2009 Progress Report to the BC Cranberry Marketing Commission
Kim Patten
Washington State University

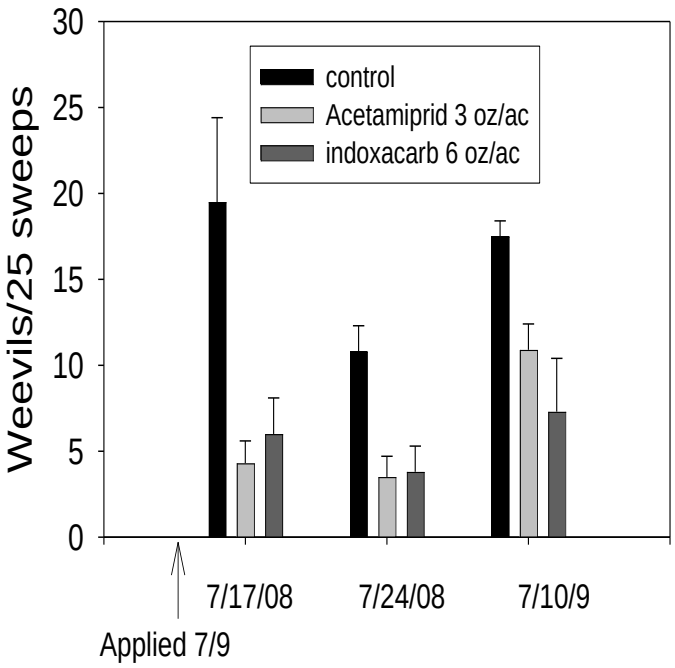
DEVELOPMENT OF EFFECTIVE MANAGEMENT STRATEGIES FOR TIPWORM, FIREWORM AND PERENNIAL WEEDS.

Kim Patten
Washington State University - Long Beach Research and Extension Unit
2907 Pioneer Rd., Long Beach WA 98631, 360-642-2031, pattenk@wsu.edu

Evaluation of biorational insecticides for control of blackvine weevil:

Numerous experiments were conducted assessing new insecticides for weevil control (Figures 1 to 4). Based on sweeping post-treatment and one year after treatment, excellent control was achieved with indoxacarb.

Figures 1 and 2. Effects of indoxacarb and acetamiprid on adult weevil population in cranberries.



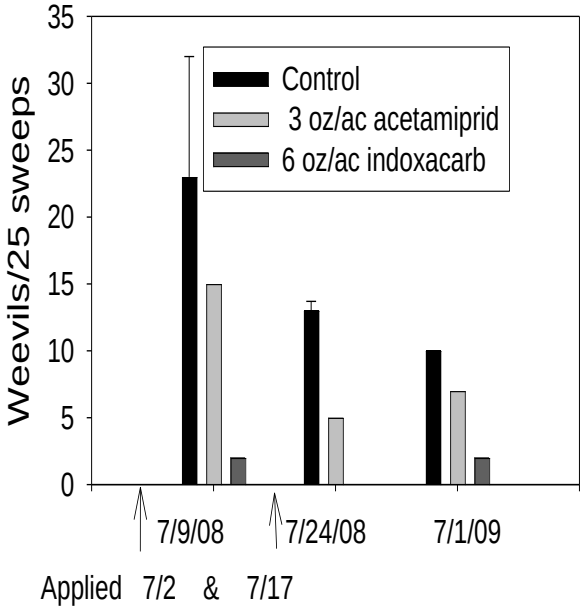
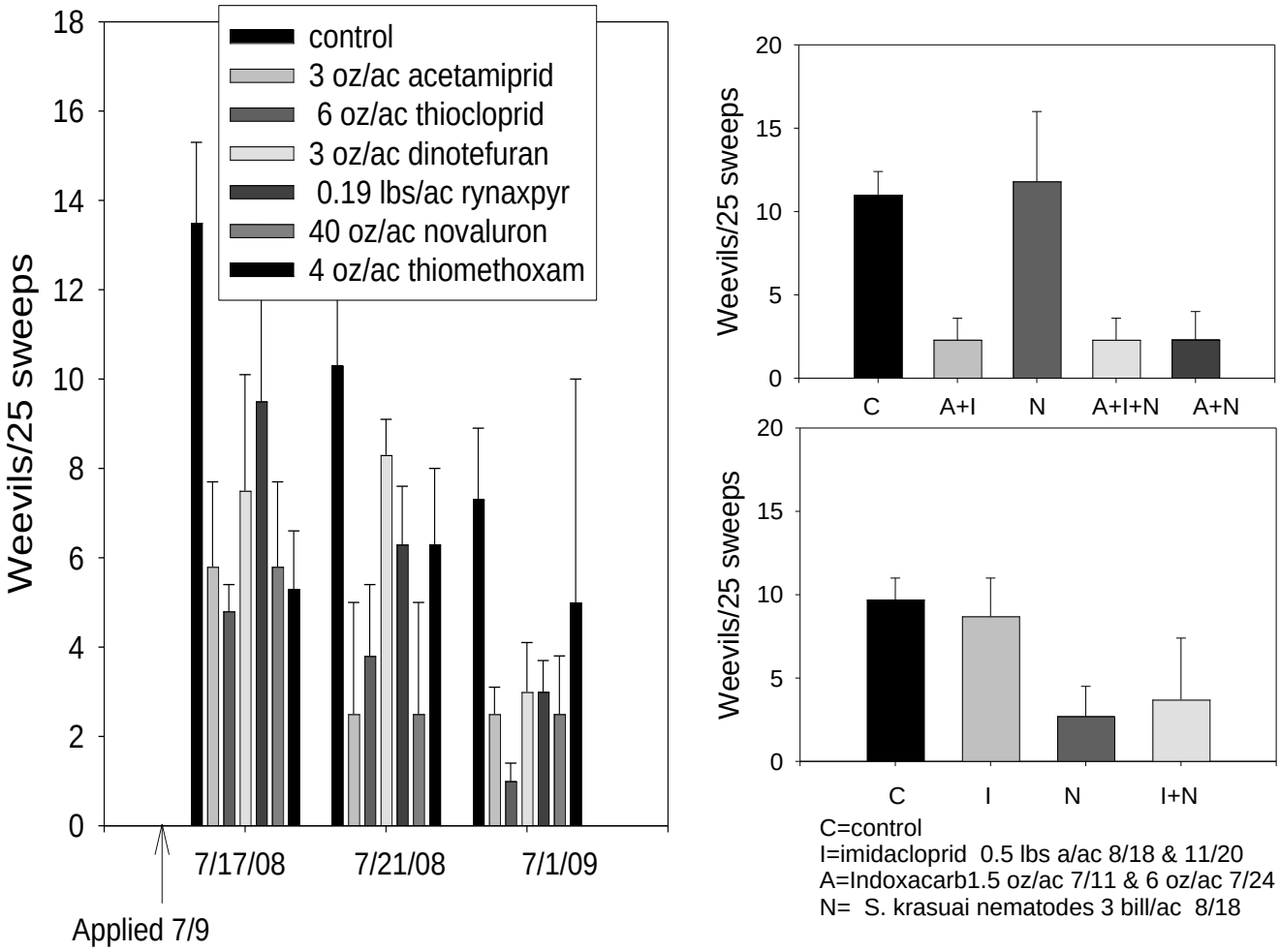


Figure 3 and 4. Effects of several insecticides and biocontrols on adult weevil populations in cranberries.



Evaluation of biorational insecticides for control of blackheaded fireworm (BHFW):

Several studies were conducted to assess efficacy of different chemistries on BHFW using chemigation. Low counts and grower over-sprays confounded the results of some of these studies (data not shown). Mixed results were obtained for the other studies. Results across these trials indicate at least one of the chemigated biorational chemistries was as effective as Diazinon (Table 1, Figures 5 & 6).

Table 1. Efficacy of chemigated insecticide on first generation fireworm control.

Treatment		# dead larvae /5 sweeps	# alive larvae /5 sweeps	Total larvae /5 sweeps
CONTROL		0.0 a	1.3 a	1.3 ab
DIAZINON AG600 (chemigation)	2 qt/a	0.3 a	0.0 a	0.3 b
Spinetoram (broadcast w/ 1 qt/a Agridex)	3.25 oz wt/a	0.3 a	0.5 a	0.8 ab
Spinetoram (chemigation)	3.25 oz wt/a	0.8 a	0.3 a	1.0 ab
Spinetoram (chemigation)	6.5 oz wt/a	0.3 a	0.5 a	0.8 ab
DPX E2Y45 (chemigated)	0.066 lb ai/a	0.5 a	0.3 a	0.8 ab
Cyazypyr (HGW 86) (chemigation)	10.1 fl oz/a	1.5 a	0.5 a	2.0 ab
Cyazypyr (HGW 86) (chemigation)	13.5 fl oz/a	1.0 a	0.0 a	1.0 ab
Novaluron (broadcast w/ 1 qt/a Agridex)	12 fl oz/a	1.8 a	1.5 a	3.3 a
Novaluron (chemigation)	12 fl oz/a	0.5 a	0.3 a	0.8 ab
Novaluron (broadcast w 1 qt/ac Agridex)	30 fl oz/a	0.3 a	0.3 a	0.5 b
Novaluron (chemigation)	30 fl oz/a	0.5 a	0.3 a	0.8 ab
LSD (P=.05)		1.11	0.95	1.55
Treatment Prob(F)		0.0678	0.0669	0.0353

Sweeping data collected 4 days after treatment. Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

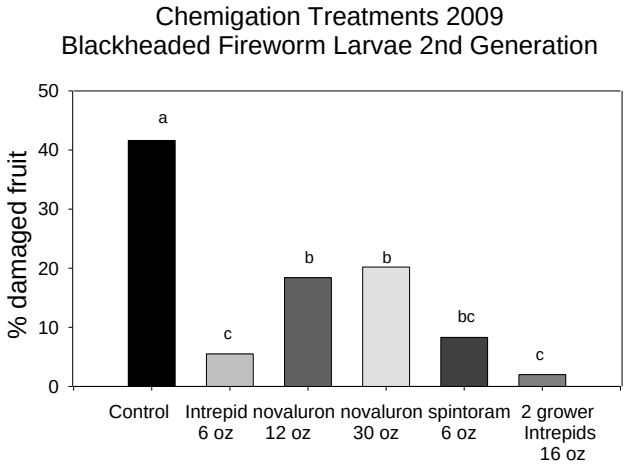


Figure 5. Efficacy of chemigated insecticide on second generation fireworm control based on fruit damage assessments.

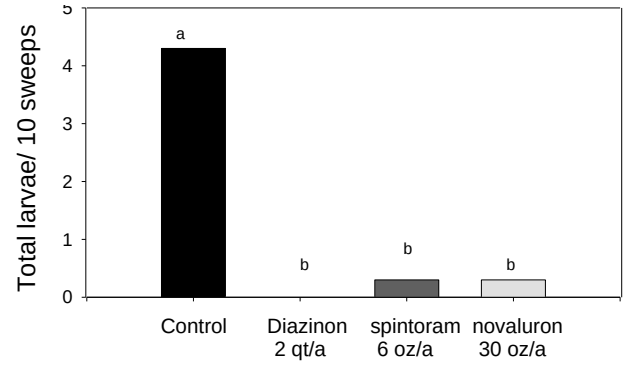


Figure 6. Efficacy of chemigated insecticide on second generation fireworm control based on sweeping.

Evaluation new herbicide for control of perennial broadleaf weeds in cranberries:

Several studies were conducted to assess the efficacy of new herbicides on a series of annual and perennial weeds in cranberries. Results are presented in Tables 2 to 8. Quinclorac was only marginally effective across a range of cranberry weeds. Rimsulfuron was very efficacious and did not damage the crop. Clethodim was the only herbicide that provided excellent grass control. The addition of other herbicides to the tank mix did not enhance its efficacy.

Table 2. Effects of several herbicides on perennial grass control in cranberries.

Treatment	% control Reed Canary Grass		
	May 18	June 3	June 29
Clethodim 0.5% w/ 1% crop oil	68.3 A	68.3 a	65.0 ab
Rimsulfuron 2 oz/a + Clethodim 0.5% w/ 1% crop oil	71.7 A	56.7 a	85.0 a
Quinclorac 8 oz/a + Rimsulfuron 2 oz/ac w/ w/ 1% crop oil	30.0 B	70.0 a	56.7 b
Quinclorac 8 oz/a + Rimsulfuron 2 oz/a + Clethodim 0.5% w/ 1% crop oil	76.7 A	70.0 a	78.3 ab
control	0.0 C	0.0 b	0.0 c
LSD (P=.05)	6.88	19.67	19.90
Treatment Prob(F)	0.0001	0.0001	0.0001

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

Table 3. Effects of several herbicides on perennial grass control in cranberries.

Treatment	Six-weeks fescues				Bentgrass			
	% Control			% cover	% Control			% cover
	May 5	June 6	June 29	Aug 8	May 5	June 6	June 29	Aug 8
Control	0.0 d	0.0 d	0.0 c	76.3 a	0.0 c	0.0 d	0.0 c	68.8 a
Rimsulfuron 1 oz/ac w/ 1% Agridex	93.3 a	93.0 a	73.8 a	42.5 a	68.8 a	27.5 b	2.5 c	75.0 a
Clethodim 0.5% w/ 1% Agridex	97.8 a	86.3 ab	65.0 ab	48.8 a	98.5 a	97.8 a	92.3 a	21.3 b
Quinclorac 8 oz/ac w/ 1% Agridex	30.0 c	0.0 d	5.0 c	71.3 a	30.0 b	18.8 c	0.0 c	86.3 a
Rimsulfuron 1 oz/ac + Clethodim 0.5% w/ 1% Agridex	95.5 a	78.8 bc	48.8 b	80.0 a	97.8 a	96.5 a	82.5 b	33.8 b
Quinclorac 8 oz/ac w/ 1% Agridex	75.0 b	72.5 c	2.5 c	91.3 a	20.0 bc	5.0 d	0.0 c	95.0 a
Quinclorac 8 oz/ac + Clethodim 0.5%+ Rimsulfuron 1 oz/ac w/ 1% Agridex	94.5 a	86.3 ab	42.5 b	45.0 a	96.5 a	100.0 a	96.0 a	20.0 b
LSD (P=.05)	14.38	7.74	19.38	32.75	23.62	5.12	5.43	35.32
Treatment Prob(F)	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0504

Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)

Table 4. Effects of rimsulfuron rates (Rimsulfuron) on cranberry yield.

Treatment	Yield bbl/ac	
	Site 1	Site 2
Control	188.3 b	71.1 a
Rimsulfuron 2 oz wt/a twice		104.0 a
Rimsulfuron 4 oz wt/a twice	353.4 a	98.9 a
Rimsulfuron 8 oz wt/a twice	450.1 a	92.7 a
LSD (P=.05)	157.68	43.61
Treatment Prob(F)	0.0180	0.4191

Table 5. Effects of Rimsulfuron on control of perennial weeds in cranberries.				
	% control			
Treatment	Lotus	Sour-dock	False geranium	Marsh St. John Wort.
Control - White	0.0 b	0.0 b	0.0 b	0.0 a
Rimsulfuron	78.3 a	92.5 a	90.0 a	62.5 a
LSD (P=.05)	61.27	4.59	11.25	68.89
Treatment Prob(F)	0.0315	0.0001	0.0001	0.0632
Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)				

Table 6. Effects of several herbicides on control of annual and perennial weeds in a new cranberry planting.								
Treatment	% Control							
	Corn Spurry		Smartweed		Horsetail		Silver leaf	
	June 12	July 14	June 12	July 14	June 12	July 14	June 12	July 14
Control	0.0 b	0.0 b	0.0 b	0.0 b	0.0 c	0.0 c	0.0 c	0.0 b
Rimsulfuron 1 oz/a	30.0 ab	83.0 a	94.5 a	100.0 a	86.3 a	53.3 ab	10.0 bc	66.7 a
Rimsulfuron 2 oz/a	51.5 ab	96.3 a	33.3 b	100.0 a	56.7 ab	81.7 a	68.8 ab	85.0 a
Quinclorac 8 oz/a	0.0 b	0.0 b	0.0 b	0.0 b	0.0 c	70.0 a	30.0 abc	12.5 b
chlorimuron 0.75 oz/a	86.0 a	100.0 a	99.8 a	77.5 a	55.0 ab	72.5 a	78.8 a	96.3 a
Callisto 8 oz/a + Clethodim 8 oz/a	89.3 a	100.0 a	99.5 a	100.0 a	26.3 bc	20.0 bc	85.0 a	100.0 a
Clethodim 8 oz/a + Callisto 8 oz/a +Classic 0.75 oz/a	82.5 a	98.8 a	99.3 a	100.0 a	75.0 a	86.0 a	78.3 a	100.0 a
Rimsulfuron	35.0 ab	87.5 a	95.0 a	100.0 a	50.0 ab	90.0 a	30.0 abc	66.7 a
LSD (P=.05)	45.01	13.47	32.59	25.53	30.44	35.28	43.70	31.60
Treatment Prob(F)	0.0008	0.0001	0.0001	0.0001	0.0001	0.0004	0.0028	0.0001
Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)								

Table 7. Effects of Rimsulfuron on control of perennial weeds in cranberries.		
	% control August 18	
Treatment	Willow	St John Wort
Control	0.0 b	0.0 b
Rimsulfuron 2oz/a twice	92.5 a	100.0 a
Rimsulfuron 4 oz/a -	85.0 a	85.0 a
LSD (P=.05)	28.98	23.78
Treatment Prob(F)	0.0004	0.0001
Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)		

Table 8. Effects of rimsulfuron and quinclorac on control of perennial weeds in cranberries.		
	% Control July 27	
Treatment	Willow	Yellow Weed
Control	0.0 b	0.0 b
Rimsulfuron 2oz/ac	41.7 a	76.7 a
Quinclorac 8 oz/a + Callisto 8 oz/a	81.7 a	68.3 a
Rimsulfuron 2 oz/ac Quinclorac 8 oz/a + Callisto 8 oz/a	75.0 a	70.0 a
LSD (P=.05)	36.97	29.92
Treatment Prob(F)	0.0057	0.0023
Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)		

Table 9. Effect of rimsulfuron and quinclorac on control of perennial weeds in cranberries.			
Treatment	% control		
	Buttercup	Silver leaf	Horsetail
Control	0.0 c	0.0 a	0.0 b
Rimsulfuron 4 oz/a	78.3 ab	40.0 a	25.0 b
Rimsulfuron 2 oz/a tiwice	100.0 a	40.0 a	17.5 b
Quinclorac 8 oz/a twice	0.0 c	0.0 a	0.0 b
Quinclorac 8 oz + Callisto 8 oz/a twice	42.7 b	75.0 a	55.0 ab
Rimsulfuron 2 oz/a + Quinclorac 8 oz + Callisto 8 oz/a twice	100.0 a	53.3 a	96.7 a
Rimsulfuron 4 oz/a + Quinclorac 8 oz + Callisto 8 oz/a	70.0 ab	92.5 a	93.3 a
LSD (P=.05)	34.29	69.95	46.04
Treatment Prob(F)	0.0001	0.1035	0.0053
Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)			

Evaluation of biorational insecticides for tipworm control in cranberries:

Several studies were conducted to assess the efficacy of new insecticides on tipworm. Only one trial had enough tipworm population to warrant data collection. Results are presented in Tables 10 and 11. Reasonably good results were obtained for novaluron. Oddly enough, the chemigated low rate was better than the other treatments of novaluron (although not significant). Spintoram compared favorably to Diazinon. Two interesting observations were noted on phytotoxicity (Table 11). The broadcast novaluron turned the leaves slightly red and the Movento resulted in some leaf curling at the end of the season. This latter effect was observed in 2007, but not in 2008. This slight leaf damage is not enough to cause much yield decline, but should warrant concern. It needs to be further investigated prior the use of spintoram by the industry.

Table 10 . Efficacy of insecticides on tip control on McFarlin cranberries in Grayland Washington, in 2009. Tipworm population varied by replications.

Treatment	Number per 25 uprights								Total larvae & pupae across all sampling dates
	Larvae	Pupae	Larvae	Pupae	Larvae	Pupae	Larvae	Pupae	
	June 9		June 17		June 25		August 8		
CONTROL	7.0 a	1.5 a	5.5 a	1.0 a	0.0 a	5.0 a	4.0 a	0.0 a	27.5 a
DIAZINON AG600 (chemigation) 2 qt/a	1.0 b	1.5 a	1.0 a	0.5 a	0.5 a	1.5 a	4.0 a	0.0 a	10.5 b
Novaluron (broadcast w/ 1 qt/a Agridex) 12 fl oz/a	5.0 a b	0.5 a	3.5 a	1.0 a	0.0 a	3.0 a	1.5 a	0.0 a	17.0 b
Novaluron (chemigation) 12 fl oz/a	0.5 b	0.5 a	0.0 a	0.0 a	0.5 a	0.5 a	0.0 a	0.0 a	2.0 b
Novaluron (broadcast w/ 1 qt/ac Agridex)30 fl oz/a	2.0 b	0.0 a	4.0 a	0.5 a	0.0 a	3.0 a	0.0 a	0.0 a	8.5 b
Novaluron (chemigation) 30 fl oz/a	2.5 b	0.0 a	4.5 a	2.0 a	0.0 a	7.5 a	0.5 a	0.0 a	12.0 b
Movento (Chemigation) 16 oz/a	2.0 b	1.0 a	1.5 a	0.5 a	0.0 a	0.0 a	1.0 a	0.0 a	9.0 b
LSD (P=.05)	2.95	2.77	4.20	3.11	1.00	7.85	2.53	0.00	9.25
Treatment Prob(F)	0.0139	0.7058	0.1174	0.7901	0.6534	0.3618	0.0266	1.0000	0.0084
Data presented for efficacy is only from replications that had significant tipworm populations. Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)									

Table 11. Effects of insecticides used for tip control on McFarlin cranberries in Grayland Washington, in 2009.				
Treatment	Insecticide phytotoxicity rating on foliage (1= no effect, 3= minor damage, 5 = significant damage)			Yield (bbl/ac)
	June 17	June 26	Sept 17	
CONTROL	1.0 c	1.3 a	1.0 b	193.5 a
DIAZINON AG600 (chemigation) 2 qt/a	1.0 c	1.4 a	1.0 b	168.0 a
Novaluron (broadcast w/ 1 qt/a Agridex) 12fl oz/a	2.8 a	1.3 a	1.0 b	200.8 a
Novaluron (chemigation) 12 fl oz/a	1.0 c	1.0 a	1.0 b	202.5 a
Novaluron (broadcast w/ 1 qt/ac Agridex)30 fl oz/a	3.0 a	1.3 a	1.0 b	211.3 a
Novaluron (chemigation) 30 fl oz/a	1.8 b	1.0 a	1.0 b	230.3 a
Movento (Chemigation) 16 oz/a	1.0 c	1.0 a	1.7 a	266.8 a
LSD (P=.05)	0.41	0.57	0.22	104.03
Treatment Prob(F)	0.0001	0.6726	0.0001	0.5895
Data are from all replication. Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)				