

Table 1. Summary of population characteristics of flower-feeding thrips and associated natural enemies in blooms of white Dutch clover, beggar ticks, creeping oxeye, sunflower and pepper, sampled from fourteen sites in seven counties across South Florida, between March 1998 and May 1999.

	White Sweet Clover	White Dutch Clover	Beggar Ticks	Creeping Oxeye	Sunflower	Pepper
	<i>Melilotus alba</i>	<i>Trifolium repens</i>	<i>Bidens pilosa</i>	<i>Wedelia trilobata</i>	<i>Helianthus annuus</i>	<i>Capsicum annuum</i>
Samples	19	52	185	127	7	189
Counties	St. Lucie, Martin, Palm Beach, Collier,	Palm Beach, St. Lucie	St. Lucie, Martin, Palm Beach, Collier, Lee, Dade	Martin, Palm Beach, Collier	Hendry	St. Lucie, Martin, Palm Beach, Collier
Habitat	Field margins, road sides, ditch banks	Drivemiddles	Field margins, ditch banks, road sides	Field margins, ditch banks, road sides	Field margins	Field
Bloom period	January-April	March – May	Year round	March – November	February	September – April
Peak bloom period	March	April	Year round	June - September	February	October – March
Peak bloom density	20 racemes / sq. ft.	30 blooms / sq. ft.	20 blooms / sq. ft.	3 blooms / sq. ft.	2 blooms / sq. ft.	5 blooms / sq. ft.
Thrips						
Density ^a range	0.2 – 30.6	0.3 – 63.3	1.4 – 40.4	0 – 19.7	4.6 – 21.2	0 – 42.3
Mean	9.5	10.8	9.6	3.9	12.1	4.1
% <i>M. abdominalis</i>	0	0.3	8.1	58.7	42.6	0.17
% <i>F. bispinosa</i>	99.6	98.8	91.4	37.1	57.4	91.7
% <i>F. occidentalis</i>	0	0.5	0	0.02	0	2.47
% <i>F. insularis</i>	0.4	0	<0.01	0.13	0	< 0.01
% other <i>Frankliniella</i>	0	< 0.01	< 0.01	< 0.01	0	< 0.01
% <i>T. palmi</i>	0	0	< 0.01	< 0.01	0	2.8
% <i>Haplothrips</i>	0	0.3	0.5	2.7	0	1.0
Minute Pirate Bug^b						
Density ^b range	0 – 0.37	0 – 1.20	0 – 0.60	0 – 0.46	0.30 – 16.00	0 – 0.80
Mean	0.08	0.25	0.09	0.04	6.6	0.06
Other predators						
Density ^b range	0 – 0.22	0 – 0.09	0 – 0.48	0 – 1.08	0 – 1.00	0 – 0.07
Mean	0.04	0.04	0.20	0.32	0.20	0.01
Parasitoids						
Density ^a range	0 – 0.06	0 – 0.04	0 – 0.17	0 – 0.20	0 – 0.20	0 – 0.09
mean	<0.01	< 0.01	0.03	0.02	0.06	< 0.01
Carrying Capacity						
Thrips	612.0	1809.0	808.0	59.0	42.4	211.5
Orius	7.4	36.0	12.0	1.4	32.0	4.0
Thrips : Orius ratio	82.7	50.3	67.3	42.1	1.3	52.9

^a insects per bloom.

^b *Orius insidiosus* (Say) adults and nymphs combined.

Table 2. Rating scale used for aphid infestation of pepper. Numerical value is given between parentheses.

% plants infested	Colony size (number of winged and/or wingless aphids)			
	0	1 – 5	6 - 20	> 20
0	None (0)			
< 1		Very low (1)	Very low (1)	Very low (1)
1 – 10		Very low (1)	Low (2)	Moderate (3)
11 – 20		Low (2)	Moderate (3)	High (4)
20		Moderate (3)	High (4)	High (4)

Table 3. Thrips and *Orius* populations per bloom in different pepper farms in south Florida, February – March 1999.

Site	February			March			April		
	Thrips	<i>Orius</i>	Samples	Thrips	<i>Orius</i>	samples	Thrips	<i>Orius</i>	Samples
Shiloh	2.10	0.006	15	11.00 a	0.044	28	4.36	0.257	9
Brown82	0.33	0.010	3	3.12 ab	0.029	4	1.69	0	1
Silverstrand	0.19	0	4	5.63 ab	0.064	4	3.59	0.116	3
Thomas#3	-	-	0	2.30 ab	0	2	1.78	0.014	4
Pero	0.03	0	2	0.23 b	0	2	-	-	0
LSD	2.25	0.018		10.37	0.101		4.05	0.332	

Table 4. Pepper weevil fruit infestation (%) and number of oviposition dimples per fruit, seven and 13 days after application, in plots treated and untreated with PROKIL Cryolite 96.

Days after application	Block	Treatment	Fruit infestation (%)	Dimples per fruit
7	1	Control	76	1.70
		PROKIL 12 lb/A	30	0.28
			0.0278 ^a	0.0159 ^a
	2	Control	66	1.16
		PROKIL 8 lb/A	22	0.26
			0.0119 ^a	0.0119 ^a
13	1	Control	36	-
		PROKIL 12 lb/A	9	-
			0.0198 ^a	

^aExact p-value of one-sided Wilcoxon test; differences are significant if $p < 0.05$.

Table 5. Mean weekly catch of pepper weevil adults (*Anthonomus eugenii* Cano) using yellow sticky traps baited with different pheromone formulations (standard lure system, TRE 1 (=TRE8420+8461) and TRE 2 (=TRE8420+8462), Shiloh pepper farm, Jupiter, Palm Beach Co., FL.

Lure Exposure (weeks)	Treatment	Rep's Trial 1	Rep's Trial 2	Mean weekly catch on								mean ^a	%
				April 13	April 20	April 27	May 4	May 11	May 18	May 25	June 1		
				Trial 1			Trial 2						
1	control	3	3	2.33			0.00					1.17 b	7
	standard	6	2	7.00			3.00					6.00 a	37
	TRE 1	6	7	9.17			3.43					6.08 a	37
	TRE 2	6	7	3.50			2.71					3.08 a	19
2	control	3	4		6.33			4.25				5.14 c	7
	standard	6	2		16.83			12.00				15.63 bc	21
	TRE 1	6	7		11.17			23.71				17.92 ab	24
	TRE 2	6	7		10.17			58.29				36.08 a	48
3	control	3	3			15.00			0.33			7.67 c	9
	standard	4	1			16.25			2.00			13.4 bc	15
	TRE 1	4	6			61.00			0.83			24.9 ab	28
	TRE 2	4	6			100.50			5.50			43.5 a	49
4	control	1	3				1.00			0.00		0.25 b	3
	standard	1	1				3.00			0.00		1.5 ab	16
	TRE 1	1	6				3.00			0.33		0.71 b	8
	TRE 2	1	6				19.00			5.00		7.00 a	74
5	control	1	3					0.00			0.00	0.00 b	0
	standard	1	1					1.00			0.00	0.50 b	9
	TRE 1	1	6					8.00			0.33	1.43 b	27
	TRE 2	1	6					21.00			0.50	3.43 a	64

^a Seasonal means within the same lure age followed with the same letter are not statistically different at p=0.05 by Fisher's least-significant difference test (based on log-transformed values; actual values shown).

Table 6. Summary of 1998-99 pepper weevil pheromone monitoring trial in South Florida.

Site	Site name	County	Crop	Area (acres)	Traps (no.)	Trap Density (acres per trap)	Planting Period (m/y)	Date of first trap catch	Date of first visual detection of weevil infestation in field	Time difference between first trap catch and first visual detection	Mean catch per trap per week
1	Green Cay West	Palm Beach	fall 98	85	6 to 11	7.7-14.2	Aug-98	21-Sep-98	Not detected	n.a.	0.01
2	Green Cay East	Palm Beach	fall 98	80	8	10	Oct-98	24-Dec-98	17-Dec-98	-7	0.14
3	Nicky Growers	Dade	fall 98	4	4	1	Sep-98	8-Oct-98	18-Oct-98	7 to 10	0.54
4	Accursio	Dade	fall 98	60	3 to 4	15	Sep-98	20-Nov-98	29-Nov-98	7 to 10	0.90
5	R. Borek	Dade	fall 98	20	4	5	Sep-98	23-Nov-98	1-Dec-98	7 to 10	0.28
6	C&B	Hendry	fall 98 - spring 99	8	6	1.3	Sep-98	16-Nov-99	16-Nov-99	0	2.04
7	Shiloh	Martin	spring 99	230	19 to 27	8.5-12.1	Oct-98 to Feb- 99	2-Feb-99	11-Feb-99	9	1.10
8	Pero	Martin	spring 99	40	7	5.8	Jan-99	30-Mar-99	23-Apr-99	n.a.	1.03
9	Thomas#3	St. Lucie	spring 99	60	10	6	Feb-99	12-Feb-99	27-Apr-99	n.a.	1.85
11	Silverstrand13-2	Collier	spring 99	10	6	1.7	Dec-98	22-Jan-99	25-Mar-99	63	1.31
13	Brown82(5E)	Collier	spring 99	12	6	2	Dec-98	22-Jan-99	5-Mar-99	42	5.81

Table 7. Pepper weevil (*Anthonomus eugeni* Cano) adult trap catch and corresponding field infestation levels based on 1998-99 pepper weevil monitoring data.

Trap catch (per week)	% Pepper fruit infested	Infestation rating
<0.1	<1%	Very low to low
0.1-1	1-10%	Moderate
>1	>10%	High

Table 8. Pepper weevil (*Anthonomus eugenii* Cano) adult trap catch after two weeks of trapping (Sept. 7-18, 1998), Homestead, Dade Co., Florida.

Replication	Yellow Panel trap	Bait Stick	Boll Weevil trap
1	2	1	1
2	0	0	0
3	2	1	0
4	4	0	0
5	2	0	0
Total	10	2	1
Mean	2	0.2	0.4

Table 9. Pepper weevils reared from black nightshade berries collected in different sites in south Florida, March – December, 1999.

County	Site	Habitat	Date (m/d)	Transect length (ft)	Nightshade plants		Berries	Pepper Weevils	% berries infested			
					No.	Vigor ^a						
Hendry	Red Star	Tomato field	4/1	n.a.	>1,000	4-5	1,412	1	0.07			
		Fallow tomato field	11/4	n.a.	>1,000	3-4	1,000	0	0			
			11/10	n.a.	>1,000	3-4	805	0	0			
			11/17	n.a.	>1,000	3-4	1,066	0	0			
	C&B	Fallow mint field		10/20	n.a.	n.a.	1-3	682	0	0		
				11/4	n.a.	n.a.	1-3	1,418	0	0		
				11/10	n.a.	n.a.	1-3	800	0	0		
				11/24	n.a.	n.a.	1-3	1,055	0	0		
			Seminole	Pepper field border		10/20	2,700	87	3-5	761	0	0
						11/4	n.a.	n.a.	3-5	1,110	0	0
	11/10	n.a.			n.a.	3-5	618	0	0			
	11/17	n.a.			n.a.	4-5	1,973	0	0			
			12/8	n.a.	n.a.	4-5	834	0	0			
Collier	Brown82	Citrus grove	4/1	n.a.	2	3	166	0	0			
		Pepper field	4/1	n.a.	1	5	684	26	3.80			
Palm Beach	Green Cay	Tree nursery	7/20	n.a.	31	1-3	693	3	0.43			
			11/19	1,500	69	4-5	1,600	0	0			
			Pepper field border	11/2	2,250	169	2-4	806	0	0		
			11/9	450	100	3-4	618	0	0			
			11/16	450	100	3-4	964	0	0			
			12/3	n.a.	n.a.	4-5	762	0	0			
Martin	Shiloh	Hammock borders	6/14	n.a.	n.a.	4-5	486	1	0.21			
			6/16	n.a.	n.a.	4-5	380	4	1.05			
			6/21	n.a.	n.a.	4-5	320	3	0.94			
			7/06	500	13	4-5	440	15	3.41			
			7/06	1,100	238	4-5	1,076	41	3.81			
			7/14	695	66	4-5	880	0	0			
			7/14	695	68	4-5	975	4	0.41			
			7/14	225	59	4-5	577	49	8.49			
			7/15	650	150	4-5	1,347	29	2.15			
			7/15	975	113	4-5	980	4	0.41			
			8/19	1,850	49	1-2	292	0	0			
			12/7	n.a.	n.a.	4-5	1,175	0	0			
				Windbreaks	6/01	n.a.	n.a.	4-5	1,107	37	3.34	
					6/01	n.a.	n.a.	4-5	1,202	20	1.66	
	6/01	n.a.	n.a.		4-5	776	50	6.44				

Table 9. Pepper weevils reared from blacknightshade berries collected in different sites in south Florida, March – December 1999

County	Site	Habitat	Date (m/d)	Transect length (ft)	Nightshade plants		Berries	Pepper Weevils	% berries infested
					No.	Vigor ^a			
			6/29	n.a.	n.a.	4-5	300	6	2.00
			7/06	n.a.	n.a.	4-5	978	29	2.97
			7/08	4,000	206	4-5	1,196	36	3.01
			7/09	4,000	84	4-5	770	16	2.08
			7/09	4,000	127	4-5	552	20	3.62
			7/21	4,000	67	3-4	950	11	1.16
			7/22	1,243	38	3-4	765	16	2.09
			7/22	980	16	3-4	560	0	0
			7/27	4,000	62	3-4	764	8	1.05
			7/29	3,000	75	3-4	875	6	0.69
			8/11	4,000	802	1-2	682	5	0.73
			8/11	1,100	82	1-2	330	1	0.30
			8/16	8,000	134	1-3	164	0	0
			8/30	4,000	318	1-2	253	0	0
St. Lucie	Thomas	Pepper field border	3/30	n.a.	n.a.	3-4	476	1	0.21
			3/30	n.a.	n.a.	3-4	651	1	0.15
			4/02	n.a.	n.a.	3-4	100	0	0
			4/02	n.a.	n.a.	3-4	500	0	0
			4/27	n.a.	n.a.	3-4	263	0	0
			4/27	n.a.	n.a.	3-4	240	4	1.67
			5/14	n.a.	n.a.	3-4	1,178	7	0.59
			5/14	n.a.	n.a.	3-4	1,093	1	0.09
			5/21	n.a.	n.a.	3-4	682	5	0.73
			5/21	n.a.	n.a.	3-4	769	3	0.39
			5/25	n.a.	n.a.	3-4	787	1	0.13
			5/25	n.a.	n.a.	3-4	872	0	0
			7/23	n.a.	n.a.	1-2	462	9	1.95
			7/30	n.a.	n.a.	1-2	520	7	1.35
			10/21	n.a.	n.a.	3-4	1,508	0	0
			10/29	n.a.	n.a.	3-4	1,106	0	0
			11/5	n.a.	n.a.	3-4	1,000	0	0
			11/12	n.a.	n.a.	3-4	1,200	0	0
			11/19	n.a.	n.a.	3-4	1,065	0	0

^a vigor rating scale: 5 = high vigor, broad canopy, no pests or diseases, numerous blooms and berry clusters, clusters very large; 4 = moderate-high vigor, some pests and diseases, many blooms and berry clusters, clusters large; 3 = moderate vigor, pests and diseases common, fewer blooms and berry clusters, clusters small; 2 = moderate-low vigor, pests and diseases widespread, few blooms and berry clusters, clusters very small; 1 = low vigor, pests and diseases severe and affected all plants, no blooms or berry clusters

Table 10. Black Nightshade survey, fallow pepper farm, Shiloh, Jupiter, Florida, June 16-26, 1998

date	wind block	sugar break	cane cane	Bid. hght	Bid. hght	dist (ft)	total NS plants	NS plants per 100 ft	mean veg. tips	mean flower clusters	mean berry clusters	total PEW adults	mean NS vigor	% infested plants							
														sm	lfc	saw	lm	ap	fung	hw	
16-Jun	1 E		5			2405	8	0.33	11.1	0.5	0	0	2.1	100							
16-Jun	1 W		0			2736	44	1.61	15	1.7	0.1	3	3	11							
25-Jun	2 E		5	4.5	4	2.5	840	5	0.60	28	4.8	0	0	2.8	40	60	0	0	0	0	0
18-Jun	2 W		5			823	21	2.55	29	10.2	0	0	2.8	100	14	0	0	5	0		
17-Jun	3 E		5	4	3	2	2532	3	0.12	20.7	2	0	1	2.5	67	67	33	0	0	0	0
17-Jun	3 W		5	4.5	4	2	2503	18	0.72	13.5	2.5	0	0	2.7	61	22	11	0	0	0	0
26-Jun	12 W		5	5	4	2.5	240	17	7.08	71.2	31	7.1	0	3.4	12	100	0	0	0	6	
26-Jun	13 E		5	4.5	4	2.5	240	23	9.58	39.6	14.9	3.8	2	3.5	57	0	0	0	0	30	
24-Jun	26 E		5	5	4	2.5	600	0	0.00												
24-Jun	26 W		5	5	4	2.5	600	8	1.33	45.8	15.3	0	0	4.6	13	33	13	0	0	0	6
24-Jun	27 E		5	5	4	3	600	2	0.33	40	16.5	0	0	4.5	0	100	0	0	0	0	0
24-Jun	27 W		5	5	4	3	600	6	1.00	32.7	14.5	0	0	4.6	0	83	0	0	0	0	0
26-Jun	39 E		5	3.5	3	2	600	3	0.50	26.7	10	0	0	3.2	0	67	0	0	0	67	0
26-Jun	39 W		1	3.5	2	2	600	7	1.17	28.7	5	0	0	3.4	0	43	0	0	0	71	0
17-Jun	56 E		5	4.5	4	1.5	802	6	0.75	45	8.8	0.2	0	4	0	100	0	0	0	0	0
17-Jun	56 W		5	4.5	3.5	1.5	1044	7	0.67	44	8.7	0.1	0	3.8	0	86	0	0	0	0	0
17-Jun	57 E		5	3.5	3.5	1.5	708	0	0.00												
17-Jun	57 W		5	3.5	4	1.5	840	1	0.12	10	4	0	0	4.5	0	0	0	0	0	0	0
17-Jun	58 E		5	3.5	4.5	1.5	578	0	0.00												
17-Jun	58 W		5	3.5	4	1.5	746	0	0.00												
TOTAL							20637	179				6									
MEAN									1.4	31.3	9.4	0.7	0.4	3.5	28.8	55.4	4.1	0.0	0.4	12.4	0.6

sm=spider mites; lfc=leaf-rolling caterpillar, lm=leafminer; ap=aphids; fung=fungal disease; hw=horn worm

Bid.=Bidens alba

Table 11. Black Nightshade survey, fallow pepper farm, Shiloh, Jupiter, Florida, August 10-17, 1998

date	wind block break	sugar cane cane hght	Bid.		total NS plants	total NS plants	mean per 100 ft	mean veg. tips	mean flower clusters	mean berry clusters	total PEW adults	mean NS vigor	% infested plants							
			Bid. hght	Bid. dist (ft)									sm	lfc	saw	lm	ap	fung	hw	
10-Aug	1 W / N	0	2.5	3.5	2647	26	0.98	2.1	88	42	0	3	50	15	0	0	0	12	4	
10-Aug	1 E / S	5	7	2	1.5	2647	0	0.00												
11-Aug	2 W / N	5	7.5	4	4.5	2546	15	0.59	2.2	93	0	0	2.5	80	0	0	13	0	7	20
11-Aug	2 E / S	5	7.5	2	3.5	2513	0	0.00												
11-Aug	3 W / N	5	7	4	4.5	2414	0	0.00												
11-Aug	3 E / S	5	7	4	4.5	2462	0	0.00												
11-Aug	26 E / S	5	7	4	4	600	0	0.00												
11-Aug	26 W / S	5	7	5	6	600	0	0.00												
12-Aug	26 E / N	5	7	4	4.5	960	2	0.21	2.5	100	0	0	4.75	0	100	0	0	0	100	0
12-Aug	26 W / N	5	7	4	5	960	0	0.00												
11-Aug	27 W / S	5	7	4	4	600	1	0.17	1	0	0	0	2	0	0	0	0	0	0	100
11-Aug	27 E / S	5	7	4	4.5	600	0	0.00												
11-Aug	28 W / S	5	7	4	5.5	600	0	0.00												
11-Aug	28 E / S	5	7	4	4	600	0	0.00												
12-Aug	29 E / N	5	7	3.5	4.5	1704	3	0.18	2	67	0	0	3.2	33	100				33	100
12-Aug	29 W / S	0	2.5	4		2268	5	0.22	2.4	100	40	0	3.8	0	80	0	0	0	100	0
17-Aug	55 E / N	5	7	3.5	3	1032	0	0.00												
17-Aug	55 W / S					1200	1	0.08	2	100	100	0	4	0	0	0	0	0	100	0
17-Aug	56 W / N	5	7	3.5	3	1058	0	0.00												
17-Aug	56 E / S	5	7	3.5	3	960	1	0.10	2	100	0	0	3.5	0	100	0	0	0	100	100
17-Aug	57 W / N	5	7	3.5	2.5	907	0	0.00												
17-Aug	57 E / S	5	7	3	2.5	734	0	0.00												
17-Aug	58 W / N	5	7	4	3.5	732	2	0.27	1.5	100	100	0	3.5	0	0	0	0	0	50	100
17-Aug	58 E / S	5	7	4	3.5	562	0	0.00												
TOTAL					31906	56						0								
MEAN		4.6	7.0	3.6	3.9	1329.4	2.3	0.1	2.0	83.1	31.3	0.0	3.4	18.1	43.9	0.0	1.6	0.0	55.8	47.1

sm=spider mites; lfc=leaf-rolling caterpillar, lm=leafminer; ap=aphids; fung=fungal disease; hw=horn worm

Bid=Bidens alba

Table 12. Augmentative release trials with *Coleomegilla maculata*.

Trial	Release date	Site	Plant	Amount released
1	4/15/98	Shiloh, bl. 44, SE corner	pepper	“several hundred” larvae + adults
2	6/16/98	Kitchen Creek, NE ditch bank	<i>Wedelia trilobata</i>	total of 500 larvae and adults
3	8/31/98	Shiloh, bl. 58, E edge	<i>Bidens</i> sp.	100 larvae and 300 adults

Table 13. Changes in insecticide usage in 1997-98 compared to previous year based on interviews of 7 pepper growers representing a total of 2,403 acres.

Compound	Category	Fall 1997-98	Spring 1997-98
Azadarachtin	Botanical	decrease	decrease
<i>Bacillus thuringiensis</i>	Biological	decrease	decrease
Methomyl	Carbamate	decrease	decrease
Sulfur	Mineral	decrease	decrease
Chlorpyrifos	O-P	decrease	decrease ^a
Permethrin	Pyrethroid	decrease	decrease ^a
Pyrethrins	Pyrethroid	decrease	decrease ^a
Rotenone	Botanical	decrease	decrease ^a
Oxamyl	Carbamate	decrease	increase
Carbaryl	Carbamate	decrease ^a	decrease ^a
Cryolite	Mineral	decrease ^a	decrease ^a
Diazinon	O-P	decrease ^a	decrease ^a
NPV Virus	Biological	decrease ^a	decrease ^a
Oxydemeton-methyl	O-P	decrease ^a	decrease ^a
Acephate	O-P	increase	decrease ^a
Azinphos-Methyl	O-P	increase	decrease ^a
Endosulfan	O-C	increase	decrease ^a
Soap	Botanical	increase	decrease ^a
Cyromazine	IGR	increase	increase
Dicofol	O-C	increase	increase
Imidacloprid	Nicotinoid	increase	increase
Neem (oil)	Botanical	increase	increase
Cyfluthrin	Pyrethroid	increase ^b	increase
Spinosad	Biological	increase ^c	increase ^c
Crop Oil	Botanical	increase ^d	increase ^d
Dimethoate	O-P	increase ^d	increase ^d
Esfenvalerate	O-C	increase ^d	increase ^d
Garlic/Sugar/Capsaicin	Botanical	increase ^d	increase ^d

^a not used in this season

^b less than 5%

^c new product

^d not used in 1996-97