fenithrothion did give 71% control at 2 weeks. Diazinon, methidathion, carbophenothion, and chlorpyrifos each provided adequate control of this pest, but chlorpyrifos appeared to be more effective in controlling 4th instars than 2nd and 3rd instars.

In summary it appears that the citrus blackfly can be effectively controlled with many insecticides. Several of these currently have labels for use on citrus, being registered for control of other citrus pests. With the efficacy of these compounds established, expansion of existing labels to include citrus blackfly should be realized.

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COMPARISON OF LOW VOLUME CITRUS SPRAY PROGRAMS APPLIED BY AIRCRAFT AND AIRBLAST SPRAYER IN FLORIDA[1]

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Abstract. **In a three-year study, three methods of aerial application were compared with two ground rigs in the application of complete, low volume spray programs to 16-year-old 'Marsh' grapefruit trees in St. Lucie County. The influence of application methods on annual packout grades and pest control as well as cumulative effect on tree condition and foliar nutrient levels at the end of three years is presented.**

Although an increasing amount of experimental work with aircraft for control of specific citrus pests has been reported during the past 18 years (5-12, 15-23, 26-32), in only three instances have aircraft been evaluated for application of a complete citrus spray program (5, 14, 33). Cooper and Schirard (14) developed a pest control program for young trees but abandoned it as trees matured. Sutton (33) developed a program for mature trees and, based on fresh fruit packout, it was considered a success. Brooks (5) reported the failure to provide control of insects and diseases over a period of two years with a concentrate aerial spray program compared to a dilute spray program using a ground-operated airblast sprayer.

The growing popularity of concentrate spraying and continued interest in aerial application prompted us to compare

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