Deposition and Efficacy of Capture and Thiodan Applied to Melons Using Several Application Technologies

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Abstract

A study was conducted in 1995 to evaluate five application technologies in the field in terms of deposition efficiency, as well as to assess their abilities to control the sweet potato whitefly and thereby influence crop yield. The FMC and ESS-on treatments provided the greatest deposition on the ventral side of the leaves. The FMC system tended to maintain high ventral deposition efficiencies as the plants grew and the canopy closed, whereas the efficiency of the ESS declined. Differences in ventral deposition efficiency among treatments were not closely associated with differences in whitefly control, although the declining rate of ventral deposition for the ESS-on is also reflected in its declining superiority in adult insect control relative to the CDA and conventional systems. The ESS sprayer provided somewhat better whitefly control than the conventional treatment, and was also associated with a higher yield of #12 melons than the control and Admire treatments, but not better than the conventional treatment. Early control of adults was associated with reduced egg counts later in the season, suggesting that there may be long term control advantages with the ESS system. New application technologies need to be developed to obtain higher ventral deposition and maximum whitefly control, with minimum use of insecticides.

Introduction

Cantaloupes, *Cucumis spp*, are the preferred host of the sweet potato whitefly strain B, *Bemisia tabaci*. As a result infestations can develop quickly, significantly reducing both fruit yield and quality. The sweet potato whitefly remains difficult to control because adults and immatures feed on the lower (ventral) surface of leaves, where spray deposition from conventional technologies has been shown to be inadequate.

Considerable research has been conducted to improve insecticide deposition . Spray technologies such as electrostatic charging of the spray solution, and air jets have received the most attention. Numerous studies have evaluated electrostatic charging. Electrostatic charging has been shown effective in laboratory and greenhouse environments, however it has met with considerably less success in the field. Furthermore, the high cost and relatively complicated operating and maintenance procedures of these systems have caused many growers to question the technology's commercial value.. The purpose of this study was to evaluate five application technologies in the field in terms of deposition efficiency, as well as to assess their abilities to control the sweet potato whitefly and thereby influence crop yiel d.

Materials and Methods

Location and Experimental Design : The studies were conducted in the Spring of 1995 at the University of Arizona's, Yuma Valley Agricultural Center. The test crop was cantaloupe, *Cucumis melo*, variety 'Topmark'. The cantaloupe was direct seeded on March 9th in single rows on beds spaced two meters on center. Seedlings were thinned to a 0.3 meter spacing within rows. A 4.2 m buffer was left between plots, with each plot consisting of two beds, 18 meters in length. Plot preparation and seasonal maintenance followed local practices. The plots were arranged in a randomized complete block design, using four blocks. Each block was divided into seven plots - five for the application technologies under test, one for a sidedress treatment, and one for an untreated control. The sidedress treatment consisted of a single application of Admire 2. (0.3 kg [AI]/ha, in 187 liters of water).

Application Technologies: Five application technologies were evaluated: Electrostatic Spraying Systems Inc., with the charging circuit on and off (ESS-on, ESS-off); Micromax (CDA), without air assist; conventional hydraulic twin-jet nozzles (Tee jet #TJ-60, 8002 EVS), and the DeGanya (FMC) air assist system. The sprayers applied a mixture of two chemicals: Capture 2E (bifenthrin, EPA Reg.# 279-3114-AA, CAS # 82657-04-3) and Thiodan 3EC (endosulfan, EPA Reg.# 279-2924, CAS # 115-29-7). As recommended by the manufacturers, application rates were set at 0.09 and 1.12 kg [AI]/ha respectively. Spray application dates were 4/19; 5/3,4; 5/17,18; and 5/31,6/1.

Spray Deposition Assessment: To facilitate deposition measurements a blue dye, FD&C #1 (Warner and Jenkinson, Inc., St. Louis, MO), and a fluorescent liquid, Leucophur EFR #247202 (Sandoz Chem. Corp., Charlotte, NC), were added to the spray mixture. The FD&C dye was applied at 99 g/ha, while the Leucophur liquid accounted for five percent of the spray mixture. Spray deposition on the cantaloupe leaves and deposition on the soil within the plots were measured using water sensitive cards, leaf washing, leaf photography and petri dishes.

The water sensitive papers have a yellow coating which turns blue when an aqueous solution contacts it. When struck by spray in the field, the papers exhibited blue dots where droplets landed on them. Percent coverage was calculated using a program which compared the quantity of dark pixels (area affected by spray) and light pixels (area unaffected by spray) in the scanned image. The leaf washing technique removed spray deposited on the leaves by simultaneously washing 26.2 mm diameter circles on the dorsal and ventral surfaces. Three milliliters of methanol were used to wash each surface. Following collection, the solutions were transported to the laboratory in coolers. Dye concentration was determined using a spectrophotometer set to a wavelength of 620 nanometers. This wavelength corresponds to the color of the FD&C dye added to the spray mixture. The leaf photographic technique required photographing sample leaves under ultraviolet light. This work was done in the field inside a light tight box, using ASA 200, 35 mm color film. The ultraviolet light fluoresced the Leucophur dye in the spray droplets on the leaves. After developing, the photographs were scanned, and the percent coverage on each leaf surface determined using the program developed for assessing coverage on the water sensitive papers. The petri dish technique was employed to measure spray deposition on the soil, both inside and outside the plots. The dishes were 89 mm in diameter, by 12.7 mm deep, and contained ten milliliters of methanol. The methanol was used to catch the spray and facilitate its removal from the petri dishes, thereby permitting analysis with the spectrophotometer.

Insect Assessment: Insect data were collected from plants growing in both beds of each plot. Immature whitefly populations were estimated 45, 70 and 90 days after planting (DAP). The samples were collected from the following locations along one randomly selected primary vine in each plot: Crown (18th leaf from the apex of the vine), mid-vine (10th leaf from the apex of the vine) and terminal (4th leaf from the apex of the vine).

Egg and nymph populations were assessed as follows. As vines reached appropriate lengths, 10 leaves from each sampling location were removed from the plants, placed in plastic bags, and transported immediately to the laboratory. The underside of each leaf was then divided into 4 sectors, and all eggs, small nymphs (crawlers and 2nd instar), large, and red-eyed nymphs (3rd and 4th instar REN) within a 100 mm^2 area of each sector were counted under a stereo microscope.

Adult whitefly counts were made on leaf undersides at 4 and 7 days after treatment (DAT), and one day before each spray application. Ten leaves from near the terminal locations (3-4th node from the fully expanded leaf to the terminal growing point) on primary vines were randomly selected in each plot for the counts. The underside of the leaves was carefully turned upward, and the number of live adults on the surface recorded. Counts were made at sunrise, between 0500-0700 hrs.

Yield data were collected by harvesting all plots over a twelve day period, on the following dates: June 18, 23, 26, 27 and 30. Data were obtained by picking mature melons (3/4 slip to full slip) in a 6.0 meter long section from the two rows of each plot. Harvested melons were culled, sorted and assessed for size and quality based on USDA standards. Yields were calculated as the total number of marketable US #1 melons harvested per 6.0 meters of row in each plot.

RESULTS

Spray Deposition

Sprayer Operational Data: During the first week, only wind speed was measured as the portable weather station was not fully operational. Thereafter, climatic measurements were made twice on 5/3, approximately every hour on 5/4, every 15 min on 5/17-18, and every 10 min on 5/31-6/1. Table 1 summarizes the climatic data obtained during the test program. As can be seen from the table, all four trials were conducted with wind velocities below 10 km/hr. This condition was prescribed in the test procedure to keep drift to a minimum.

Travel velocity and nozzle height for each sprayer were set according to manufacturer's recommendations. Liquid application rate varied from system to system because of equipment design, and also from week to week because of difficulties encountered with equipment operation (Table 2). The variation in application rate was taken into account in the calibrations used for the various deposition measurement techniques.
run for each sprayer.

Water Sensitive Papers: The water sensitive paper data indicated that the FMC sprayer was associated with the highest deposition efficiency overall (Table 3). The conventional and CDA systems had lower efficiencies than the FMC, but higher efficiencies than either the ESS-on or ESS-off. The ESS-on and ESS-off were not significantly different from each other. For the dorsal side of the leaves, the FMC, CDA and conventional systems had comparable efficiencies. These were higher than either of the ESS systems. There was no difference in dorsal deposition efficiency between the ESS-on, and ESS-off, systems (Table 3). For the ventral side of the leaves, deposition efficiency was an order of magnitude less than the dorsal side, for all sprayers. The FMC had a higher efficiency than either the ESS-off or the conventional system, while the CDA had a higher efficiency than the conventional. The ESS-on system provided a deposition efficiency which was statistically comparable to that of FMC and CDA, yet it was not shown to be significantly greater than the least efficient, conventional system. The ESS-off was associated with a deposition efficiency significantly less than the FMC, but no different than the other systems. There were no statistically significant differences in deposition efficiency between the ESS-on and ESS-off, for the ventral side of the leaves.

Leaf Photo Analysis: Analysis of the data obtained from the leaf photographs suggested that for the leaves overall, the efficiency of the FMC, CDA, ESS-on and conventional systems were not statistically different (Table 4). The ESS-off had a significantly lower deposition efficiency than the other four technologies. For the dorsal side of the leaves, the conventional system had a higher efficiency than the ESS systems, and the ESS-off system had a significantly lower efficiency than the other systems. For the ventral side of the leaves, the FMC and ESS-on systems had significantly higher deposition efficiencies than the other systems. In all cases the ESS-off exhibited lower deposition efficiencies than the ESS-on.

Leaf Washing: The leaf washing results did not agree with either the water sensitive papers or the leaf photographs. Leaf washing indicated that the conventional system had the greatest deposition, and therefore efficiency, for the leaves overall, and for the dorsal side of the leaves (Table 5). The FMC, ESS-on and CDA systems provided significantly less deposition than the conventional sprayer, but were not significantly different from each other. Deposition for the ESS-off was less than the conventional and ESS-on, but not significantly different from the CDA and FMC systems. For the ventral side of the leaves, no statistical differences among spray treatments were established from leaf washing.

Spray Deposition on the Soil Within the Plots: Spray deposition on the soil within the plots was measured using petri dishes and water sensitive papers. Because of time limitations, however, the petri dishes were not deployed the first week. Deposition was significantly affected by sprayer, and week that measurements were made. There were no significant differences in deposition measured between the petri dishes and the water sensitive papers. Generally deposition on the soil was higher for the FMC, CDA and conventional sprayers, than the ESS-on and ESS-off (Table 6). No significant differences in deposition between the ESS-off and ESS-on could be established from the data, nor could differences among the FMC, conventional, and CDA systems be established.

Deposition on the soil in the plots decreased from the first week, to the last week. As the plants grew, the canopy closed, and interception of spray by the leaves increased. This affected deposition on the soil, even though the dishes and papers were placed such that they were not directly under leaves. There were significant differences among treatments as to how much the deposition on the soil decreased with time. The ESS system, both with the charging circuit on and off, showed a greater decrease in deposition with time than the other systems.

Whitefly Efficacy

Adult Suppression: Mean numbers of adult whiteflies counted per leaf (log scale) during the season are shown in Fig 1. It also shows the response of whitefly numbers to each spray application, with each application indicated by an arrow. In general, the treated plots had fewer adults per leaf than the untreated plots. Following each application, a temporary suppression of adult whitefly population occurred as compared to those in the control and in the plots which received a sidedress application of Admire. The percent reduction in whitefly adults for each treatment following each application, as compared to the untreated control is shown Table 7. At four days after treatment (4-DAT) for the first two applications, the ESS plots exhibited significantly greater adult control than the CDA and conventional systems. After the second application, the FMC was comparable to the ESS systems, and was associated with greater control of adult whiteflies than the CDA and conventional systems. Following the third application, however, the ESS-on and conventional systems provided better control than the CDA and ESS-off. The FMC was no different than the ESS-on, ESS-off and conventional systems. No differences among treatments were detected at 4-DAT for the fourth application. At 7-DAT no differences among systems were found on any application date.

Immature Colonization: Immature colonization in each treatment at 45, 70 and 90 days after planting (DAP) is presented in Table 8. It should be noted that in general colonization by whiteflies was low in 1995, when compared to previous years. At 45 DAP, there were no significant differences in the number of eggs, nymphs or pupal cases observed in the treatments. At 70 DAP, fewer eggs were found in the ESS-on, ESS-off, FMC and Admire treatments, than in the untreated control. The CDA and conventional systems were no different than the control with regard to number of eggs. Because no significant differences in the number of nymphs were found among treatments, the fewer eggs recorded in the ESS-on, ESS-off and FMC treatments may have been a result of the greater control of adults associated with these treatments in the early part of the study (Table 8). Only the Admire treatment had fewer pupal cases than the control at 70 DAP. At 90 DAP, which was just prior to harvest, the ESS-on, ESS-off, and Admire treatments were the only ones associated with egg and nymph counts significantly less than the control. There were no significant differences among spray treatments in mean number of pupal cases found on the leaves at 90 DAP.

Overall, whitefly pressure was light to moderate in 1995. This may have contributed to the general lack of detectable differences in total yield, or yield of numbered size classes 9, 15, 18 and 23 melons among treatments. The ESS treatments, however, were associated with a significantly greater number of #12 melons than the untreated control (Table 9).

Discussion

Both ESS treatments provided somewhat better whitefly control than the conventional treatment, based on percent adult counts when the plants were young, and in terms of egg deposition at 70 and 90 DAP. The ESS systems were also associated with a higher yield of #12 melons than the control and Admire treatments, but not better than the conventional treatment. The #12 cantaloupe is the size of melon which usually has the highest market value.

The FMC and ESS-on treatments provided the greatest deposition on the ventral side of the leaves. This is the location where the targeted pest, the sweet potato whitefly, tends to feed and is most active. The FMC system tended to maintain high ventral deposition efficiencies as the plants grew and the canopy closed, whereas the efficiency of the ESS declined. Differences in ventral deposition efficiency among treatments were not closely associated with differences in whitefly control, although the declining rate of ventral deposition for the ESS-on is also reflected in its declining superiority in adult insect control relative to the CDA and conventional systems. Early control of adults was associated with reduced egg counts later in the season, suggesting that there may be long term control advantages with the ESS system.

All of the sprayers gave much greater deposition efficiencies on the dorsal side of the leaves, than on the ventral side. Ventral deposition efficiencies were very low for all of the sprayers tested. This indicates that the majority of the material applied was being deposited on leaf surfaces where it is least effective against the whitefly. Consequently, no treatment was shown to have consistently superior benefits in terms of insect control, and hence no treatment was associated with greater yields than the conventional system. New application technologies need to be developed to obtain higher ventral deposition and maximum whitefly control, with minimum use of insecticides.

The FMC was associated with significantly greater deposition on the soil both inside and outside of the plots, than either of the ESS systems. In addition, the FMC had the greatest drift of any system, with the ESS-on having the least. There were no significant differences in drift among sprayers at the far sampling location. This implies that none of the spray technologies offers advantages in long range drift, when compared to a conventional system.

Table 1. Climatic Data Obtained During the Test Program.

Date	Temp (°C)	Wind Speed (kph)	Wind Direction
4/19	n/a	< 10	n/a
5/3-4	Mean 30.0 Range 26-34	Mean 2.83 Range 0-6	W to E - 5/3 S to SW - 5/4
5/17-18	Mean 26.5 Range 20-32	Mean 4.44 Range 0-8	S
5/31-6/1	Mean 35 Range 27-39	Mean 4.40 Range 0-9	S NE - E - SE

Table 2. Travel Velocity, Nozzle Height and Application Rate of the Sprayers Evaluated.

System	Travel Velocity (kph)	Nozzle height (meter)	Dye FD&C (gm/ha, (Leuc %)	Chem [kg/ha] (Cap., Thio.)	Application rate (l/ha)			
					4/19	5/3	5/17	5/31
CDA	4.2	0.30	99 5	0.09 1.12	12.2	14.3	14.5	18.3
CON	4.2	0.50	99 5	0.09 1.12	204	179	151	143
ESS	4.2	0.43	99 5	0.09 1.12	55.6	58.6	54.5	61.0
FMC	8.4	0.43	99 5	0.09 1.12	229	227	227	228

Table 3. Deposition Efficiencies on the Leaves (percent) as Measured by Water Sensitive Papers.

Leaf Surface	Application Date (4/19)	(5/3&4)	(5/17&18)	(5/31,6/1)	Mean
Both	FM a 51	FM a 52	CD a 48	FM a 51	FM a 51
	CO a 51	CO ab 43	FM ab 48	CO a 47	CO b 45
	EN ab 37	EN ab 42	CO ab 43	CD ab 41	CD b 44
	EF b 28	CD b 31	EN ab 38	EF ab 41	EN c 34
	CD - -	EF c 19	EF b 34	EN b 30	EF c 31
Dorsal	CO a 100	FM a 97	FM a 93	FM a 99	FM a 94
	FM ab 88	CO ab 83	CD a 89	CO a 91	CO a 88
	EN bc 63	CD ab 78	CO a 83	EF ab 80	CD a 82
	EF c 50	EN b 60	EN a 73	CD ab 78	EN b 63
	CD - -	EF c 35	EF a 66	EN b 57	EF b 58
Ventral	FM a 15	FM a 7	CD a 7	CD a 5	FM a 7
	EN a 10	CD ab 5	FM ab 4	FM a 3	CD ab 6
	EF a 6	EN ab 3	EN b 3	CO a 3	EN abc 5
	CO a 2	EF b 2	CO b 2	EN a 3	EF bc 3
	CD - -	CO b 2	EF b 2	EF a 2	CO c 2

Treatment abbreviations:EN,ESS-on; EF,ESS-off; CD,CDA; FM,FMC; CO,CONVENTIONAL

Table 4. Deposition Efficiencies on the Leaves (percent) as Measured by Leaf Photographs.

Surface	Test Date (4/19)	(5/3&4)	(5/17&18)	(5/31,6/1)	Mean
Both	EN a 46	CD a 45	CD a 39	FM a 42	CO a 37
	CO a 44	CO a 45	EN ab 26	CD ab 36	FM a 36
	FM a 39	EN ab 43	FM b 22	CO bc 26	CD a 36
	EF a 31	FM ab 37	EF b 13	EF c 16	EN a 30
	CD b 8	EF b 29	CO - -	EN c 14	EF b 21
D orsal	CO a 87	CD a 90	CD a 78	FM a 81	CO a 73
	EN a 79	CO a 88	EN ab 53	CD ab 73	CD ab 71
	FM a 73	EN ab 80	FM b 46	CO b 51	FM ab 68
	EF a 61	FM ab 69	EF b 25	EF c 31	EN b 57
	CD b 16	EF b 58	CO - -	EN c 26	EF c 41
Ventral	EN a 12	FM a 6	FM a 1	FM a 3	FM a 4
	FM ab 6	EN a 5	CD b 0	EN ab 1	EN a 4
	CO b 2	CO ab 2	EN b 0	EF ab 1	CO b 1
	EF b 0	EF b 1	EF b 0	CO ab 1	EF b 1
	CD b 0	CD b 0	CO - -	CD b 0	CD b 0

Treatment abbreviations: EN,ESS-on; EF,ESS-off; CD,CDA; FM,FMC; CO,CONVENTIONAL

Table 5. Deposition on the Leaves (microliters of dye * 100) as Measured by the Leaf Washing.

Surface	Test Date (4/19)	(5/3&4)	(5/17&18)	(5/31,6/1)	Mean
Both	CD a 226	CO a 323	CO a 278	CO a 245	CO a 266
	CO a 173	EN ab 250	EN a 252	FM ab 178	EN b 204
	EN a 161	EF ab 207	FM ab 208	EN b 137	CD bc 174
	EF ab 124	CD b 189	CD ab 180	CD b 121	FM bc 147
	FM b 8	FM b 119	EF b 105	EF b 94	EF c 133
Dorsal	CD a 422	CO a 604	CO a 553	CO a 486	CO a 515
	CO a 345	EN ab 433	EN ab 471	FM b 297	EN b 362
	EN ab 269	CD b 347	CD abc 357	EN b 245	CD bc 329
	EF ab 215	EF b 312	FM bc 343	CD b 229	FM bc 256
	FM b 9	FM b 210	EF c 186	EF b 172	EF c 222
Ventral	EN a 52	EF a 101	FM a 73	FM a 59	EF a 47
	EF a 46	EN a 67	EN ab 34	EN a 29	FM a 46
	CD a 29	CO a 60	EF b 23	EF a 17	EN a 45
	CO a 23	CD a 32	CD b 4	CD a 13	CO a 22
	FM a 8	FM a 28	CO b 4	CO a 3	CD a 18

Treatment abbreviations: EN,ESS-on; EF,ESS-off; CD,CDA; FM,FMC; CO,CONVENTIONAL

Table 6. Deposition on the Soil Within the Plots (percent of maximum possible).

Technique	Test Date (4/19)	(5/3&4)	(5/17&18)	(5/31,6/1)	Mean
Petri Dishes	CO - -	CO a 72	CO a 52	FM a 63	CO a 54
	FM - -	FM a 61	CD a 43	CO ab 39	FM a 53
	EN - -	CD a 58	FM a 34	CD b 11	CD ab 37
	EF - -	EF a 44	EF a 28	EN b 9	EF b 27
	CD - -	EN a 28	EN a 25	EF b 6	EN b 20
Water Sensitive Papers	CO a 75	CD a 67	CD a 62	FM a 51	FM a 57
	FM b 56	FM ab 61	FM ab 43	CD a 43	CD a 52
	EN c 40	CO abc 48	CO b 39	CO a 41	CO a 49
	EF d 18	EN bc 41	EF b 30	EN b 16	EN b 29
	CD - -	CD a 64	EN b 22	EF b 12	EF b 22
Petri Dishes & Papers Combined	CO - -	FM a 61	CD a 56	FM a 56	FM a 53
	FM - -	CO ab 56	CO ab 43	CO ab 40	CO a 36
	EN - -	EN b 36	FM abc 40	CD b 32	CD a 42
	EF - -	EF b 35	EF bc 30	EN c 13	EN b 44
	CD - -	EF c 31	EN c 23	EF c 11	EF b 43

Treatment abbreviations: EN,ESS-on; EF,ESS-off; CD,CDA; FM,FMC; CO,CONVENTIONAL

Table 7. Sweet Potato Whitefly adults at 4 and 7 Days After Treatment (DAT).

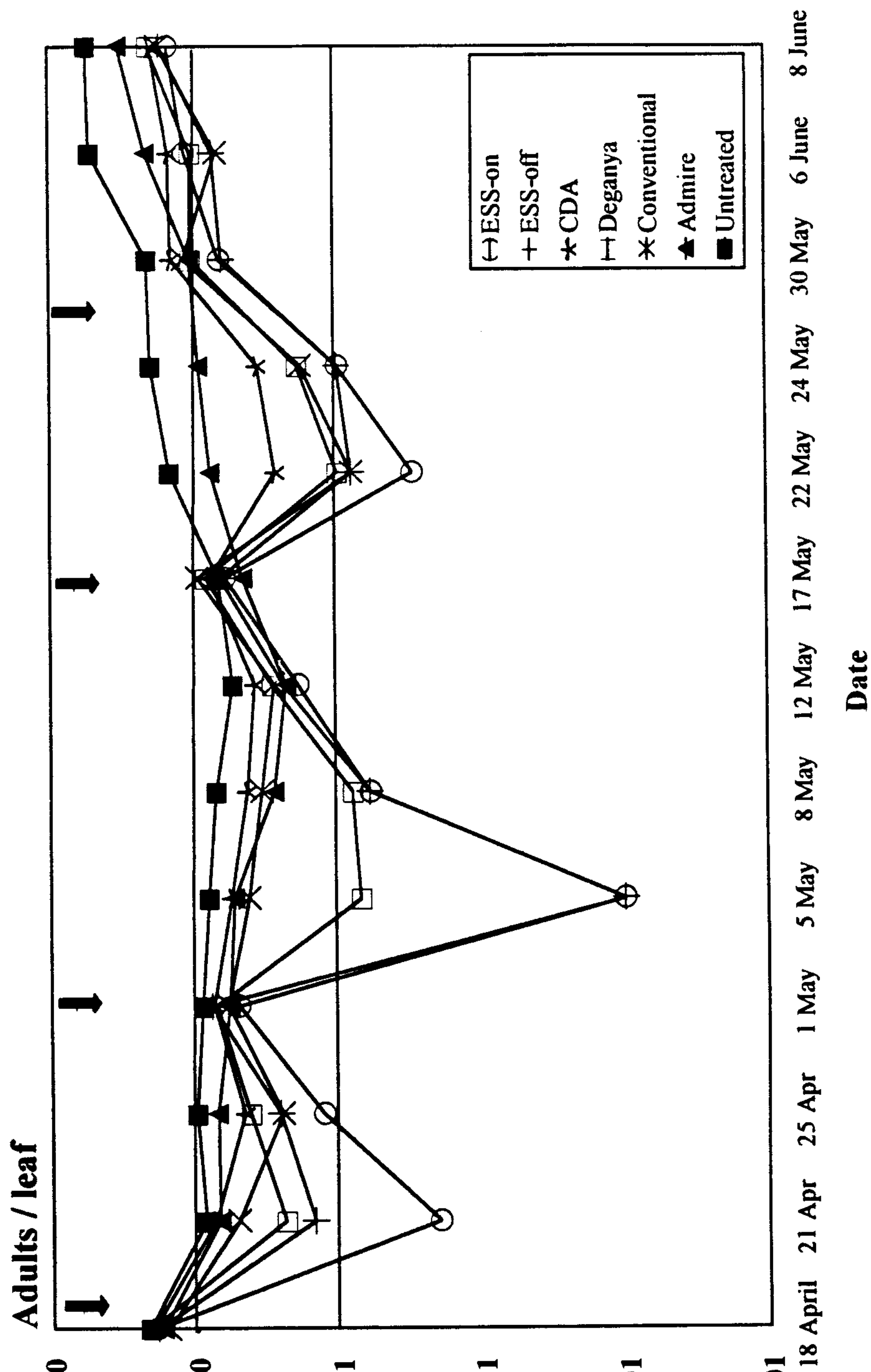
		Percent Reduction	
Test Date	Sprayer	4-DAT	7-DAT
4/19	EN	96.5 a	81.3 a
	EF	98.5 a	69.5 a
	CD	22.0 c	67.0 a
	FM	64.5 b	52.8 a
	CO	40.5 b	52.3 a
5/1	EN	81.3 a	42.3 a
	EF	89.3 a	45.3 a
	CD	27.5 b	23.5 a
	FM	80.5 a	29.8 a
	CO	37.5 b	27.8 a
5/17	EN	96.5 a	93.2 a
	EF	80.0 bc	87.5 a
	CD	74.8 c	76.3 a
	FM	90.3 ab	89.5 a
	CO	95.0 a	93.0 a
5/30	EN	80.5 a	38.5 a
	EF	83.8 a	48.5 a
	CD	70.5 a	65.3 a
	FM	80.0 a	38.5 a
	CO	85.8 a	66.5 a

Treatment abbreviations: EN,ESS-on; EF,ESS-off; CD,CDA; FM,FMC; CO,CONVENTIONAL

Table 8. Whitefly Densities at 45, 70 and 90 Days After Planting.

	Mean number of sweet potato whitefly immatures/cm^2 of leaf								
	45-DAP			70-DAP			90-DAP		
Sprayer	Eggs	Nymphs	Pupal Cases	Eggs	Nymphs	Pupal Cases	Eggs	Nymphs	Pupal Cases
ESS-on	31.8 a	0.0 a	0.0 a	1.2 bc	1.5 a	2.3 a	0.8 bc	2.4 b	1.5 a
ESS-off	36.0 a	0.3 a	0.0 a	1.6 b	1.2 a	2.8 a	0.6 c	2.3 b	3.0 a
CDA	33.7 a	0.5 a	0.0 a	2.8 a	1.0 a	3.6 a	2.0 ab	6.6 a	4.3 a
FMC	36.1 a	0.3 a	0.0 a	1.3 b	1.3 a	2.6 a	1.8 abc	2.9 b	3.3 a
Conv	32.6 a	0.3 a	0.0 a	2.8 a	1.5 a	2.3 a	1.8 abc	4.7 ab	2.5 a
Admire	31.5 a	0.3 a	0.0 a	0.6 c	0.9 a	1.0 b	1.4 bc	2.9 b	2.9 a
Control	36.1 a	0.3 a	0.0 a	3.2 a	1.3 a	2.5 a	4.2 a	7.5 a	2.9 a

Figure 1



Adults / leaf
100
10
1
0.1
0.01
0.001
18 April
21 Apr
25 Apr
1 May
5 May
8 May
12 May
17 May
22 May
24 May
30 May
6 June
8 June
Date
ESS-on
ESS-off
CDA
Deganya
Conventional
Admire
Untreated

Table 9. Mean number of cantaloupes harvested from a 6.0 meter long section of 2 rows/plot

Treatment	Size Classification					
	9	12	15	18	23	Total
ESS-on	0.0 a	4.5 ab	12.6 a	3.2 a	0.8 a	21.1 a
ESS-off	0.7 a	5.0 a	11.8 a	2.5 a	0.7 a	20.7 a
CDA	0.0 a	3.4 abc	10.7 a	3.7 a	0.6 a	18.4 a
FMC	0.1 a	3.9 abc	13.9 a	4.0 a	0.8 a	22.7 a
Conv	0.2 a	4.0 abc	10.2 a	2.2 a	1.2 a	17.8 a
Admire	0.2 a	2.7 bc	11.9 a	3.2 a	1.4 a	19.5 a
Control	0.1 a	2.1 c	11.0 a	4.6 a	1.0 a	18.8 a