Chemical Control of Citrus Leafminer (Phyllocnistis citrella)

by Philip A. Stansly
University of Florida/IFAS
Southwest Florida Research and Education Center
Immokalee FL 33934

Materials & Methods The trial was carried out on 1-year old white Mars grapefruit in Immokalee, Fl. A randomized complete block design was used with 12 treatments and 5 replications. Ten trees were selected for treatment based on availability of new flush from each 1 row plot, each containing about 60, 6 ft trees on 24x13 ft spacing. Treatments were applied 15 September with a and gun sprayer at 200 psi, calibrated 0.26 gal. per tree or 38 gal./acre. When the trees were sprayed there was a 6-8 mph breeze across the rows from the east. All treatments were mixed per 100 gallons with 5% FC-435-66 petroleum oil except Micromite and Micromite + Kinetic. Samples were taken at -2, 1 day, 5 days and 12 days after treatment (DAT). Samples consisted of 5 flush branches from 5 different trees, from which 5 consecutive leaves were used. One and 5 day samples were examined with dissecting microscopes to determine the size of larvae and whether or not they were alive. The 12 day sample was examined in the field where the number of mines and percent leaf damage was estimated on 5 new, fully expanded leaves on 5 flushes per plot.

Results Align gave the highest mortality after 1 day, but not significantly different from Agri-Mek + oil, Lannate + oil, Asana + oil, Ethion + oil, Micromite+Kinetic, or straight oil. At 5 days Align was still on top, though not significantly different from 5% petroleum oil or Agri-Mek + oil. Asana, Lannate and Javelin with oil were not significantly different from the control. Fewest new mines after 12 days were seen with the Agri-mek + oil treatment, though not significantly different from Align + oil or petroleum oil alone. However, significantly less leaf damage was seen with Agri-mek than any other treatment. All treatments gave fewer new mines and less leaf damage than the control. However, only the addition of Agri-mek to oil significantly improved the control obtained with 5% oil alone.

Table 1. Treatment list.

NUM	COLOR	TREATMENT	PRODUCT/100 GAL SPRAY
1	RED	ASANA XL	3.5 oz
2	RED/WHITE	AGRIMEK	2.0 oz
3	PINK	FC-435-66 PETROL. OIL	5 gal
4	PINK/BLACK	JAVELIN	1 lb
5	ORANGE	LANNATE	2 pt
6	ORANGE/BLACK	VYDATE	2 pt
7	YELLOW	ETHION	3 pt
8	YELLOW/BLACK	ALIGN (Neem Extract)	21 oz
9	BLUE	MICROMITE	10 oz
10	BLUE/WHITE	MICROMITE+KINETIC	10 oz\5 oz
11	WHITE	CONTROL	Unsprayed
12	GREEN	KINETIC	5 oz

Table 2. T tests (LSD) for percent larvae dead over 3 size categories at **1 DAT**. N = 25 except were live + dead larvae = 0;

T Grouping			Mean	N	TRT
	A		89.915	23	ALIGN
	A				
B	A		87.991	25	AGRIMEK
B	A				
B	A	C	86.772	25	LANNATE
B	A	C			
B	A	C	83.781	25	ASANAXL
B	A	C			
B	A	C	81.416	25	ETHION
B	A	C			
B	A	C	79.340	25	MICRO+KIN
B	A	C			
B	A	C	78.439	24	OIL
B		C			
B		C	77.718	25	JAVELIN
B		C			
B		C	76.655	24	KINETIC
		C			
	D	C	75.283	24	VYDATE
	D				
	D		64.499	25	MICROMITE
	E		45.269	25	CONTROL

Alpha= 0.05 df= 202 MSE= 842.0214, critical Value of T= 1.97
Least Significant Difference= 19.475

Table 3. T tests (LSD) for percent larvae dead over 3 size categories at **5 DAT**. N = 20 except were live + dead larvae = 0;

T Grouping				Mean	N	TRT
		A		85.742	19	ALIGN
		A				
B		A		72.738	17	OIL
B		A				
B		A		70.427	20	MICROMITE
B		A				
B		A	C	66.827	20	KINETIC
B			C			
B			C	63.292	9	AGRIMEK
B			C			
B		D	C	59.827	19	ETHION
B		D	C			
B	E	D	C	58.543	17	VYDATE
B	E	D	C			
B	E	D	C	55.972	20	MICRO+KIN
	E	D	C			
F	E	D	C	48.944	18	ASANAXL
F	E	D				
F	E	D		41.750	20	JAVELIN
F	E					
F	E			40.348	18	LANNATE
F						
F				32.102	20	CONTROL

Table 4. Number of large mines per 5 leaf sample at **12 DAT.**

T Grouping				Mean	N	TRT
		A		22.480	25	CONTROL
		B		11.480	25	JAVELIN
		B				
C		B		11.080	25	ASANAXL
C		B				
C		B		10.680	25	VYDATE
C		B				
C		B	D	9.160	25	MICRO+KIN
C		B	D			
C	E	B	D	8.720	25	MICROMITE
C	E		D			
C	E		D	7.760	25	LANNATE
	E		D			
	E	F	D	6.600	25	ETHION
	E	F				
	E	F		5.520	25	KINETIC
		F				
G		F		3.840	25	OIL
G						
G				1.880	25	ALIGN
G						
G				0.480	25	AGRIMEK

Alpha= 0.05, df= 284, MSE= 39.26308, critical value of T= 1.97
LSD = 3.4885

Table 5. Percent leaf surface damaged by leafminer at **12 DAT.**

T Grouping				Mean	N	TRT
		A		76.240	25	CONTROL
		B		53.000	25	JAVELIN
		B				
C		B		47.800	25	MICROMITE
C		B				
C		B	D	45.200	25	ASANAXL
C		B	D			
C		B	D	43.800	25	VYDATE
C		B	D			
C		B	D	43.520	25	MICRO+KIN
C		B	D			
C	E	B	D	41.200	25	LANNATE
C	E		D			
C	E		D	37.080	25	ETHION
	E		D			
	E		D	33.400	25	KINETIC
	E					
	E	F		30.200	25	OIL
		F				
		F		18.960	25	ALIGN
		G		4.640	25	AGRIMEK

Alpha= 0.05 df= 284 MSE= 503.7527 Critical Value of T= 1.97
Least Significant Difference= 12.496

Table 6. Small, medium and large live and dead larvae per 5 leaf sample at **1 DAT.**

	SMADEAD	SMALIVE	MEDEAD	MEDLIVE	LARDEAD
	MEAN	MEAN	MEAN	MEAN	MEAN
TRT					
AGRIMEK	4.76	0.04	4.80	0.52	1.24
ALIGN	4.52	0.00	4.76	0.28	2.88
ASANAXL	4.92	0.72	5.60	1.24	1.08
OIL	3.76	0.16	3.04	0.56	1.36
CONTROL	1.92	1.80	1.64	1.20	1.20
ETHION	4.04	0.76	3.28	0.96	1.24
JAVELIN	4.52	0.96	2.64	1.00	0.92
KINETIC	3.32	0.28	3.60	0.52	1.40
LANNATE	5.64	0.08	3.52	0.44	1.00
MICRO+KIN	3.80	0.28	4.68	1.36	1.24
MICROMITE	2.32	1.12	3.72	1.36	2.40
VYDATE	3.88	1.24	2.68	0.96	1.28

	LARLIVE	PUPDEAD	PUPALIVE	TOTLDEAD	TOTLLIVE
	MEAN	MEAN	MEAN	MEAN	MEAN
TRT					
AGRIMEK	1.24	0.08	0.40	10.80	1.80
ALIGN	1.08	0.28	1.12	12.16	1.36
ASANAXL	1.00	0.04	0.80	11.60	2.96
OIL	1.68	0.16	0.40	8.16	2.40
CONTROL	3.44	0.04	1.20	4.76	6.44
ETHION	0.80	0.00	0.80	8.56	2.52
JAVELIN	0.60	0.32	0.36	8.08	2.56
KINETIC	1.04	0.04	1.52	8.32	1.84
LANNATE	0.68	0.12	0.44	10.16	1.20
MICRO+KIN	0.96	0.08	1.16	9.72	2.60
MICROMITE	2.68	0.04	1.20	8.44	5.16
VYDATE	0.44	0.04	0.68	7.84	2.64

Table 7. Percent small, medium, large and total larvae dead at **1 DAT.**

	PERSDEAD	PERMDEAD	PERLDEAD	PERTDEAD
	MEAN	MEAN	MEAN	MEAN
TRT				
AGRIMEK	99.00	90.54	62.96	87.99
ALIGN	100.00	92.36	77.20	89.91
ASANAXL	86.26	86.28	50.18	83.78
OIL	95.22	86.91	46.27	78.44
CONTROL	47.02	57.49	33.06	45.27
ETHION	91.03	80.68	67.83	81.42
JAVELIN	85.61	75.97	62.50	77.72
KINETIC	90.06	83.68	52.54	76.66
LANNATE	96.59	91.53	54.17	86.77
MICRO+KIN	92.33	78.07	67.50	79.34
MICROMITE	68.88	78.20	48.36	64.50
VYDATE	72.64	76.07	80.78	75.28

Table 8. Small, medium and large live and dead larvae per 5 leaf sample at **5 DAT.**

	SMADEAD	SMALIVE	MEDEAD	MEDLIVE	LARDEAD
	MEAN	MEAN	MEAN	MEAN	MEAN
TRT					
AGRIMEK	0.90	0.45	0.60	1.05	0.95
ALIGN	4.60	1.20	3.30	0.45	1.10
ASANAXL	1.20	1.20	1.75	1.90	1.15
OIL	2.00	1.00	1.30	0.95	0.45
CONTROL	2.55	8.00	3.55	8.10	2.20
ETHION	1.35	1.60	1.30	1.55	1.25
JAVELIN	1.00	1.60	2.15	2.75	1.15
KINETIC	2.55	2.30	1.40	0.75	0.65
LANNATE	1.60	1.70	1.25	1.35	0.25
MICRO+KIN	1.95	2.70	2.45	2.45	2.80
MICROMITE	1.00	1.00	2.05	1.60	2.00
VYDATE	0.85	0.70	0.75	0.60	0.45

Table 8, Con't.

	LARLIVE	PUPDEAD	PUPALIVE	TOTLDEAD	TOTLLIVE
	MEAN	MEAN	MEAN	MEAN	MEAN
TRT					
AGRIMEK	1.55	0.05	0.40	2.45	3.05
ALIGN	0.50	0.00	0.35	9.00	2.15
ASANAXL	3.30	0.00	1.55	4.10	6.40
OIL	0.90	0.00	0.05	3.75	2.85
CONTROL	6.45	0.00	1.05	8.30	22.55
ETHION	1.35	0.00	0.70	3.90	4.50
JAVELIN	3.05	0.05	0.50	4.30	7.40
KINETIC	0.55	0.00	0.25	4.60	3.60
LANNATE	1.35	0.05	0.15	3.10	4.40
MICRO+KIN	2.50	0.00	0.35	7.20	7.65
MICROITE	1.80	0.10	0.85	5.05	4.40
VYDATE	0.90	0.00	0.20	2.05	2.20

Table 9. Percent small, medium, large and total larvae dead at 5 DAT.

	PERSDEAD	PERMDEAD	PERLDEAD	PERTDEAD
	MEAN	MEAN	MEAN	MEAN
TRT				
AGRIMEK	72.45	47.50	50.07	63.29
ALIGN	85.47	88.47	84.52	85.74
ASANAXL	58.70	53.88	39.05	48.94
OIL	78.33	66.87	37.36	72.74
CONTROL	33.70	43.06	22.07	32.10
ETHION	66.07	54.02	48.89	59.83
JAVELIN	49.40	53.78	25.06	41.75
KINETIC	59.57	68.63	61.31	66.83
LANNATE	47.10	43.74	15.00	40.35
MICRO+KIN	63.46	45.91	60.40	55.97
MICROMITE	62.70	73.25	52.58	70.43
VYDATE	42.22	61.67	51.28	58.54

Table 10. Number of small, medium and large mines per 5 leaf sample and percent of leaf damaged at 12 DAT.

	SMAMINES	MEDMINES	LARMINES	TOTMINES	PERDAM
	MEAN	MEAN	MEAN	MEAN	MEAN
TRT					
AGRIMEK	0.84	0.96	0.48	2.28	4.64
ALIGN	4.36	7.84	1.88	14.08	18.96
ASANAXL	1.28	4.12	11.08	16.48	45.20
OIL	1.52	4.56	3.84	9.92	30.20
CONTROL	0.20	1.64	22.48	24.32	76.24
ETHION	0.68	4.20	6.60	11.48	37.08
JAVELIN	1.48	4.64	11.48	17.60	53.00
KINETIC	1.12	3.64	5.52	10.28	33.40
LANNATE	3.08	5.72	7.76	16.56	41.20
MICRO/KIN	0.88	2.44	9.16	12.48	43.52
MICROMITE	0.36	2.56	8.72	11.64	47.80
VYDATE	1.48	3.72	10.68	15.88	43.80