Progress report to the BC Cranberry Research Commission 2010

Project Title: Development of effective management strategies for perennial weeds, fireworm, weevil, girdler and tipworm.

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Objectives:

1. Evaluate efficacy of reduced-risk insecticides applied through chemigation for control of fireworm, tipworm and blackvine weevil.

2. Evaluate chemical control strategies for priority weed species.

3. Assess field applications of *Metarhizium anisopliae* (strain F52) for blackvine weevil and potential girdler control (pending site locations)

4. Evaluate spray and/or environmental conditions that results in Spirotetramat causing foliar phytotoxicity to cranberries.

5. Evaluate timing of insecticides for tipworm control.

Results:

Evaluate efficacy of reduced-risk insecticides applied through chemigation for control of fireworm and blackvine weevil: In summer of 2010, multiple grower sites received one or two field applications of Avaunt or Assail in combination with other insecticides. Sites had low weevil counts and results were not too consistent between sites, but the combination of Assail and Avaunt was the most consistently effective treatment (Table 1). Our results from lab feeding studies indicated that Avaunt suppressed feeding and it was only effective for 6 days (Table 2).

Our earlier research suggested that novaluron, dpx 2y45, HGW 86 and spinetoram had reasonable activity against BHFW when applied through a chemigation system. These results, however, were confounded by both the lack of good sites and grower overspray. Our research in 2010 compared the efficacy of chemigated applied Spinetoram (two rates), Alticor, HGW 86, Novaluron, MBI-205, Assail and Intrepid for BHFW control. Seven different trials were conducted on fireworm in growers' fields. Treatments were applied using simulated chemigation to six replicated plots, 10' x 10'. Efficacy was based on percentage of live larvae several days post-treatment. Dpx 2y45, HGW 86 and Spinetoram provided adequate efficacy for first generation fireworm, while Novaluron and MBI-205 did not (Tables 3 & 4). Additional studies on later generations confirmed consistent efficacy of HGW 86, Alticor and both rates of Spinetoram (Tables 5-9). We also obtained efficacy with Intrepid and Assail. Adding Bravo fungicide as a sticker did not improve efficacy of Intrepid (Table 6), whereas applying Intrepid in split treatments reduced efficacy (Table 9).

Table 1. BVW adulticide field ovicide assessment 2010		
Treatment	Adult weevils per 25 sweep (1st and 2nd sweeps combined)	
Name	Johnson Farm	Waara Farm
Avaunt 6 oz/a twice 14 days apart	1	2
Assail 6.9 oz/a twice 14 days apart	0.3	0.3
Assail 6.9 oz/a + Avaunt twice 6 oz/a 14 days apart	0	0
Avaunt 6 oz/a twice + Novaluron 12 oz/ac three times14 days	0.5	0.3
Assail 6.9 oz/a twice + Novaluron 12 oz/ac three times14 days apart	1.3	0
Control	3.8	2
LSD (P=.05)	2.6	1.6
Treatment Prob(F)	0.07	0.02

Table 2. Feed trials lab of field-aged residue – BVW adulticide	
Name	% Alive 23 DAT
Avaunt 6 oz/a twice 14 days apart	15
Assail 6.9 oz/a twice 14 days apart	75
Avaunt 6 oz/a + Assail 6.9 oz/a twice 14 days apart	20
Avaunt 6 oz/ 8 DAT	90
Novaluron 12 oz/ac twice14 days apart	95
Control	85
LSD (P=.05)	37
Treatment Prob(F)	.006

Table 3. First generation blackheaded fireworm control with chemigation in 2010 (Beckerle Farm)								
	3 DAT				7 DAT			
Treatment	1-2 inst	3-4 inst	5-6 inst	Total Alive	1-2 inst	3-4 inst	5-6 inst	Total Alive
Control	0.8	1	0	3	1.3	2	0.5	3.8
Diazinon AG600 (chemigation) - 2 qt/a	0	0.3	0.8	0.3	0	0	0	0
Spinetoram (chemigation) - 3.25 qt/a	0.3	0.8	1.3	1	0	0	0	0
Spinetoram (chemigation) – 6.5 oz/a	0	0.5	0.5	0.5	0	0	0	0
Dpx 2y45 (dpx 2y45) - 0.066 lb ai/a	0	1.5	1	1.5	0	0	0	0
HGW 86 (HGW 86) (chemigation) 10.1 fl oz /a	0.5	0.5	1.3	1	0.3	0	0	0.3
Novaluron (chemigation) 12 oz/a	0.5	1	0.5	3.3	0	0.3	1	1.3
MBI-205 3% @ 100 gpa	0.5	0.8	0.5	1.5	0.5	1	1.3	2.8
LSD (P=.05)	0.81	1.33	1.29	1.53	1.17	1.15	0.65	1.77
Treatment Prob(F)	0.3889	0.643	0.4784	0.0037	0.3233	0.0124	0.0012	0.0006

Table 4. First generation blackheaded fireworm control with chemigation in 2010 (McPhail Farm)								
	3 DAT				7 DAT			
Treatment	1-2 inst	3-4 inst	5-6 inst	Total Alive	1-2 inst	3-4 inst	5-6 inst	Total Alive
Control	0.5	2.5	4	7	0.5	0.8	1.5	2.8
Diazinon AG600 (chemigation) - 2 qt/a	0	0	0	0	0	0	0	0
Spinetoram (chemigation) - 3.25 oz/a	0	0.5	0	0.5	0	0.5	0	0.5
Spinetoram (chemigation) – 6.5 oz/a	0	0.3	0	0.3	0	0	0	0
Dpx 2y45 - 0.066 lb ai/a	0	1.5	0	1.5	0.3	0.3	0	0.5
HGW 86 (chemigation) 10.1 fl oz /a	1	1.3	0	2.3	0.8	0	0	0.8
Novaluron (chemigation) 12 oz/a	0.3	3.3	3.5	7	0.3	0.8	1.5	2.5
MBI-205 3% @ 100 gpa	0.8	3.5	3.3	7.5	0.8	0.8	2.3	3.8
LSD (P=.05)	0.96	2.12	1.63	3.69	0.93	1	1.34	1.43
Treatment Prob(F)	0.2283	0.0115	0.0001	0.0002	0.4401	0.412	0.0048	0.0001

Table 5. Second generation blackheaded fireworm control with chemigation in 2010 (Pierson Farm- study one)								
	3 DAT				7 DAT			
Treatment	1-2 inst	3-4 inst	5-6 inst	Total Alive	1-2 inst	3-4 inst	5-6 inst	Total Alive
Control	0.5	0	3.8	4.3	1	0	0.8	1.8
Assail 6.9 oz/a	0.3	0.3	1.3	1.8	0	0.3	0.3	0.5
Spinetoram (chemigation) – 6.5 oz/a	0	0	0	0	0	0.3	0	0.3
Dpx 2y45 - 0.066 lb ai/a	0	0.3	0	0.3	0	0.3	0	0.3
HGW 86 (chemigation) 10.1 fl oz /a	0	0	0	0	0.3	0	0.5	0.8
LSD (P=.05)	0.8	0.51	2.04	2.37	0.95	0.42	0.83	0.53
Treatment Prob(F)	0.5767	0.6114	0.0067	0.0087	0.1656	0.4449	0.2754	0.0002

Table 6. Second generation blackheaded fireworm control with chemigation in 2010 (Pierson Farm- study two)				
	3 DAT			
Treatment	1-2 inst	3-4 inst	5-6 inst	Total Alive
CONTROL	17	2.8	0	19.8
Spinetoram (chemigation) – 6.5 oz/a	2.8	0	0	2.8
Intrepid 16 oz/a	4	0	0	4
Intrepid 16 oz/a + Bravo	2.8	0	0	2.8
LSD (P=.05)	3.72	3.88	0	4.01
Treatment Prob(F)	0.0001	0.3382	1	0.0001

Table 7. Third generation blackheaded fireworm control with chemigation in 2010 (Evergreen Farms study one)												
	2 DAT				6 DAT				10 DAT			
Treatment	1-2 inst	3-4 inst	5-6 inst	Total Alive	1-2 inst	3-4 inst	5-6 inst	Total Alive	1-2 inst	3-4 inst	5-6 inst	Total Alive
CONTROL	6.3	7.8	8.8	22.8	8.8	9.3	19	37	5	6	12.3	23.3
Spinetoram – 6.5 oz/a	0.5	0.5	0.3	1.3	0	0.3	0	0.3	0	0	0	0
Spinetoram 3.25 qt/a	4	4.5	0.8	9.3	0.3	0.5	0.5	1.3	0.3	0	0.3	0.5
Intrepid 16 oz/a	4.5	3.5	0.5	8.5	0.3	0	0.5	0.8	0	0	0	0
LSD (P=.05)	7.2	5.28	2.6	9.5	3.5	4.5	7.2	13.4	0.6	3.2	3.4	3.9
Treatment Prob(F)	0.38	0.07	.0001	.004	.0007	.003	.0005	.0003	.0001	.005	.0001	.0001

Table 8. Third generation blackheaded fireworm control with chemigation in 2010 (Evergreen Farms study two).												
	2 DAT				4 DAT				7 DAT			
Treatment	1-2 inst	3-4 inst	5-6 inst	Total Alive	1-2 inst	3-4 inst	5-6 inst	Total Alive	1-2 inst	3-4 inst	5-6 inst	Total Alive
Control	3	5	19	0.5	8	9.8	13.8	31.5	1.8	3.5	4.3	9.5
Spinetoram – 6.5 oz/a	2.8	5.8	0.3	10	0.5	0	0.3	0.8	0.3	0	0	0.3
Spinetoram 3.25 qt/a	2.3	2	0.5	10.3	0.3	1.5	0	1.8	0	0.3	0	0.3
Intrepid 16 oz/a	2.8	6.8	5.3	7	2.5	6	1	9.5	0	0	0	0
LSD (P=.05)	4.9	6.5	7.2	5.2	3.2	2.7	1.8	6.0	0.7	1.4	2.6	3.9
Treatment Prob(F)	0.9	0.43	.0007	.007	.001	.0001	.0001	.0001	.001	.0008	.01	0.001

Table 9. Third generation blackheaded fireworm control with chemigation in 2010 (Evergreen Farms study three).	
	5 DAT

Treatment	1-2 inst	3-4 inst	5-6 inst	Total Alive
Control	3.5	3.3	6.5	13.3
Spinetoram (chemigation) – 6.5 oz/a with washoff	0	0.5	0	0.5
Spinetoram twice (chemigation) – 3.25 oz/a w/ no washoff + 3.25 oz/a in 4 hrs with washoff	0	0	0	0
Intrepid twice (chemigation) 8 oz/a w no washoff _ 8 oz/a in 4 hrs with washoff	1	3.3	0.5	4.8
LSD (P=.05)	2.12	3.26	3.18	7.22
Treatment Prob(F)	0.014	0.0927	0.0029	0.0084

*Evaluate chemical control strategies for priority weed species: G*eneral efficacy and crop safety of fomesafen, MAT 28, indaziflam, and flumioxazin was assessed. Comparison were made to quinclorac and rimsulfuron, Callisto and an untreated control. Treatments were applied throughout the early growing season. All herbicides were applied with a surfactant and ~ 40 gpa spray volume. Fomesafen, MAT 28, indaziflam, and flumioxazin all resulted in too much crop damage to considered useful herbicides for cranberries (Tables 10-15). Comparisons of different formulations of quinclorac (75% DF vs. 4 lb/gallon liquid) and rates of rimsulfuron for control of several of the problematic weed species in cranberry beds in the PNW were also made. (Tables 12, 13, 16-23). Both formulations of quinclorac and rimsulfuron were efficacious for numerous weed species on cranberry beds. There were no major effects of quinclorac or rimsulfuron on yield in the year of treatment or in the year following treatment. Rimsulfuron appear to reduce flower bud set.

Table 10. Effect of indaziflam and Mat 28 on Pilgrim vines treated 6/2/10 during early hook.

Treatment	Phytotoxicity rating 1=none, 5=dead	estimated crop 1=none,5=200 bbl/a
	8/17/2010	
indaziflam 1.1 oz ai/a	3.9	1
Mat 28 1 oz ai/a	3.2	1.3
Control	1	3.3
LSD (P=.05)	0.85	0.89
Treatment Prob(F)	0.0015	0.0036

Table 11. Effect of fomesafen, indaziflam, Mat 28, and Callisto + Quinclorac on Pilgrim vines treated 4/30/10 during early roughneck.

	% control yellow weed

Treatment	6/7/2010	8/4/2010
Name	2	3
Control	0	0
(fomesafen) 0.5 pt/a	63	8
(fomesafen) 0.25 pt/a	50	8
Mat 28 1 oz ai/a	57	33
(indaziflam) 1.1 ai/a	93	77
Callisto 8 oz/a + Quinclorac 16 oz/a	50	25
LSD (P=.05)	22.01	31.09
Treatment Prob(F)	0.0001	0.0044

Table 12. Effect of indaziflam, Mat 28, and Quinclorac on yellow weed treated in 2010.

	% yellow weed control	
Treatment	8-Apr	19-Aug
Control	0	0
CS AA10717 (indaziflam) 1 oz ai.a 6/3	63.3	94.3
Mat 28 1 oz ai/a 6/3	50	65
Quinclorac 0.75 lb ai/a 6/3 & 6/28	41.7	48.3
Quinclorac 1.5 lb ai/a 6/3	55	56.7
LSD (P=.05)	33.97	23.74
Treatment Prob(F)	0.0185	0.0002

Table 13. Effect of fomesafen, indaziflam, and Mat 28 applied at late dormant (4/1) and early rough neck (6/3) on Bergmans.

	17-Aug		
Treatment	phytotoxicity rating 1=none, 5=dead	estimated crop 1=none, 5= 200 bbl/a	bbl/ac
Reflex 1 pt/a 4/1	1.2	2.3	
indaziflam 1.1 oz/ai/a 4/1	1.3	2.5	
Quinclorac 16 oz/a 4/1	1.2	2.3	41
MAT 28 1 oz ai/a 4/1	1.8	1.2	11
Reflex 1 pt/a 6/3	1.2	2.8	
indaziflam 1.1 oz/ai/a 6/3	2.8	1	
Quinclorac 16 oz/a 6/3	1	3.3	66
MAT 28 1 oz ai/a 6/3	2.8	1	12
control	1	3	47
LSD (P=.05)	0.5	0.6	21
Treatment Prob(F)	0.0001	0.0001	0.0012

Table 14. Effect of indaziflam and Mat 28 on Pilgrims vine treated 6/3/10 during early roughneck.

	17-Aug	
Treatment	phytotoxicity rating	estimated crop

	1=none, 5=dead	1=none, 5= 200 bbl/a
indaziflam 1.1 oz ai/a 6/3	3.9	1
Mat 28 1 oz/a 6/3	3.2	1.3
Control WHITE	1	3.3
LSD (P=.05)	0.85	0.89
Treatment Prob(F)	0.0015	0.0036

Table 15. Effect of indaziflam rate on Pilgrims vine treated 4/30/10 during bloom.

		17-Aug	
		phytotoxicty rating 1=none, 5=dead	estimated crop 1=none, 5= 200 bbl/a
Treatment	Rate (oz ai/a)		
Control	0	1	3
indaziflam	0.25	2	1.8
indaziflam	0.5	3.3	1.5
Indaziflam	0.75	4	1.1
Indaziflam	1.1	4	1
LSD (P=.05)		1.6	0.98
Treatment Prob(F)		0.011	0.0106

Table 16. Efficacy of herbicides for control of yellow weed on cranberry beds in 2010.

Treatment	% control yellow weed 8/19/10
Control	0
Quinclorac 0.75 lb ai/a 5/27 & 6/28	48.3
Quinclorac 1.5 lb ai/a 5/27	56.7
LSD (P=.05)	23.74
Treatment Prob(F)	0.0002

Table 17. Effect of Quinclorac formulations and timings on yellow weed control and cranberry yield in 2010.

Treatment	% control yellow weed 8/19/10	Yield (bbl/ac)
Quinclorac DF 0.75 lb ai/a 6/7 & 6/20	72.5	81.5
Quinclorac EC0.75 lb ai/a 6/7 & 6/20	65	63.4
Quinclorac DF 0.75 lb ai/a 6/7 & 7/8	60	90.6
Quinclorac EC 0.75 lb ai/a 6/7 & 7/8	60	95.1
LSD (P=.05)	42.3	25.25
Treatment Prob(F)	0.0342	0.1296

Table 18. Effect of herbicides sprayed in 2009 on control of yellow weed and yield in cranberry beds in 2009 and 2010.

	% control yellow weed		Yield (bbl/ac)	
Treatment	7/14/2009	8/19/2010	2009	2010

Control	33	0	39	38
Rimsulfuron 4 oz/a 2009	43	53	89	49
Quinclorac & Callisto 8 oz/a each 2009	47	100	89	87
Rimsulfuron2 oz/ac + Quinclorac & Callisto 8 oz/a each 2009	43	97	13	48
LSD (P=.05)	38	48	63	23
Treatment Prob(F)	0.839	0.007	0.062	0.004

Table 19. Efficacy of herbicides for control on assorted weeds in cranberry beds in 2010.

	% control 8/18/10					
Treatment	Yellow weed	Lotus	Fireweed	Marsh St. John's Wort	Annual Bluegrass	Sourdock
Control	0	0	0	0	0	0
Quinclorac 75DF 0.75 lb a/a 4/30 & 6/7	98.3	100	33.3	93.3	90	90
Quinclorac 4L 0.75 lb a/a 4/30 & 6/7	98.3	100	81.7	50	46.7	21.7
Rimsulfuron 4 oz/a 4/30 & 6/7	99.3	99.3	96.7	56.3	96.3	85
Quinclorac 75DF 1.5 lb a/a 4/30	86.7	100	100	16.7	18.3	16.7
Quinclorac 75DF 1.5 lb a/a 6/30	60	73.3	83.3	37.5	16.7	66.7
LSD (P=.05)	10.97	34.4	49.85	43.45	36.33	41.18
Treatment Prob(F)	0.0001	0.0004	0.0063	0.0116	0.0005	0.0026

Table 20. Effect of herbicides on yellow weed, flower bud set and yield of cranberry beds in 2010

Treatment	% yellow weed control 8/19/10	Rating for flower bud set for 2011 (1=none, 5=100%)	Yield (bbl/ac)
Control	0	3.7	218
Quinclorac 75DF 16 oz/a 5/11 & 6/7	76.7	3.7	178
Quinclorac 4L 16 oz/a 5/11 & 6/7	75	4	228
Rimsulfuron4 oz/a 5/11 & 6/7	91.7	2.8	65
LSD (P=.05)	9.27	0.9	134
Treatment Prob(F)	0.0001	0.0814	0.0817

Table 21. Effect of herbicides on cranberry phytotoxicity and yield in 2010.

Treatment	Crop phytotoxicity rating (1=none,5=dead) 8/17/10	Yield (bbl/ac)
Control	1	46.8

Quinclorac 8 oz/a 4/1	1.2	40.8
Mat 28 1 oz a/a 4/1	1.8	10.6
Quinclorac 8 oz/a 6/3	1	66.4
Mat 28 1 oz ai/a 6/3	2.8	12.1
LSD (P=.05)	0.53	21.21
Treatment Prob(F)	0.0001	0.0012

Table 22. Effect of Rimsulfuron and Quinclorac timing on yellow weed control and cranberry yield in 2010.

Treatment	Yellow weed % control 8/19/10	Yield (bbl/ac)
Control	0	70.9
Rimsulfuron 2 oz/ac - 6/3 & 6/23	0	70.9
Rimsulfuron 2 oz/ac - 6/3 & 7/23	0	68.4
Quinclorac 8 oz/a - 6/3 & 6/26	88.8	93.5
Quinclorac 8 oz/a - 6/3 & 7/23	95.5	68.2
LSD (P=.05)	4.98	41.24
Treatment Prob(F)	0.0001	0.6386

Table 23. Efficacy of herbicides for control of marsh arrowgrass on cranberry beds in 2010.

	Marsh arrowgrass % control 8/20/10	Crop phytotoxicity rating (1=none,5=dead) 8/20/10
Control	0	1
Rimsulfuron2oz/a twice	20	1
Rimsulfuron4 oz/ac twice	60	1
Quinclorac 1.35 lb/a twice	5	1.5
2,4 d-G 20 lbs twice	5	1
LSD (P=.05)	51.26	0.47
Treatment Prob(F)	0.0256	0.2394

Assess Metarhizium anisopliae (strain F52) for blackvine weevil and girdler control. No data was collected, as the registrant wasn't able to supply product for research.

Evaluate spray and/or environmental conditions that result in Spirotetramat causing foliar phytotoxicity. Spirotetramat was applied at low and high volume applications on Pilgrim vines at different dates in mid June to early July based on the weather conditions. The goal was to assess potential phytotoxicity under different extremes in weather. In 2010 a new formulation was provided by the registrant. Unlike the previous formulation, we did not obtain phytotoxicity in vine under any of the application conditions (table 24).

Table 24. Effect of weather condition during application on the crop phytotoxicity of Spirotetramat applied to Pilgrim during bloom.

date	spray volume (gpa)	temp (f)	solar radiation (w/m2)	time	phytotoxicity rating 1=none, 5=dead)	Yield (bbl/ac)	fruit size (g/berry)
22-Jun	70	64	540	3:00 PM	1	192.5	1.1
22-Jun	380	64	540	3:00 PM	1	159.3	1.1
7-Jul	70	88	934	noon	1	189	1.2
7-Jul	380	88	934	noon	1	200.7	1.2
18-Jun	70	60	563	4:00 PM	1	155.2	1.1
18-Jun	380	60	563	4:00 PM	1	173.3	1.2
7-Jul	70	52	0	1:00 AM	1	200.9	1.2
7-Jul	380	52	0	1:00 AM	1	175.9	1.1
Control					1	186.9	1.1
LSD (P=.05)					0	47	0.14
Treatment Prob(F)					1	0.4252	0.9202

Evaluate timing of insecticides for tipworm control. Spirotetramat, Assail, Belay and spinetoram were applied over several treatment timings. Plots were assessed for damage to vines and tipworm larvae and pupae. Assail, spinetoram and Belay all suppressed the early populations of tipworm, but failed to suppress mid-season population (Table 25). Assail was the least effective of the three insecticides. Spirotetramat was very effective in controlling tipworm. Two early applications (5/18 and 6/1) controlled tipworm all season. Similarly one application on 6/30 controlled tipworm for the remainder of the summer. The treatments with least amount of crop damage, based on # of cupped tips, % dead tips and % uprights setting a fruit bud were two early spirotetramat sprays, spirotetramat applied only on 6/30, or Belay applied three times (Table 26) .

Table 25. Effect of Spirotetramat, Assail, Spinetoram and Belay on Tipworm control on McFarlin cranberries in 2010.													
	2-Jun	10-Jun			23-Jun			8-Jul			21-Jul		
	# of larvae (L), pupae (P) and total (Tot) tipworm found in 25 random uprights												
LSD (P=.05)	L	L	P	Tot	L	P	Tot	L	P	Tot	L	P	Tot
control	8.3	3.8	1.3	5	2.3	2.3	4.5	5.8	3	8.8	3.8	0.3	4
Spirotetramat 16 oz/ac 5/18 & 6/1	0	0.3	0.3	0.5	0	0	0	0	0	0	0	0	0
Assail 6.9 oz/ac 5/18, 6/1 & 6/30	2	1	1	2	5.3	1.5	6.8	3.8	1.5	5.3	0.8	0.3	1
Spinetoram 6.5 oz/ac 5/18, 6/1 & 6/30	1.5	0	0	0	4.3	0.3	4.5	2.3	0.5	2.8	1.3	0	1.3
Belay 0.067 lb ai/a 5/18, 6/1 & 6/30	0.3	0.3	0	0.3	5.8	0.3	6	0.3	1	1.3	0	0	0
Spirotetramat 16 oz/ac 6/30								0	1	1	0	0	0
LSD (P=.05)	3.4	2.2	1.4	2.5	4.4	2.0	5.0	2.6	2.1	3.6	2.4	0.4	2.3
Treatment Prob(F)	0.0006	0.014	0.24	0.004	0.08	0.11	0.08	0.0008	0.11	0.0006	0.031	0.564	0.01

Table 26. Effect of Spirotetramat, Assail, Spinetoram and Belay on the damaging effects of tipworm on McFarlin cranberries in 2010.										
							% upright			
	#cupped tip/ 25 uprights						dead tip	branching	fruit buds	
	2-Jun	10-Jun	23-Jun	8-Jul	21-Jul	16-Aug	16-Aug	16-Aug	10-Sep	bbl/ac
control	5.3	5.3	8	8.3	4.5	14.3	36	15.2	17.8	88
Spirotetramat 16 oz/ac 5/18 & 6/1	1.5	2	1	1.3	0	5.5	0	1.2	29.8	65
Assail 6.9 oz/ac 5/18, 6/1 & 6/30	3.5	3.3	8	5	0.8	12	21.2	8		75
Spinetoram 6.5 oz/ac 5/18, 6/1 & 6/30	2.3	1	5	4.5	1.3	9	15.2	6		76
Belay 0.067 lb ai/a 5/18, 6/1 & 6/30	1.3	2	4.3	3.5	0.5	4.3	5.2	3.2		78
Spirotetramat 16 oz/ac 6/30				4	0	4.8	1.2	0	20.8	81
LSD (P=.05)	3.4	2.3	4.1	2.4	1.2	4.3	13.08	6.16	4.1	37
Treatment Prob(F)	0.1336	0.014	0.0123	0.0003	0.0001	0.0003	0.0001	0.0007	0.0002	0.8