Cranberry Development Plan S0002 Year 6 #02 -11 Effective Control of Insects & Weeds

DEVELOPMENT OF EFFECTIVE CONTROLS FOR TIPWORM, WEEVIL, FIREWORM, YELLOW LOOSESTRIFE, SHEEP SORREL AND BUTTERCUP

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Project Title: Development of effective controls for tipworm, weevil, fireworm, yellow loosestrife, sheep sorrel and buttercup.

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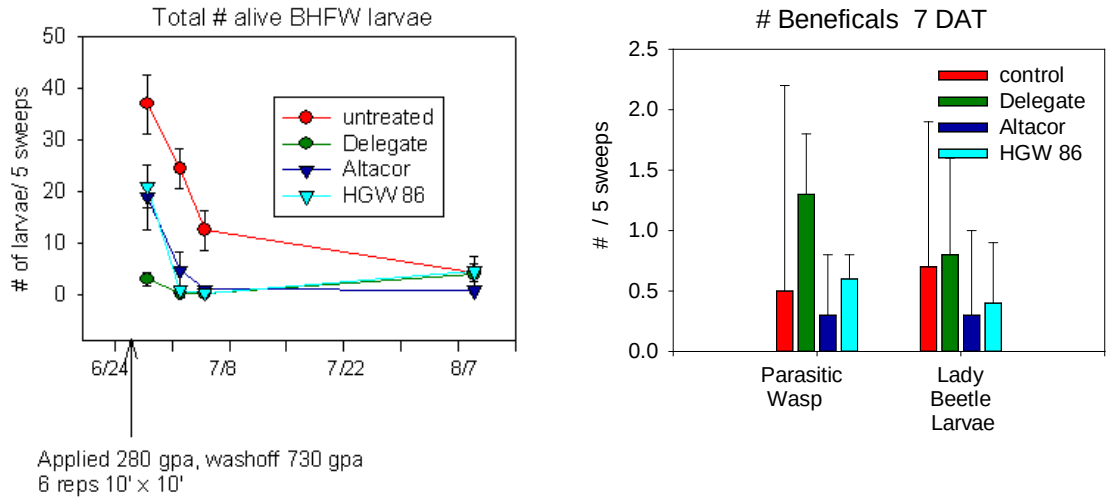
Objectives:

1. Evaluate efficacy of reduced-risk insecticides applied through chemigation for control of fireworm.
2. Assess field applications of *Metarhizium anisopliae* (strain F52) for blackvine weevil.
3. Evaluate application timing and frequencies of Movento for tipworm control and relate those results to action threshold and subsequent flower bud set and yield.
4. Evaluate chemical control strategies for priority weed species (yellow loosestrife, sheep sorrel and buttercup).

Results:

1) Evaluate efficacy of reduced-risk insecticides applied through chemigation for control of fireworm.

Small-scale trials: Second generation fireworm were chemigated with Delegate, Altacor and HGW 86 in the early instar stage. Efficacy and beneficial insects were monitored across plots over time (Figure 1). There was no substantial difference between treatments in efficacy between chemistries, but Delegate killed more quickly than either Altacor or HGW (cyazypyr). There was no chemical treatment effect on the number of parasitic wasp or lady beetle larvae on the plots following treatment. In another study (unreplicated), Delegate, Altacor and HGW 86 were chemigated through a single sprinkler using a small pump. The beds had a serious outbreak of fireworm at the time of application. There was no substantial difference between treatments in short or long-term efficacy between chemistries (Figures 2a & 2b).



Figures 1a & 1b. Effect of reduced-risked insecticides applied with chemigation on control of second generation fireworm and beneficial insects.

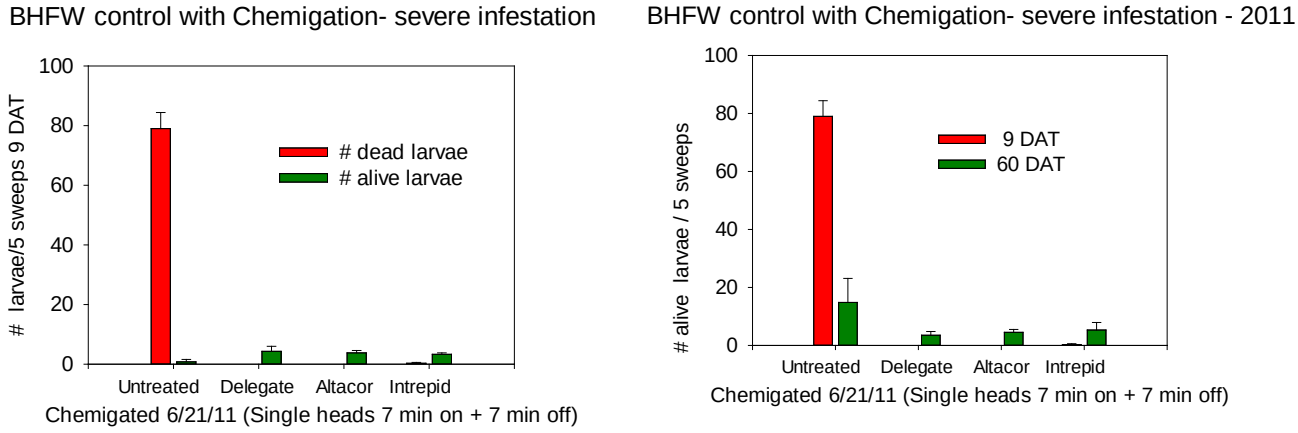


Figure 2a & 2b. Effect of reduced-risked insecticides applied with chemigation on control of second generation fireworm.

Whole farm trials: Whole beds and/or whole farms were treated with reduced-risk insecticides applied through growers' chemigation systems (5 farms). These beds/farms were paired with traditional control beds/farms (3 farms) (Table 1). Some of the reduced-risk farms required a second treatment to maintain low levels of fireworm; others didn't (Table 1). There was no real difference in peak trap counts between reduced-risk treated and conventionally treated farms (Table 1 & Figure 3). Comparative adjacent beds were monitored mid-season for percentage of fireworm -infested fruit (Figure 4). There was no consistent difference between conventional and reduced-risk treated beds. In situations where there was a large percentage of infested fruit, the growers missed their timing for that treatment. Sweeping data indicated no treatment difference between fireworm larvae, but that conventionally treated beds had reduced beneficial insects compared to reduced-risk treated beds (Figure 5).

Table 1. Comparative effect of reduced-risked insecticides on control of second generation fireworm and beneficial insects.

Farm #	Treatment 1st generation	#larvae/5 sweeps Pre-spray	#larvae/5 sweeps post 1st spray	#larvae/5 sweeps post 2nd spray	Peak 2nd gen. trap counts
1 Chemigated	Delegate 3 oz/a + Delegate 6 oz/a	21	4 DAT= 29	0	52
2 Chemigated	Delegate 6 oz/a	3	4 DAT =1	No spray	56
3 Chemigated	Delegate 3.25 oz/a Delegate 6 oz/a	31	7 DAT =31	14	65
4 Chemigated	Delegate 6 oz/a + Intrepid 16 oz/a	26	4 DAT =39	8	85
5 Hand Brd. @ 8 gpa	Entrust 3 oz/a	18	6 DAT =1	No spray	97
6 Chemigated	Acephate 1 lb/a	-	-	-	85
7 Chemigated	Diazinon	-	-	-	65
8 Chemigated	Diazinon 3 pt/a	-	-	-	65

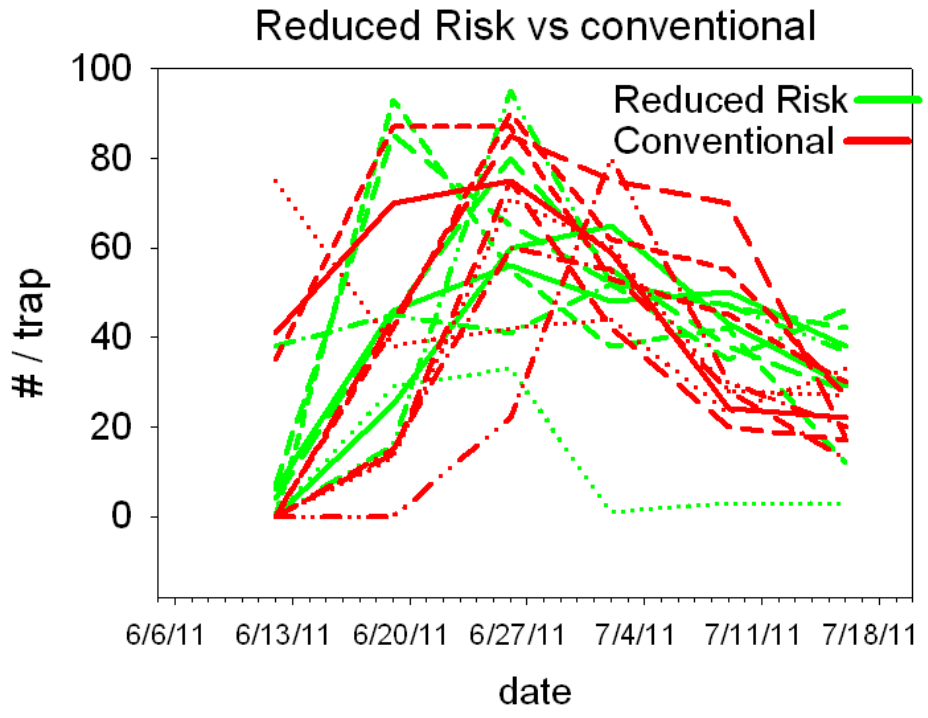


Figure 3. Fireworm trap count numbers of time for reduced-risk and conventionally treated beds in 2011.

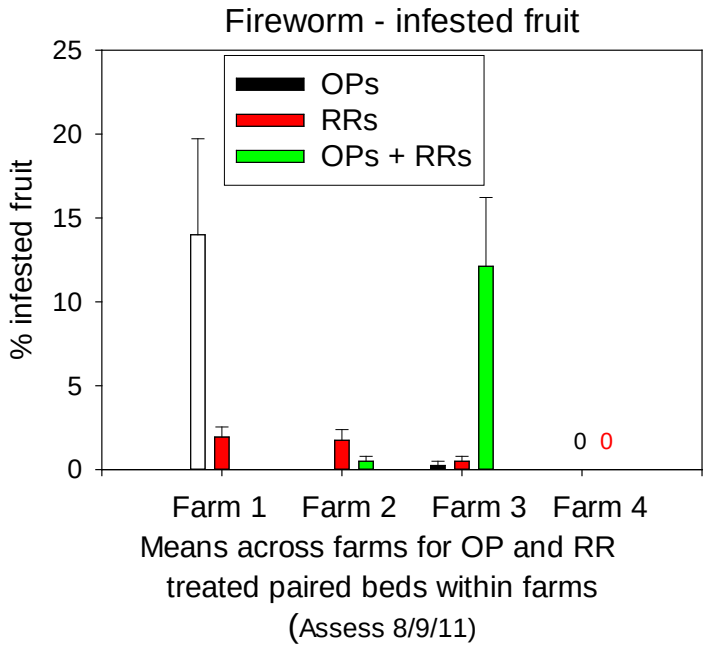


Figure 4. Percentage of fireworm-infested fruit on four paired beds (reduced-risk vs. conventionally OP treated or OP plus reduced-risk treated)

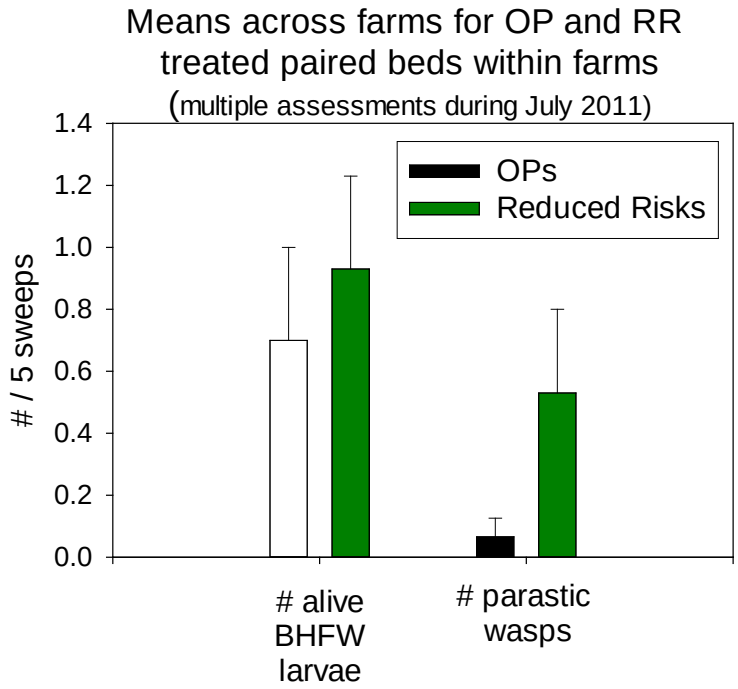


Figure 5. Number of fireworm larvae and parasitic wasps found across multiple sweepings of reduced-risk and OP treated cranberry farms in 2011.

2) Assess Metarhizium anisopliae (strain F52) for blackvine weevil. In April and mid-July 2011, beds with known weevil populations were identified and vines were lifted up to assure a known larvae population existed for every plot. *Metarhizium anisopliae* was applied over the top of vines to 4'x4' replicated plots at three sites with known weevil larvae density and watered in 1" of irrigation. April and July Plots were assessed for weevil larvae in late May and Late November respectively, by digging and efficacy determined via comparisons to untreated controls. MET F52 applied at either timing resulted in no reduction in weevil larvae count compared to untreated site (data not shown).

3) Evaluate timing of Movento for tipworm control. 2010 Movento-treated McFarlin plots were assessed in 2011 for percent fruiting upright and yield (Figure 6). Movento was applied to control tipworm in 2010, resulting in an increase in fruiting uprights and yield in 2011. Two farms were treated with numerous timings of Movento in 2011 in replicated plots. Although the tipworm populations were heavy at treatment time, there were low counts across all assessment times and there was no treatment effect on tipworm infestation or yield (data not shown).

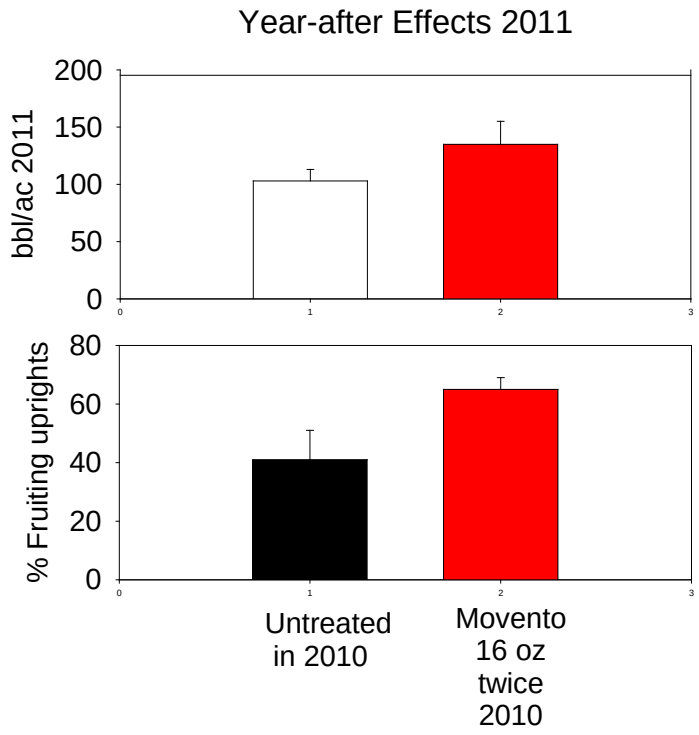


Figure 6. Effect of Movento treatment in 2010 on fruit uprights in 2011 and yield of a McFarlin cranberry bed in Grayland, Washington.

4) Evaluate chemical control strategies for priority weed species.

Lily: Treatments to suppress false lily of the valley with Callisto were not effective (Table 2). Other herbicides provided some temporary suppression of lily, but by the end of the season the treated plots were no different than the control plots (Table 3).

Sheep sorrel: New treatments to control sheep sorrel were not effective (Table 3) and data not shown).

Lotus and clover: Quinclorac provided some suppression of lotus and clover (Table 4). Chlorimuron controlled lotus and clover (Table 5).

Horsetail: Quinclorac usually suppressed horsetail, but data was not too consistent (Tables 4, 6, 7, 8). Rimsulfuron provided good suppression of horsetail (Tables 6, 7, 8).

Marsh St. Johns Wort: Mixed results were obtained for St Johns wort control with Callisto and Quinclorac (Tables 4 & 9). They ranged from none to 60% control. Best control (98%) of St John's wort was with two Callisto and chlorimuron applications in June (see Table 9).

Rushes: With the right timing, quinclorac, rimsulfuron and Callisto all controlled louse grass and spike rush (Table 9). If the timing was wrong, no control was achieved. Fall-applied quinclorac and rimsulfuron both suppressed arrowgrass, but not consistently and not for the whole season (Table 8).

Grasses: Quinclorac provided reasonable control of velvet grass (Table 6)

Yellow weed: Chlorimuron alone or combined with Callisto controlled yellow weed in the season of application (Table 5, 9, 11, 15, 16, 17). Rimsulfuron control of yellow weed ranged from none to good depending on the timings, rates and number of applications (Tables 6, 7, 8, 9, 11, 12, 13, 14, and 17). Control of yellow weed in the year of treatment with quinclorac was poor to moderate (Tables 7, 9, 10, 11, 13, 14, 16), but was good in the year following treatment (Tables 13, 14, 17). Quinclorac combined with chlorimuron or Callisto improved control in the year of treatments (Tables 9, 11, 15, 17).

Crop effects: Fomesafen and MAT 28 damaged cranberries (data not shown). Indaziflam applied early did not affect cranberries (Table 19). Quinclorac usually had no effect on the crop or vine (Tables 8, 10, 11, 13 18), but occasionally yield was partially suppressed (Tables 10, 18). Rimsulfuron usually had no effect on the crop (Tables 8, 11, 20) but yield was suppressed in one site in the year of treatment (Table 13). Chlorimuron effects on crop varied from none to moderate depending on timing and location (Tables 11, 18). The effect of the combination of Callisto plus chlorimuron was dependent on the timing. Applications during sensitive growth phase suppressed yield or had a temporary effect on upright color, but applications that missed that timing had no effect (Table 12, 18). Combinations of quinclorac and Callisto had no effect on the crop (Tale 10), while combinations of rimsulfuron, Callisto and quinclorac did suppress the crop (Table 12, 17).

Table 2 Control of False Lily of the Valley with Callisto in 2011.			
Treatment			Lily % coverage 7/7/11
Callisto + li700 5%	8	fl oz/a	56
Callisto + 1% vinegar	8	fl oz/a	70
Callisto	8	fl oz/a	93
Callisto	16	fl oz/a	71
Control			84
LSD (P=.05)			54
Treatment Prob(F)			NS
Applied 3/29/11. Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)			

Table 3 Efficacy of New Herbicide for False Lily of the Valley Control In 2010/2011					
			False lily of the valley		
			control rating 1-none 5-100%	% control	
Treatment			4/12/2010	7/7/2011	8/16/2010
Control			1 c	0 c	0 a
Reflex (fomesafen)	1	pt/a	5 a	47 b	30 a
CS AA10717 (indaziflam)	1.1	oz ai/a	2.7 b	53 b	7 a
Quinclorac	16	oz/a	1 c	60 b	0 a
Mat 28	1	oz ai/a	5 a	100 a	0 a
LSD (P=.05)			0.49	34	46
Treatment Prob(F)			0.0001	0.0019	0.5323
Applied 3/26/10 and 5/27/10 Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)					

Table 4. Effect of quinclorac and Callisto on various weeds in 2011.

	Lotus			White Clover			Sheep Sorrel % Control		Marsh St. John's Wort % Control		Horsetail	
	% Cover	% Control	% Cover	% Cover	% Control	% Cover	Cover	% Cover	% Control	%Cover	% Cover	% Cover
Treatment	6/15/11	7/7/11	9/1/11	6/15/11	7/7/11	9/1/11	6/15/11	7/7/11	7/7/11	9/1/11	6/15/11	9/1/11
Control	28 a	0 a	67 ab	30 a	0 b	52 a	20 a	0 b	0 b	15 b	48 a	58 a
Quinclorac + Callisto 4/29 & 7/6	22 a	45 a	35 b	0 b	100 a	3 b	20 a	7 a	7 a	58 a	32 b	0 b
Quinclorac 4/29 & 7/26	35 a	3 a	85 a	0 b	33 b	5 b	22 a	0 b	0 b	18 b	53 a	0 b
Callisto 4/29 & 7/26	37 a	10 a	75 ab	18 ab	0 b	7 b	27 a	0 b	0 b	17 b	57 a	72 a
LSD (P=.05)	30	47	39	21	58	39	17	6	6	22	14	14
Treatment Prob(F)	0.6581	0.17	0.0795	0.0293	0.0161	0.0615	0.7619	0.0701	0.0701	0.0077	0.02	0.0001

Applied 4/49/11 and 7/6/11.
Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 5 Effect of chlorimuron on control of various weeds in 2011

	Lotus				Horsetail			Yellow Weed		White Clover % Control
	% Control	% Cover	% Cover	% Control	% Cover	% Cover	% Control	Height (In)	% Control	% Control
Treatment	5/12/2011	5/16/2011	6/13/2011	7/5/2011	5/16/2011	6/13/2011	7/5/2011	7/5/2011	7/7/2011	7/5/2011
Control	0 b	67 a	67 a	0 a	30 a	32 a	0 a	18 a	0 b	0 b
Chlorimuron 1 oz/a	77 a	22 a	22 b	18 a	28 a	62 a	43 a	6 a	80 a	100 a
LSD (P=.05)	7	57	45	26	68	54	87	13	25	0
Treatment Prob(F)	0.00	0.08	0.05	0.09	0.93	0.14	0.17	0.06	0.01	1.00

Applied 4/29/11. Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 6 Control of yellow weed, horsetail and velvet grass with rimsulfuron and quinclorac in 2011

	Horsetail			Yellow Weed					
	% Control	Height In	% Cover	Control %	Cover %	Height In	Height In	Velvet Grass % Cover	
Treatment	7/5/2011	7/5/2011	9/1/2011	7/5/2011	9/1/2011	7/5/2011	9/1/2011	6/15/2011	9/1/2011
Control	0 b	17 a	45 b	0 b	92 a	26 a	24 a	38 a	17 b
Rimsulfuron 2 oz/a 5/15 & 6/15	63 a	8 b	78 a	80 a	78 ab	6 c	10 b	0 b	0 b
Rimsulfuron 2 oz/a 5/15 & 7/26	47 a	9 b	85 a	57 a	53 b	8 c	12 b	0 b	2 b
Quinclorac 8 oz/a 5/15 & 6/15	45 a	12 b	12 c	25 b	83 a	18 b	20 a	57 a	73 a
Quinclorac 8 oz/a 5/15 & 7/26	21 b	12 b	8 c	14 b	78 ab	16 b	21 a	63 a	53 a
LSD (P=.05)	24	4	29	25	25	4	5	27	30
Treatment Prob(F)	0.0036	0.0056	0.0006	0.0009	0.0671	0.0001	0.0009	0.0014	0.0015

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 7 Control of horsetail and yellow weed with rimsulfuron in 2011

	Yellow weed				Horsetail	
	% Control	% Cover		Height In	Height In	% Control
	Bed 2	Bed 1	Bed 2	Bed 1	Bed 2	Bed 2
Treatment	8/7/2011	9/1/2011	9/1/2011	9/1/2011	6/2/2011	8/7/2011
Control	0 b	12 ab	65 ab	16 a	10 a	0 b
Rimsulfuron 4/18 & 6/1	67 a	50 a	88 a	13 ab	6 bc	60 a
Rimsulfuron 4/ 29 & 6/15	66 a	12 ab	55 bc	11 ab	4 c	46 a
Rimsulfuron 5/17 & 6/5	88 a	5 b	35 c	8 b	7 ab	32 a
LSD (P=.05)	25	42	28	7	3	29
Treatment Prob(F)	0.0007	0.1269	0.0176	0.153	0.0138	0.0102

Applied 4/29/11.
Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 8 Effect of fall-applied rimsulfuron on marsh arrowgrass in 2011.

	% Arrowgrass Control		% Arrowgrass Coverage		Horsetail		Yield bbl/Ac			
	Bed 1	Bed 2	Bed 1	Bed 2	% Control	Height (Inches)				
Treatment	7/5/2011	7/5/2011	9/1/2011	9/2/2011	7/5/2011	9/2/2011	Bed 3	Bed 1	Bed 4	Bed 2
Control	0 c	0 b	100 a	45 a	0 b	83 a	164 a	9 a	71 ab	155 a
Rimsulfuron 2 oz/ac	70 b	33 ab	51 a	65 a	63 a	9 b	153 a	21 a	89 ab	189 a
Rimsulfuron 4 oz/ac	0 c	96 a	50 a	25 a	70 a	18 b	182 a	22 a	40 b	262 a
Quinclorac 16 oz/a	99 a	40 ab	100 a	55 a	17 b	28 b	159 a	8 a	139 a	146 a
LSD (P=.05)	26	76	49	65.32	40	21	51	33	92	222
Treatment Prob(F)	0.0002	0.1009	0.0675	0.5291	0.0123	0.0005	0.593	0.6216	0.1621	0.6018

Applied 10/13/10.
Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 9 Effect of various herbicide combinations on yellow weed and other weeds in 2011

Treatment	Yellow Weed							Marsh St John's Wort % Control	Spike Rush % Control	Louse Grass % Control
	% Cover			% Control		Height Inches				
	6/29/2011	6/29/2011	8/31/2011	7/7/2011	8/7/2011	6/29/2011	8/31/2011	8/7/2011	7/7/2011	7/7/2011
Control	66 ab	73 a	89 a	0 b	0 e	9 ab	14 a	0 d	0 b	0 b
Rimsulfuron 6/1 & 6/23	13 c	73 a	83 ab	68 a	56 b	5 cd	7 b	26 bcd	106 a	100 a
Quinclorac 6/1 & 6/23	10 c	70 a	40 c	65 a	58 b	5 cd	7 b	5 d	79 a	100 a
Rimsulfuron + Quinclorac + Callisto 6/1 & 6/23	0 c	61 a	47 bc	80 a	85 a	4 d	7 b	46 bc	100 a	100 a
Rimsulfuron 7/6 & 7/20	66 ab	65 a	63 abc	15 b	38 c	10 ab	13 a	56 bc	0 b	0 b
Quinclorac + Callisto 7/6 & 7/20	76 ab	71 a	81 ab	0 b	33 c	10 ab	14 a	63 b	0 b	0 b
Quinclorac + Chlorimuron 6/1 & 7/20	46 b	78 a	46 bc	68 a	83 a	5 cd	4 b	25 cd	80 a	100 a
Quinclorac 6/1 & 6/23	75 ab	76 a	86 ab	10 b	8 de	10 ab	13 a	0 d	6 b	0 b
Callisto + Chlorimuron 6/1 & 6/23	0 c	91 a	81 ab	68 a	84 a	8 bc	7 b	98 a	98 a	100 a
Callisto + Chlorimuron 7/6 & 7/20	88 a	88 a	89 a	3 b	24 cd	11 a	16 a	6 d	1 b	0 b
LSD (P=.05)	33	29	36	19	18	3	5	34	28	
Treatment Prob(F)	0.0001	0.5752	0.0302	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	

Rates: rimsulfuron 2 oz/a, quinclorac 8 oz/a, Callisto 8 oz/a, chlorimuron 1 oz/a
Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 10 Effects of quinclorac and Callisto on yellow weed and cranberry yield in 2011

	Yellow Weed % Cover			
Treatment	6/15/2011	9/1/2011	bbl/ac	% rot
Control	67 a	83 a	190 a	0.6 a
Quinclorac + Callisto April 18 & May 18	42 a	92 a	161 ab	1.4 a
Quinclorac April 18 & May 18	63 a	65 a	47 b	0.6 a
Callisto April 18 & May 18	43 a	53 a	89 ab	0.2 a
LSD (P=.05)	33	46	111	1.7
Treatment Prob(F)	0.2332	0.2603	0.0663	0.4158

Rates for all herbicides 8 oz/a.
Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 11. Effect Callisto, chlorimuron and quinclorac on yellow weed control in Oregon in 2011

Treatment	Yellow Weed				Flower Bud Set Rating	bbl/Ac	
	% Coverage	% Control	Height (Inches)	Turion Formation (1=None 5= Lots)	1-1=None, 5=100%`	Grower 1	Grower 2
	8/10/2011	10/27/2011	8/10/2011	10/27/2011	10/27/2011	10/28/2011	10/28/2011
Rimsulfuron 2 oz/a	39 bcd	69 a	11 cd	1.4 c	4.1 a	274 a	396 a
Callisto 8 oz/a	61 b	24 b	15 b	2.0 bc	2.8 a	252 a	331 a
Callisto + chlorimuron 8 oz/a	15 d	85 a	8 d	1.6 c	4.3 a	204 ab	357 a
Chlorimuron 1 oz/a	19 cd	81 a	9 d	1.7 c	4.1 a	112 bc	241 a
Quinclorac 0.3 lb ai/a	43 bc	26 b	13 bc	3.1 ab	3.6 a	318 a	341 a
Control	100 a	17 b	19 a	3.5 a	2.7 a	33 c	
LSD (P=.05)	16.3	35	3	1.2	2.0	118	163
Treatment Prob(F)	0.0001	0.0037	0.0001	0.0192	0.5352	0.013	0.2784

Treatments applied 6/1 and 6/26.
Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 12 Effect of Callisto, chlorimuron, rimsulfuron and quinclorac on cranberries in 2011						
	vine over-growth rating 1=none, 5= heavy	Phytotoxicity Rating 1- None 5=Dead				
Treatment	8/1/2011	7/7/2011	7/12/2011	8/8/2011	9/2/2011	bbl/ac
Control	2.5 a		1 c	1 b	1 a	21 bc
Rimsulfuron 6/1 & 6/23	1.88 b		1.75 ab	1.05 b	1 a	18 bc
Quinclorac 6/1 & 6/23	2.35 ab	0.9 b	1 c	1 b	1 a	19 bc
Rimsulfuron + Quinclorac + Callisto 6/1 & 6/23	1.9 ab	1.6 a	1.48 b	1 b	1 a	9 c
Rimsulfuron 7/6 & 7/20	1.15 c	0.9 b	1 c	1.05 b	1 a	43 a
Quinclorac + Callisto 7/6 & 7/20	2 ab	0.9 b	1 c	1 b	1 a	23 bc
Quinclorac + Chlorimuron 6/1 & 7/20	1.18 c	1.1 ab	1.63 b	1.03 b	1 a	15 bc
Quinclorac 6/1 & 6/23	2 ab	0.9 b	1.1 c	1 b	1 a	29 ab
Callisto + Chlorimuron 6/1 & 6/23	1.28 c	1.1 ab	2 a	1 b	1 a	17 bc
Callisto + Chlorimuron 7/6 & 7/20	1 c	0.9 b	1 c	1.4 a	1 a	41 a
LSD (P=.05)	0.554	0.57	0.34	0.22	0	15
Treatment Prob(F)	0.0001	0.658	1E-04	0.02	1	0.0001
Rates: rimsulfuron 2 oz/a, quinclorac 8 oz/a, Callisto 8 oz/a, chlorimuron 1 oz/a Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)						

Table 13 Year-after effect of quinclorac and rimsulfuron on yellow weed and cranberries 2010/2011						
Treatment		Yellow Weed % Coverage		Fruit Bud Set -One 5- 100%	bbl/Ac	
		8/4/2010	8/10/2011	8/19/2010	2010	2011
Control		75 a	33 a	3.7 ab	219 a	357 a
Quinclorac 75 DF	16 oz/a	28 b	2 c	3.7 ab	178 ab	307 a
Quinclorac 4L	16 fl oz/a	27 b	2 c	4.0 a	228 a	358 a
Rimsulfuron	4 oz/a	5 b	18 b	2.8 b	65 b	355 a
LSD (P=.05)		28	15	0.9	135	188
Treatment Prob(F)		0.0048	0.0056	0.0814	0.0817	0.8847
Applied 5/11/10 Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)						

Table 14 Carryover effect of rimsulfuron and quinclorac timing on yellow weed control in 2009/2010/2011.				
	Yellow weed % cover			bbl/ac
Treatment	5/28/2010	7/29/2010	8/31/2011	9/20/2010
Control	17 a	79 a	80 a	71 a
Rimsulfuron - 4/30/09 + 6/3/09 2 oz wt/a	18 a	45 ab	69 ab	71 a
Rimsulfuron 4/30/09 + 6/26/09 2 oz wt/a	16 a	76 a	74 a	68 a
Quinclorac -4/30/09 + 6/3/093 8 fl oz/a	3 a	16 b	35 b	94 a
Quinclorac - 4/30/09 + 6/26/09 8 fl oz/a	4 a	21 ab	38 b	68 a
LSD (P=.05)	19	55	32	41
Treatment Prob(F)	0.3044	0.0824	0.0257	0.6386
Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)				

Table 15 Control of yellow weed with summer-applied Callisto + chlorimuron in 2011		
	Yellow Weed	
	% Cover	Burn Down Rating 1-One 5=100%
Treatment	9/6/2011	9/6/2011
Control	82 a	3 b
Callisto 8 oz /ac + chlorimuron 1 oz /ac	7 b	5 a
LSD (P=.05)	33	1
Treatment Prob(F)	0.0102	0.0198
Applied 7/5/11 Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)		

Table 16 Control of yellow weed with various timings of chlorimuron, chlorimuron + Callisto, and quinclorac in 2011

	% Yellow Weed Control					Yellow Weed Ht (Inches)		
	7/7/2011	8/8/2011	7/11/2011	8/8/2011	9/28/2011	7/11/2011	8/31/2011	9/1/2011
Treatment	a25	a25	Thissell	Thissell	Thissell	Thissell	a25	Thissell
Control	0 c	0 e	0 d	0 c	0 c	16 a	16 a	14 a
Chlorimuron 6/10	68 a	96 a	53 a	82 a	88 a	7 d	6 b	5 b
Chlorimuron 7/26	0 c	10 e	0 d	20 bc	27 bc	13 abc	11 ab	12 a
Chlorimuron + Callisto 6/10	67 a	83 b	45 ab	83 a	60 ab	9 cd	7 b	8 ab
Chlorimuron + Callisto 7/26	0 c	10 e	0 d	18 bc	27 bc	15 ab	15 a	11 ab
Quinclorac 6/10	10 c	43 d	12 cd	72 a	53 ab	11 bcd	12 ab	5 b
Quinclorac 7/26	0 c	0 e	0 d	25 b	43 b	13 abc	14 a	9 ab
Quinclorac 6/10 + 7/26	25 b	57 c	27 bc	75 a	43 b	12 abc	11 ab	8 ab
LSD (P=.05)	11	13	18	22	34	4	6	6
Treatment Prob(F)	0.0001	0.0001	0.0001	0.0001	0.0039	0.0076	0.018	0.071

Rates: chlorimuron 1 oz/a, Callisto 8 oz/a, quinclorac 8 oz/a
Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 17 Long term control of yellow weed with rimsulfuron and other herbicide combinations 2009/2010/2011

	Yellow Weed % Con		YW% Cover		Yellow Weed Ht "	Cb Phytotoxicity Rate	bbl/ac
	6/4/2009	8/19/2010	8/31/2011	7/29/2010	7/14/2009	7/14/2009	2011
Control	0 b	0 b	75 a	65 a	13 a	1.0 b	39 ab
Rimsulfuron-4 oz	7 ab	53 a	35 ab	33 ab	19 a	1.0 b	89 a
Quinclorac + Callisto 8 oz/ac each	15 ab	100 a	10 b	0 b	13 a	1.1 a	89 a
Rimsulfuron 2 oz/ac + Quinclorac & Callisto 8 oz/ac	20 a	97 a	30 ab	2 b	12 a	1.0 ab	13 b
LSD (P=.05)	15	48	55	53	11	0.1	63
Treatment Prob(F)	0.06	0.01	0.09	0.04	0.40	0.10	0.06

Applied 5/13/09 & 6/4/2009
Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 18 Effect of various timing of chlorimuron, chlorimuron + Callisto, and quinclorac on cranberries in 2011

	Cranberry Phytotoxicity Rate 1-None 5=100%						bbl/ac	
	7/7/2011	7/11/2011	8/8/2011	8/8/2011	9/28/2011	8/8/2011		
Treatment	a25	Thissell	a25	Thissell	Thissell	a25	a25	Thissell
Control	1 b	1 c	1 a	1 a	1 a	3 bcd	95 b	115 c
Chlorimuron 6/10	1.83 a	2 a	1.03 a	1.07 a	1 a	1.7 e	185 ab	182 abc
Chlorimuron 7/26	1 b	1 c	1 a	1 a	1 a	2.7 cd	94 b	130 bc
Chlorimuron + Callisto 6/10	2 a	1.63 b	1.17 a	1.2 a	1 a	2.3 de	225 a	246 a
Chlorimuron + Callisto 7/26	1 b	1 c	1 a	1 a	1 a	3.3 abc	130 ab	121 c
Quinclorac 6/10	1.07 b	1.1 c	1 a	1 a	1 a	4 a	92 b	206 abc
Quinclorac 7/26	1 b	1 c	1 a	1 a	1 a	3.7 ab	131 ab	186 abc
Quinclorac 6/10 + 7/26	1.03 b	1 c	1 a	1 a	1 a	4 a	124 ab	223 ab
LSD (P=.05)	0.193	0.1	0.185	0.19	0	0.91	95	90
Treatment Prob(F)	0.0004	0.0001	0.5201	0.324	1	0.0006	0.0846	0.0529

Rates: chlorimuron 1 oz/a, Callisto 8 oz/a, quinclorac 8 oz/a
Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 19 Effect of indaziflam on cranberries in 2011						
	Cranberry					
	Phytotoxicity Rating (1=None, 5= Toast) 9/22/11			Bbl/Ac	Bbl/Ac	Bbl/Ac
Treatment	McFarlin	Stevens	Pilgrim	McFarlin	Stevens	Pilgrim
Control	1 a	1 a	1 a	51 a	65 a	135 a
Indaziflam 5 oz/ac	1 a	1 a	1 a	59 a	50 a	115 a
LSD (P=.05)	0	0	0	66	117	81
Treatment Prob(F)	1	1	1	0.68	0.65	0.40
Applied 3/14/11. Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)						

Table 20 Effect of rimsulfuron on cranberries in 2011	
Treatment	yield bbl/ac
Control	103 a
Rimsulfuron 7/5	131 a
Rimsulfuron 7/18	104 a
Rimsulfuron 7/5 + 7/18	136 a
LSD (P=.05)	68
Treatment Prob(F)	0.5442
Rate of rimsulfuron 2 oz/a Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)	

Table 21 Effect of rimsulfuron timings on cranberries in 1 2011		
Treatment		Cranberry phytotoxicity rating 1 =none; 5=dead 7/7/11
Control		1.0 f
Rimsulfuron	6/10	1.4 d
Rimsulfuron	6/10 + 6/23	3.0 a
Rimsulfuron	6/23 + 7/26	2.0 b
Rimsulfuron	6/10 + 7/5	1.4 d
Rimsulfuron	6/10 + 7/26	1.2 e
Rimsulfuron	6/23	1.8 c
Rimsulfuron	7/5	1.0 f
Rimsulfuron	7/26	1.1 ef
LSD (P=.05)		0.1
Treatment Prob(F)		0.0001
Rate of rimsulfuron 2 oz/a Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)		

Table 22. Effect of spray volume on the phytotoxicity of chlorimuron and rimsulfuron in 2011	
	bbl/ac
Control	34 a
Chlorimuron 1 oz/ac 20 gpa	45 a
Chlorimuron 1 oz/ac 100 gpa	30 a
Rimsulfuron 2 oz/ac 20 gpa	35 a
Rimsulfuron 2 oz/ac 100 gpa	56 a
LSD (P=.05)	37
Treatment Prob(F)	ns
Applied 7/7/11. Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)	

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