Progress Report for 2010
Evaluation of new cranberry varieties for the Pacific Northwest

Project No.: Continuing 13C-4167-1217

Title: Cranberry Varieties Trials

Year initiated: 2003 **Current year:** 2010 **Terminating year:** 2012

Personnel: Kim D. Patten, WSU-Long Beach, Extension Specialist

Title: Evaluation of new cranberry varieties for the Pacific Northwest.

Justification:

As cranberry growers plant new acreage or replant existing beds, they want to select varieties that are 1) adapted to the growing region, and 2) high-yielding. Selecting a variety (or varieties) with pest resistance or some level of tolerance may also reduce the overall requirements for pesticides and hence lower the cost of production and increase return per acre. Besides yield, the suitability of a variety for the fresh fruit market is a very important criterion for many growers in Grayland. The goal of this project is to evaluate genotypes for low levels of field and storage rot with good yield and ease of dry harvesting.

Objectives:

1. Maintain the new replicated plantings on the Pacific Coast Cranberry Research Farm in Long Beach with 9 new genotypes and 2 standard varieties.

2. Gather data on vine cover, upright density and initial fruit quality.

Results:

Objective 1) Maintain the new replicated planting on the Pacific Coast Cranberry Research Farm in Long Beach with 9 new genotypes and 2 standard varieties.
A field planting, using a randomized complete block design, was planted in summer 2003. Vines were obtained from Nick Vorsa's breeding program at Rutgers University (njs98-23, njs95-37, cnj96-44-83, cnj97-105-4, cnj95-20-20, cnj93-9-42, cnj93-13-100, njs98-65, njs98-28) and from an old cultivar trial in Wisconsin (BE4 (Willapa Red), AR2, BAIN FAVORITE #1). Pilgrim and Stevens (DNA-tested) from Rutgers were used for comparisons. Plots have been maintained using standard horticultural practices and have reached maturity.

Objective 2) Gather data on variety performance.
Vines have come into full production. Yield, fruit size, fruit rot and brix data were collected (Tables 1 to 4). Based on production nd other variables, Pilgrim is still the top performing selection over time. In 2010, Bain Favorite #1, AR2, CNJ 44-83, CNJ95-20-20, and Pilgrim were all fairly comparable, with Pilgrim having the highest yield. Pilgrim, Bain Favorite and

Crimson Queen had the largest fruit, Stevens the highest BRIX. Willapa Red consistently had lower field and storage rots than other selections over four years. In 2010, Crimson Queen and cnj 96-44-83 had the highest rots.

Pilgrim, Willapa Red and Crimson Queen were given a pollination challenge test in 2010, using bee exclusion cages (Table 5). Pilgrim appeared to be the most pollination-challenge tolerant. It had the highest set fruit and yield when caged from bees during the entire pollination window. Crimson Queen is susceptible to being misshapen by lack of pollination.

Of the two new releases, Crimson Queen and Mullica Queen, only Crimson Queen has distinguished itself as a superior cultivar for the PNW. Crimson Queen, however, appears to be less productive than Pilgrim or Willapa Red.

Table 1. Yield from 2003 cultivar/advanced selection trials in Long Beach WA

Variety	Yield bbl/ac						
	2005	2006	2007	2008	2009	2010	Total
Crimson Queen	77	179	347	242	293	208	1346
njs95-37	85	277	322	246	356	234	1520
Mullica Queen	23	20	252	178	206	224	903
cnj96-44-83	54	203	288	270	369	275	1459
cnj95-20-20	32	180	253	173	247	268	1153
cnj93-9-42	61	187	451	266	337	239	1541
nj93-13-100	46	135	295	213	360	229	1278
Willapa Red	150	217	383	229	376	232	1587
AR2	16	222	290	239	346	264	1377
Bain Favorite #1	46	177	212	200	286	299	1220
Pilgrim	257	202	327	345	334	319	1784
Stevens	1	48	209	138	246	168	810
njs98-65	11	201	335	196	268	172	1183
njs98-28	27	171	352	153	261	197	1161
LSD 0.05	61	46	112	104	153	102	

Table 2. Fruit size from 2003 cultivar/advanced selection trials in Long Beach WA				
	Fruit size (grams/fruit)			
Variety	2007	2008	2009	2010
Crimson Queen	1.56	1.56	1.58	1.37
njs95-37	1.18	1.06	1.17	1.05
Mullica Queen	1.52	1.42	1.38	1.17
cnj96-44-83	1.39	1.26	1.31	1.11
cnj95-20-20	1.23	1.17	1.09	1.07
cnj93-9-42	1.34	1.23	1.18	1.09
nj93-13-100	1.10	1.00	1.15	0.97
Willapa Red	1.11	1.00	1.13	1.06
AR2	1.42	1.20	1.27	1.23
Bain Favorite #1	1.73	1.44	1.44	1.41
Pilgrim	1.48	1.31	1.38	1.3
Stevens	1.09	1.10	1.16	1.04
njs98-65	1.65	1.37	1.63	1.27
njs98-28	1.46	1.26	1.31	1.13
LSD 0.05	0.11	0.13	0.16	0.12

Table 3. Fruit BRIX from 2003 cultivar/advanced selection trials in Long Beach WA				
Variety	BRIX			
	2007	2008	2009	2010
Crimson Queen	8.1	7.9	8.1	8.7
njs95-37	8.8	7.9	8.7	9
Mullica Queen	8.8	8.8	9.0	8.9
cnj96-44-83	9.1	8.6	8.5	8.9
cnj95-20-20	8.2	8.1	8.1	7.7
cnj93-9-42	8.3	8.2	8.4	8.6
nj93-13-100	8.6	8.9	8.0	9.1
Willapa Red	8.3	7.3	7.8	8.6
AR2	8.7	8.1	8.6	9.1
Bain Favorite #1	8.1	9.0	8.8	9
Pilgrim	8.9	7.8	8.6	8.8
Stevens	9.3	8.2	8.9	9.7
njs98-65	8.9	8.2	9.0	8.9
njs98-28	8.9	8.1	8.1	8.2
LSD 0.05	0.7	0.8	0.7	0.87

Table 4. Percent field and six weeks storage rots of several cultivar/advanced cranberry selection trials in Long Beach WA

Variety	% rot							
	2007		2008		2009		2010	
	field rot	storage rot	field rot	storage rot	field rot	storage rot	field rot	storage rot
Crimson Queen	8	14	22.1	1.7	6.7	19.7	5.6	5.7
njs95-37	2	2	7	0.2	2.9	13.0	2.0	2.0
Mullica Queen	7	4	21.3	4	4.9	15.6	4.9	3.8
CNJ96-44-83	11	16	19.4	0.7	5.4	16.0	7.3	6.1
CNJ95-20-20	17	2	7.8	0.7	3.2	14.8	1.6	1.8
CNJ93-9-42	10	7	15.9	0.5	4.7	13.3	3.7	3.9
CNJ93-13-100	35	3	11.5	1	8.8	14.4	1.4	1.9
Willapa Red	3	2	6.6	0.2	5.1	20.2	2.7	2.2
AR	9	4	11.3	0	5.8	12.8	4.0	2.1
Bain Favorite #1	15	9	28.3	1.3	5.6	16.4	4.3	1.1
Pilgrim	5	2	16.6	1.3	7	14.3	3.8	3.8
Stevens	3	2	10.7	0.4	3.3	12.8	1.6	3.2
NJS98-65	7	2	9.8	0.6	8.9	20.0	3.5	4.2
NJS98-28	8	6	9.9	0.4	4.9	13.1	2.5	1.3
LSD 0.05	25.1	11.5	13.4	3.4	3.4	11.6	3.6	2.6

Table 5. Effect of excluding honey bees the on fruit set, misshapen fruit, yield and fruit size of Willapa Red, Pilgrims and Crimson Queen in Long Beach WA in 2010.

Treatment	% Set	% monkey face fruit	Yield (bbl/ac)	fruit size (g/fruit)
Willapa Red - open pollinated	64	9	435	1.06
Willapa Red -caged 4 weeks + 5 day open pollinated	35	32	116	0.57
Willapa red - caged 5 weeks no pollination	27	12	99	0.72
Pilgrim - open pollinated	61	1	597	1.39
Pilgrim - caged 4 weeks + 5 day open pollinated	53	20	316	0.9
Pilgrim - caged 5 weeks no pollination	47	26	206	0.74
Crimson Queen - open pollinated	66	12	389	1.22
Crimson Queen - caged 4 weeks + 5 day open pollinated	29	24	125	0.87
Crimson Queen - caged 5 weeks no pollination	20	18	51	0.67
LSD 0.05	13	12	202	0.22

Progress Report for 2010

Weed and other pest control systems for cranberries

Project No: Continuing 13C-4167-1215

Title: Weed and other pest control systems for cranberries

Year Initiated: 1991 **Current Year:** 2010 **Terminating Year:** 2014

Personnel: Kim D. Patten, WSU-Long Beach, Extension Specialist

Justification:
Weeds, insects and disease are major problems facing cranberry growers in Washington. The registration of new pesticides for use in the PNW on cranberries is critical to the survival of the industry. Research to help the registration of new pesticides and improve the efficacy of current registrations is needed to help solve these major pest problems in the industry.

Objectives:

1) Screen and evaluate new herbicides for their effectiveness in controlling perennial weeds in established cranberry bogs.

2) Evaluate alternative controls for blackvine weevil.

3) Evaluate biorational insecticides for control of blackheaded fireworm and tipworm.

4) Implement new cranberry disease management alternatives for domestic and export markets for fresh fruit production.

Procedures:

Objective 1: Screen and evaluate new herbicides for their effectiveness in controlling perennial weeds in established cranberry bogs.

General efficacy and crop safety of fomesafen, MAT 28, indaziflam, and flumioxazin were assessed. Comparisons 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 be considered as useful herbicides for cranberries (Tables 1-6). 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 7-14). 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 1. Effect of indaziflam and MAT 28 on Pilgrim vines treated 6/2/10 during early hook.		
	Phytotoxicity rating 1=none, 5=dead	Estimated crop 1= none, 5=200 bbl/a
Treatment	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 2. 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 3. 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 4. 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 5. Effect of indaziflam and MAT 28 on Pilgrim vines treated 6/3/10 during early roughneck.		
	17-Aug	
Treatment	phytotoxicity rating 1=none, 5=dead	estimated crop 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 6. Effect of indaziflam rate on Pilgrim vines 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 7. 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 8. 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 9. 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
Rimsulfuron 2 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 10. 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 11. 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 12. 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 13. 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 14. 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

Evaluate alternative controls for 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 15). Our results from lab feeding studies indicated that Avaunt suppressed feeding and it was only effective for 6 days (Table 16, Table 17).

Table 15. BVW adulticide field ovicide assessment 2010		
Treatment	Adult weevils per 25 sweeps (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 times 14 days apart	1.3	0
Control	3.8	2
LSD (P=.05)	0.07	0.02
Treatment Prob(F)	2.6	1.6

Table 16. Feed trials lab of field-aged residue – BVW adulticide	
Name	% Alive 23 DAT
Avaunt 6 oz/a	15
Assail 6.9 oz/a	75
Avaunt 6 oz/a + Assail 6.9 oz/a	20
Avaunt 6 oz/ 8 DAT	90
Novaluron 12 oz/ac	95
Control	85
LSD (P=.05)	.006
Treatment Prob(F)	37

Table 17. Feed trials lab of field-aged Avaunt residue-BVW adulticide	
Name	% Dead 20 days post 1 DAT exposure
Control	40
Avaunt 6 oz/a 1 DAT	60
Avaunt 6 oz/a 4 DAT	40
Avaunt 6 oz/a 7 DAT	5
LSD (P=.05)	47.16
Treatment Prob(F)	0.13

Evaluate biorational insecticides for control of blackheaded fireworm and tipworm.

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 18, 19). Additional studies on later generations confirmed consistent efficacy of HGW 86, Alticor and both rates of Spinetoram (Tables 20-24). We also obtained efficacy with Intrepid and Assail. Adding Bravo fungicide as a sticker did not improve efficacy of Intrepid (Table 21), whereas applying Intrepid in split treatments reduced efficacy (Table 24).

Spirotetramat, Assail, Belay and spinetoram were applied over several treatment timings to control tipworm. 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 18. First generation blackheaded fireworm control with chemigation in 2010 (Beckerle Farm)

Treatment	3 DAT				7 DAT			
	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 19. First generation blackheaded fireworm control with chemigation in 2010 (McPhail Farm)

Treatment	3 DAT				7 DAT			
	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 20. Second generation blackheaded fireworm control with chemigation in 2010 (Pierson Farm- study one)

Treatment	3 DAT				7 DAT			
	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 21. Second generation blackheaded fireworm control with chemigation in 2010 (Pierson Farm- study two)

Treatment	3 DAT			
	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 22. Third generation blackheaded fireworm control with chemigation in 2010 (Evergreen Farms study one)

Treatment	2 DAT				6 DAT				10 DAT			
	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 23. Third generation blackheaded fireworm control with chemigation in 2010 (Evergreen Farms study two).

Treatment	2 DAT				4 DAT				7 DAT			
	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 24. Third generation blackheaded fireworm control with chemigation in 2010 (Evergreen Farms study three).

Treatment	5 DAT			
	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

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.

	#cupped tip/ 25 uprights						% upright			bbl/ac
							dead tip	branching	fruit buds	
	2-Jun	10-Jun	23-Jun	8-Jul	21-Jul	16-Aug	16-Aug	16-Aug	10-Sep	
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

Implement new cranberry disease management alternatives for domestic and export markets for fresh fruit production

Mid-bloom treatments of Indar + Abound or Evito were compared to an untreated control or typical grower treatment (Bravo at set, followed by Dithane in 2 weeks), or a combination of grower treatment plus mid bloom Indar +Abound or Evito. Treatments were applied on four Stevens beds and three Pilgrim beds. For both varieties/studies there was no consistent trend in yield or field rot (Tables 27 & 28). There was a trend on several beds for higher yield and lower field rot with a combination of grower treatments and Abound + Indar during bloom. This difference, however, was usually not statistically significant. Evito by itself or in combination with the grower fungicide treatments didn't appear to show any consistent treatment effect. Data collection and analysis for fruit storage rot is pending.

Table 27. Efficacy of fungicide and fungicide timing on yield and field rot in Pilgrim cranberry beds in 2010.

Treatment	bbl/ac total			bbl/ac marketable			% field rot		
	p 3	p 7	j	p 3	p7	j	p 3	p 7	j
Untreated control	173	200	143	149	186	142	13.4	6.6	1.4
Abound+ Indar twice during bloom	183	186	164	160	178	160	12.4	3.4	2
Evito twice during bloom	147	207	156	124	166	153	16	5.1	1.7
Bravo @ set + Manzate in 2 wks	187	197	147	170	184	145	9.1	5.3	0.7
Treatment 2 + treatment 4	212	233	153	189	227	151	10.6	1.7	1.3
Treatment 3 + treatment 4	191	239	190	165	229	188	12.8	3.3	0.5
LSD (P=.05)	45	73	48	37	81	45	5.4	3.6	2.1
Treatment Prob(F)	0.12	0.63	0.40	0.04	0.49	0.35	0.18	0.03	0.68

Table 28. Efficacy of fungicide and fungicide timing on yield and field rot in Stevens cranberry beds in 2010.

Treatment	bbl/ac total				bbl/ac marketable				% field rot			
	c1	s1	m1	s5	c1	s1	m1	s5	c1	s1	m1	s5
Grower treatment	87	242	91	166	83	223	70	124	2.2	6.5	22.9	13.0
Grower treatment + Abound Indar twice during bloom	109	189	113	138	109	178	98	104	1.4	4.1	9.7	7.6
Gower treatment + Evito twice during bloom	76	201	108	180	76	190	89	142	0.6	4.5	16.4	8.3
LSD (P=.05)	52	74	55	71	52	68	45	49	1.8	3.8	7.9	9.8
Treatment Prob(F)	0.38	0.29	0.64	0.44	0.37	0.35	0.41	0.26	0.22	0.34	0.01	0.43