Evaluation of Oils, Insecticides and Insect Growth Regulators for Control of Sweetpotato Whitefly on Muskmelon and Watermelon

Michael D. Rethwisch, Tony Tellez, Alphonso Tellez, David Tellez, Mary Shaw, Alex Galarza and Luis Lastra

Abstract

Five insecticides, four oils, one soap, and two insect growth regulators were evaluated for control of sweetpotato whitefly on muskmelons and watermelons in 1990. Best control (> 80%) was noted from the insect growth regulators at 11 days post treatment, but declined thereafter. Oils as a class provided some control but not all oils provided similar results. Insecticides tested did not provide adequate control and resulted in increased whitefly egg and nymph numbers at 11 days post treatment.

Introduction

The sweetpotato whitefly, *Bemisia tabaci* (Gennadius), has traditionally been a pest of melons as well as cotton in Arizona. Few data exist for the effectiveness of various insecticides and other materials against this pest in melons. Whitefly numbers increase on melons in the late summmer and early fall prior to and following defoliation of cotton. Large numbers of whiteflies can be present on melons although the extent of their damage was not as great as in 1991. In 1991 melon fields were killed by populations of the poinsettia (B) biotype in the fall as well as in the spring which had not been noted to occur in previous years when only the cotton (A) biotype was present. This study was conducted in August and September of 1990 and most whiteflies present were thought to have been the A biotype, although some B biotype may have also been present. Control of the B biotype is thought to be more difficult to achieve.

Methods and Materials

A trial to evaluate the effectiveness of various controls for sweetpotato whitefly on muskmelons and watermelons was conducted at the Yuma Valley Agricultural Center. Melon seed was planted in early June, 1990, on 80 inch beds. Muskmelon seed planted was "Top Net SR" from Harris Moran seed company. Two varieties of watermelon seed were interplanted: "Sunsweet" and "NVH 4266", both from Northrup-King.

Treatments were applied to both types of melons on August 16th. Melons at time of application were nearing maturity. Plots were 25 ft long by one bed wide. Treatments were applied using a CO_2 powered backpack sprayer connected to a boom with 3 TX-8 nozzles calibrated to deliver 24.4 gallons per acre at 20 psi. Applications were made by treating 1/2 the bed and then returning and treating the remaining half. This application method simulated an aerial application more than a ground application as low volumes of water were used and residues were on leaf top surfaces, and not on leaf undersides as would happen with an electrostatic or high pressured ground application. Treatments were made during the a.m., and 616 Langleys of solar radiation were received that day. High temperature that afternoon was 100°F.

Treatments that were included in this trial were primarily done so to collect control data for leafminers, *Liromyza sativae* Blanchard and *L. trifolii* (Burgess), as the arrival of *L. trifolii* in Arizona has been of concern to Arizona melon growers. As low populaitons of leafminers existed just prior to time of application and whitefly numbers were increasing, several other insecticides were added for whitefly insecticide efficacy data.

Treatments applied in this experiment included the following oils: Natur'l Oil (Stoller, Inc.), Vegetable Oil Concentrate (Setre Chem. Co.), Cote (Gowan Co.), and Sunspray Ultrafine Spray Oil (Mycogen, Inc.), all applied at the rate of 1 gallon/acre. Other treatments included Monitor 4 at both 0.5 and 1.0 lbs of active ingredient/acre, Trigard 75 W (0.125 # ai/A), Safer's Soap (2% solution), AgriMek 0.15 EC (0.01 # ai/A rate and this rate plus 6 oz of vegetable oil concentrate/A), and Pyrellin at the rate of 1 pt/A + 1 qt/A of vegetable oil concentrate. Two growth regulator compounds (NTN 33893 25WP [Mobay] and Nylar 10 EC [Fairfield American]), were each used at two rates. The Nylar and NTN 33893 treatments had Penetrator (Helena Chemical Co.) added to them at the rate of 0.25%.

Samples were taken on August 20, 27 and September 4 (4, 11 and 19 days post treatment) from muskmelon plots and August 20, 27 and September 6 (4, 11 and 21 days post treatment) from watermelon plots. Samples consisted of 10 leaves per plot, five from the 5th leaf from the terminal end of the vine and five from the 10th leaf from the vine terminal. It should be noted that only two replicates were sampled from watermelon the last sample date due to the vines drying up.

Eggs, crawlers and immatures were counted. Adult whiteflies in plots were not collected or counted because of interplot movement which would mask differences. Due to pest density a 1 inch diameter circle was made on the back of muskmelon leaves and whitefly numbers counted. On watermelon leaves whiteflies were counted on the entire backside of the leaf on the first sample date, but only from 1/2 leaf the other sample dates.

Data were statistically analyzed with a Student-Newman-Kuhls Test (Co-Stat 2.0). Numbers of immatures represent nymphs only and do not include eggs and crawlers.

Results

Differences between treatments were most pronounced on August 27th. Effectiveness of some treatments, such as AgriMek and AgriMek + oil, differed between type of melon. This may have been due to the leaf thickness which, with translaminar uptake from the top down as occurs with AgriMek in this experiment, may not have penetrated deep enough to affect whiteflies as they fed on the leaf undersides. Other treatment differences may have been due to the rate of plant growth or an interaction between leaf wax and insecticide/oil which affects uptake by the plant. Best control (90-95%) was achieved by NTN 33893 in both types of melons on August 27th. Oil treatments did not cause any noticeable phytotoxicity and did reduce insect numbers somewhat on the first sample date. Oil efficacy, as some other treatments, would be expected to be improved provided they contacted the whiteflies on the leaf undersides. Control from the NTN 33893 material did not last through the last sample date. This may be due to a foliar application of this material as granular applications that are root absorbed have shown longer residual control of insects compared to foliar formulations (see article by Palumbo et al. on Evaluation of Imidicloprid for Control of Aphids on Broccoli).

Systemic insecticides used in this study (Monitor 4) did not provide control and the higher rates generally had more immatures than did the untreated check. Although disruption of naturally occurring parasitoids (not noted to be present) by insecticides may have occurred, it may also be that higher insecticide rates caused more plant stress, allowing whiteflies to colonize more effectively. Monitor use on alfalfa varieties with resistance to spotted alfalfa aphid caused plants to lose resistance and become highly susceptible to spotted alfalfa aphid on numerous occasions as did Thuringiesis and to a lesser degree Ammo and Curacron (Bacon 1987). A similar phenomemon may also be occurring with whiteflies on melons treated with Monitor.

Literature Cited

Bacon, O. G. 1987. Insecticide effectiveness studies and potentials. Proc. 1987 California Alfalfa Seed Symposium. Pp. 7-9.

MEAN NUMBER OF SWEETPOTATO WHITEFLY IMMATURES ON 5TH AND 10TH LEAF FROM TERMINAL ON MUSKMELONS

Treatment	Rate lb (AI)/acre	IMMATURES/INCH CIRCLE ON 5TH LEAF Aug. 20	Aug. 27	Sept. 4	IMMATURES/INCH CIRCLE ON 10TH LEAF Aug. 20	Aug. 27	Sept. 4
Trigard	0.125	5.0	59.1	88.25	20.75	70.4	158.4
Monitor 4	0.5	18.4	144.95	199.1	22.75	81.8	150.25
Monitor 4	1.0	23.2	74.35	304.55	22.3	103.6	190.0
Nylar 10 EC	0.0075	26.75	59.8	75.65	18.3	54.75	65.75
Nylar 10 EC	0.0150	19.75	29.15	73.15	13.75	64.8	77.6
NTN 33893 25 WP	0.07	18.75	22.5	36.25	16.85	19.0	51.35
NTN 33893 25 WP	0.09	18.5	28.6	188.35	23.45	8.35	68.65
Safer's Insecticide Concentrate	2% by volume	29.05	84.4	184.35	22.85	54.7	103.55
Agri-Mek 0.15 EC	0.01	32.6	177.7	81.95	42.55	95.8	57.75
Agri-Mek 0.15 EC + Vegetable Oil Concent.	0.01 6 oz	26.95	68.25	150.15	22.55	87.2	98.0
Pyrellin EC + Vegetable Oil Conc.	1 pt 1 qt	15.25	86.75	162.0	21.05	91.35	146.1
Natur'l Oil	1 gal	16.9	49.5	145.2	13.15	58.8	116.35
Vegetable Oil Conc.	1 gal	10.55	63.35	169.65	18.05	55.5	90.85
SunSpray Ultra Fine	1 gal	15.15	69.25	190.45	15.55	38.8	110.4
Cote	1 gal	16.2	69.2	58.75	17.35	43.75	116.2
Untreated Check	____	23.0	139.4	173.1	22.4	94.2	139.05

Means in columns followed by the same letter are not significantly different ($P \leq 0.05$; S-N-K test).

MEAN NUMBER OF SWEETPOTATO WHITEFLY EGGS/INCH CIRCLE ON 5TH AND 10 LEAF FROM TERMINAL ON MUSKMELONS

Treatment	Rate lb (AI)/acre	Eggs/INCH CIRCLE ON 5TH LEAF Aug. 20	Aug. 27	Sept. 4	eggs/INCH CIRCLE ON 10TH LEAF Aug. 20	Aug. 27	Sept. 4
Trigard	0.125	22.65[a]	75.95[a]	48.6 [a]	17.05[ab]	52.75[a]	88.1 [a]
Monitor 4	0.5	37.55[a]	162.1 [a]	95.9 [a]	44.1 [b]	86.5 [a]	89.65[a]
Monitor 4	1.0	57.5 [a]	118.15[a]	48.6 [a]	28.0 [ab]	101.4 [a]	95.2 [a]
Nylar 10 EC	0.0075	30.8 [a]	73.0 [a]	21.35[a]	16.65[ab]	39.95[a]	39.65[a]
Nylar 10 EC	0.0150	43.5 [a]	97.45[a]	46.65[a]	11.75[a]	75.3 [a]	68.25[a]
NTN 33893 25 WP	0.07	21.55[a]	115.65[a]	40.75[a]	13.45[ab]	12.25[a]	49.0 [a]
NTN 33893 25 WP	0.09	16.25[a]	50.9 [a]	41.8 [a]	15.1 [ab]	3.4 [a]	40.8 [a]
Safer's Insecticide Concentrate	2% by volume	44.15[a]	176.3 [a]	48.25[a]	17.7 [ab]	90.3 [a]	47.15[a]
Agri-Mek 0.15 EC	0.01	44.65[a]	89.7 [a]	42.9 [a]	30.75[ab]	51.05[a]	18.5 [a]
Agri-Mek 0.15 EC + Vegetable Oil Concent.	0.01 6 oz	29.2 [a]	104.55[a]	60.55[a]	10.55[a]	78.1 [a]	109.45[a]
Pyrellin EC + Vegetable Oil Conc.	1 pt 1 qt	13.9 [a]	125.3 [a]	57.9 [a]	17.3 [ab]	30.6 [a]	84.2 [a]
Natur'l Oil	1 gal	31.5 [a]	164.85[a]	68.3 [a]	11.05[a]	21.55[a]	46.45[a]
Vegetable Oil Conc.	1 gal	35.25[a]	88.05[a]	64.75[a]	7.1 [a]	65.4 [a]	57.15[a]
SunSpray Ultra Fine	1 gal	98.2 [a]	169.3 [a]	47.75[a]	9.85[a]	41.95[a]	41.35[a]
Cote	1 gal	19.25[a]	76.55[a]	25.2 [a]	28.5 [ab]	61.8 [a]	64.1 [a]
Untreated Check	____	38.6 [a]	70.0 [a]	35.1 [a]	16.65[ab]	80.35[a]	105.4 [a]

Means in columns followed by the same letter are not significantly different ($P \leq 0.05$; S-N-K test).

MEAN NUMBER OF SWEETPOTATO WHITEFLY IMMATURES ON WATERMELON 5TH AND 10TH LEAF FROM VINE TERMINAL

Treatment	Rate lb (AI)/acre	5TH LEAF (NUMBER/LEAF) Aug. 20	Aug. 27	6 Sep	10TH LEAF (NUMBER / LEAF) Aug. 20	Aug. 27	Sept. 6*
Trigard	0.125	32.75	119.5 [a]	574.4[a]	42.15	137.9 [ab]	164.6
Monitor 4	0.5	51.4	140.55[a]	307.8[a]	82.35	244.2 [ab]	71.2
Monitor 4	1.0	39.5	142.3 [a]	488.0[a]	107.5	299.3 [b]	66.4
Nylar 10 EC	0.0075	50.5	32.75[a]	687.8[a]	108.5	89.95[ab]	140.4
Nylar 10 EC	0.0150	60.4	33.6 [a]	399.0[a]	?3.75	90.1 [ab]	113.6
NTN 33893 25 WP	0.07	28.2	5.7 [a]	243.4[a]	59.15	12.5 [a]	47.0
NTN 33893 25 WP	0.09	40.35	5.4 [a]	480.4[a]	26.7?	26.4 [a]	109.8
Safer's Insecticide Concentrate	2% by volume	86.9	74.6 [a]	588.0[a]	70.15	151.2 [ab]	120.0
Agri-Mek 0.15 EC	0.01	93.45	58.65[a]	484.4[a]	127.3	83.6 [ab]	132.0
Agri-Mek 0.15 EC + Vegetable Oil Concent.	0.01 6 oz	122.05	86.8 [a]	1,109.4[a]	74.8	196.2 [ab]	222.8
Pyrellin EC + Vegetable Oil Conc.	1 pt 1 qt	33.3	120.1 [a]	460.6[a]	103.65	210.8 [ab]	55.8
Natur'l Oil	1 gal	100.05	84.0 [a]	577.8[a]	107.45	81.1 [ab]	79.4
Vegetable Oil Conc.	1 gal	54.4	30.35[a]	219.6[a]	100.0	46.4 [a]	32.4
SunSpray Ultra Fine	1 gal	50.4	32.65[a]	427.8[a]	47.3	68.4 [ab]	164.8
Cote	1 gal	100.15	72.4 [a]	317.4[a]	88.6	129.5 [ab]	119.6
Untreated Check	____	63.1	51.25[a]	548.6[a]	61.4	106.3 [ab]	116.6

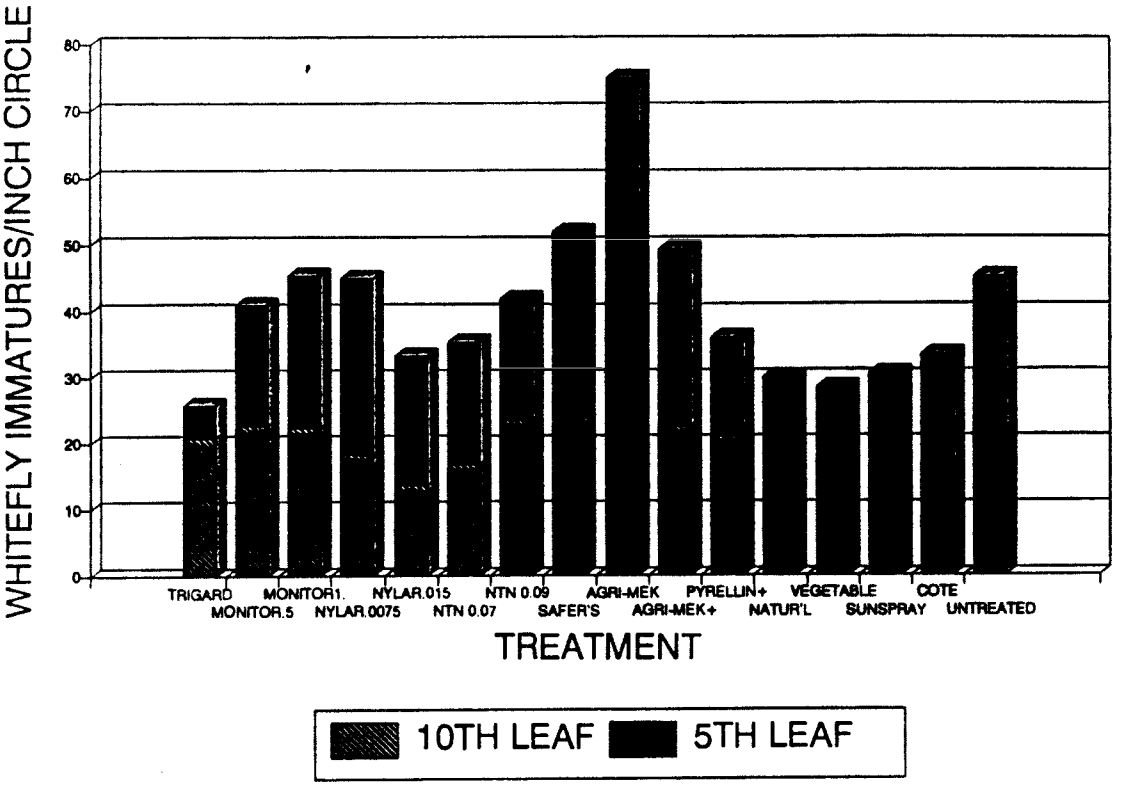
* Only two replications sampled on this date.

MEAN NUMBER OF SWEETPOTATO WHITEFLY EGGS ON WATERMELON 5TH AND 10TH LEAF FROM VINE TERMINAL

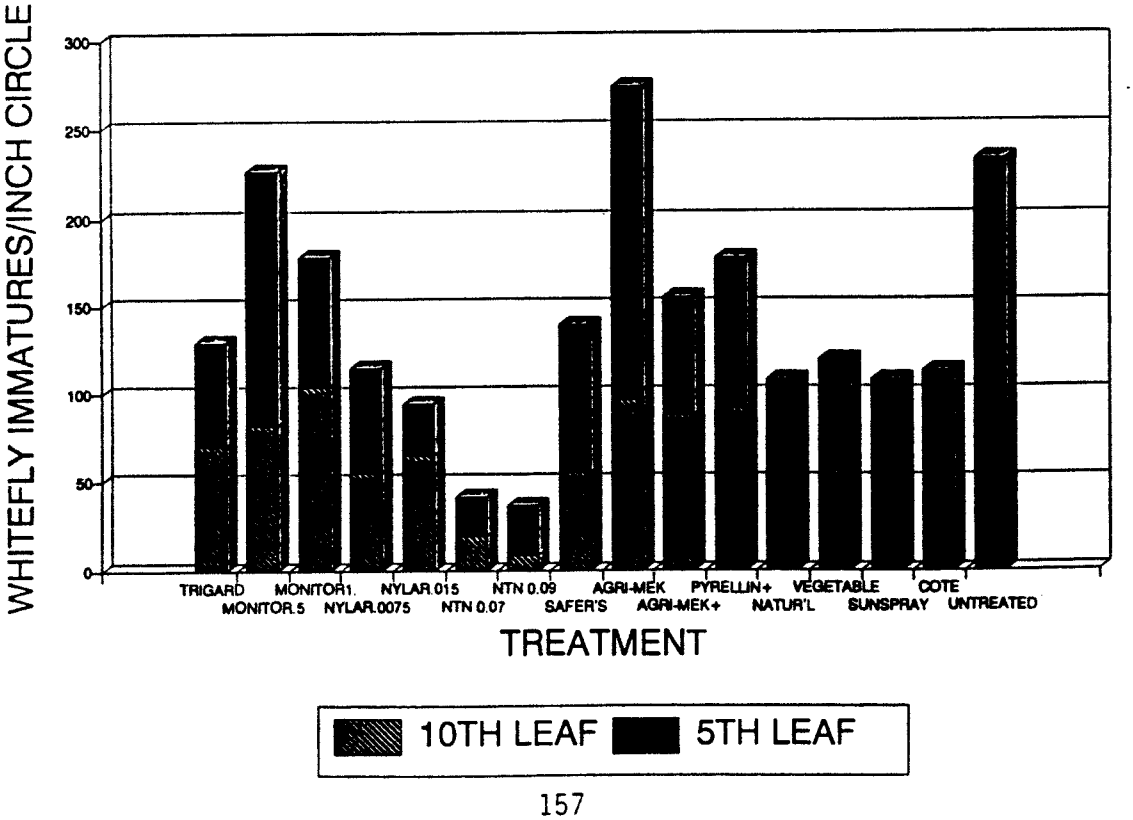
Treatment	Rate lb (AI)/acre	5TH LEAF (NUMBER/LEAF) Aug. 20	Aug. 27	6 Sep	10TH LEAF (NUMBER / LEAF) Aug. 20	Aug. 27	Sept. 6*
Trigard	0.125	99.0 [a]	516.9[a]	373.0[a]	163.4[a]	125.8	164.6
Monitor 4	0.5	139.0 [a]	512.5[a]	485.2[a]	246.9[a]	243.4	71.2
Monitor 4	1.0	40.4 [a]	462.5[a]	526.6[a]	231.9[a]	289.2	66.4
Nylar 10 EC	0.0075	35.6 [a]	171.6[a]	699.4[a]	87.1[a]	89.9	140.4
Nylar 10 EC	0.0150	53.5 [a]	155.0[a]	394.6[a]	61.1[a]	47.1	113.6
BAY NTN 33893 25WP	0.07	51.85[a]	72.4[a]	139.0[a]	30.0[a]	12.5	47.0
BAY NTN 33893 25WP	0.09	20.45[a]	25.5[a]	446.0[a]	11.7[a]	26.4	109.8
Safer's Insecticide Concentrate	2% by volume	64.75[a]	289.6[a]	641.2[a]	141.2[a]	148.7	120.0
Agri-Mek 0.15 EC	0.01	82.45[a]	120.8[a]	657.0[a]	128.2[a]	81.0	132.0
Agri-Mek 0.15 EC + Vegetable Oil Concent.	0.01 6 oz	23.3 [a]	409.9[a]	1,265.4[a]	147.3[a]	194.6	222.8
Pyrellin EC + Vegetable Oil Conc.	1 pt 1 qt	94.8 [a]	422.7[a]	348.8[a]	188.8[a]	208.5	55.8
Natur'l Oil	1 gal	30.7 [a]	108.4[a]	341.6[a]	48.7[a]	81.0	79.4
Vegetable Oil Conc.	1 gal	26.65[a]	110.0[a]	145.0[a]	62.5[a]	46.2	32.4
SunSpray Ultra Fine	1 gal	27.5 [a]	240.5[a]	497.0[a]	126.4[a]	67.7	164.8
Cote	1 gal	68.9 [a]	171.7[a]	285.4[a]	99.4[a]	129.1	119.6
Untreated Check	____	18.1 [a]	173.8[a]	479.0[a]	50.3[a]	105.4	116.6

* Only two replications sampled on this date.

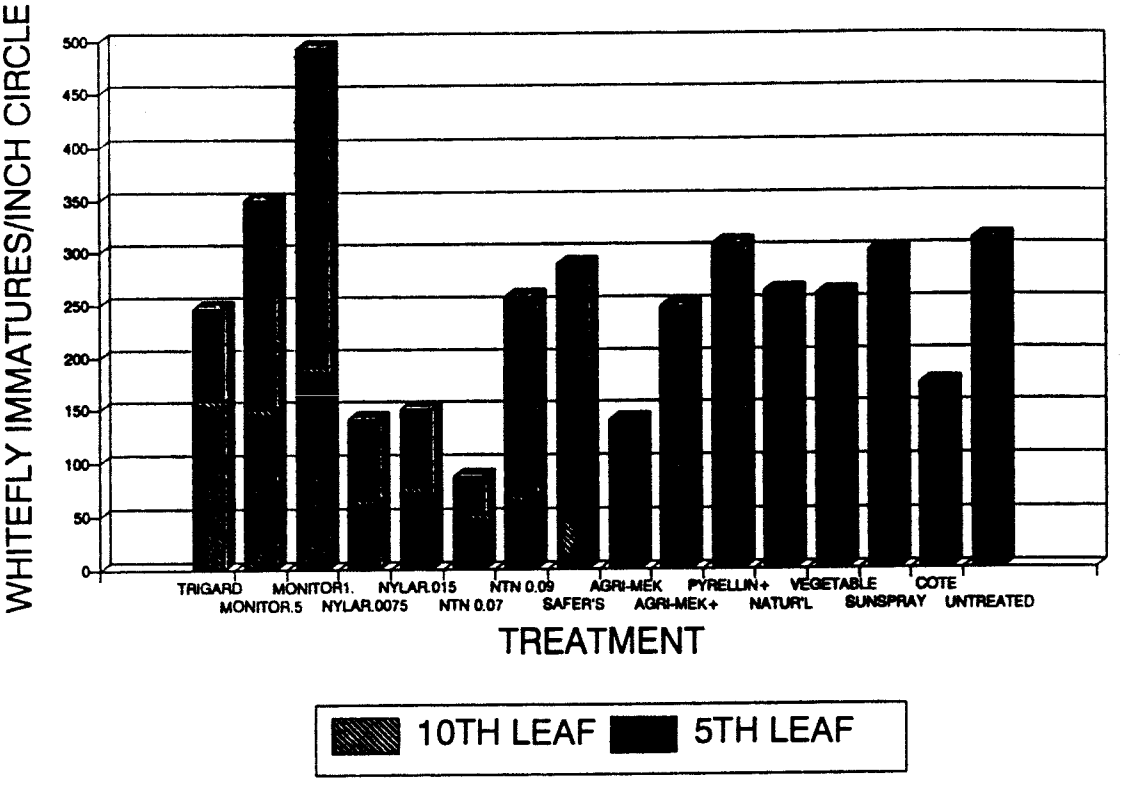
SWEET POTATO WHITEFLY IMMATURES ON 5TH AND 10TH LEAF OF MUSKMELON, 8-20-90



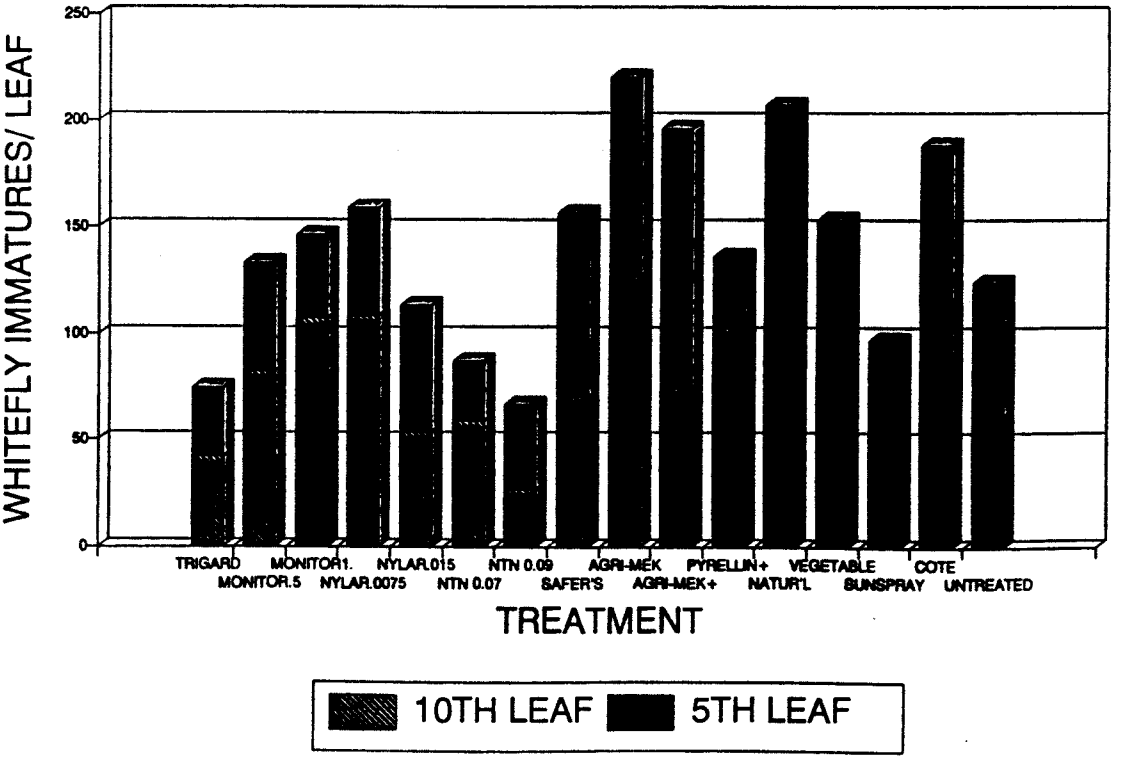
SWEET POTATO WHITEFLY IMMATURES ON 5TH AND 10TH LEAF OF MUSKMELON, 8-27-90



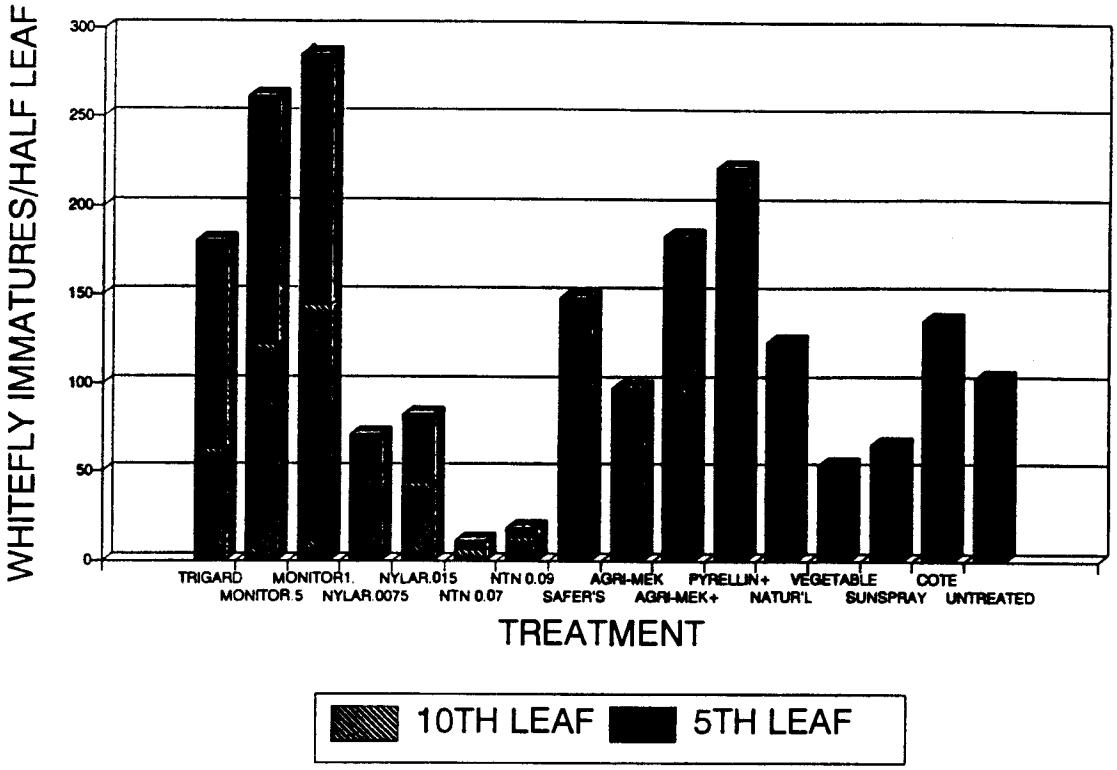
SWEET POTATO WHITEFLY IMMATURES ON 5TH AND 10TH LEAF OF MUSKMELON, 9-4-90



SWEET POTATO WHITEFLY IMMATURES ON 5TH AND 10TH LEAF OF WATERMELON, 8-20-90



SWEET POTATO WHITEFLY IMMATURES ON 5TH AND 10TH LEAF OF WATERMELON, 8-27-90



SWEET POTATO WHITEFLY IMMATURES ON 5TH AND 10TH LEAF OF WATERMELON, 9-6-90 *