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Progress Report for 2008
Cranberry Varieties Trials

Project No.: Continuing 13C-4167-1217

Title: Cranberry Varieties Trials

Year initiated: 2003 **Current year:** 2008 **Terminating year:** 2010

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 planting 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, 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, color and rot, and vine disease data were collected (Tables 1 to 4). Based on production and other variables, none of the new selections out-yielded Pilgrim. CNJ 44-83, CNJ95-37 and CNJ93-9-42 appear to be the most promising new selections in the trial. Of the two new releases, Crimson Queen and Mullica Queen, only

Crimson Queen has distinguished itself as a superior cultivar for the PNW. None of the advanced selections distinguished itself in terms of resistance to foliage disease or fruit rot at harvest or after storage, although CNJ95-37 consistently had lower rot than other advanced selections. Grower ratings for ease of dry harvesting and potential for the fresh fruit market consistently gave highest values to Crimson Queen, CNJ 44-83, CNJ95-37 and CNJ93-9-42. BE4, an Aviator x McFarlin cross, also performed well. It had virtually no fruit rot and good early red color and should be easy to dry harvest. Although the fruit are on the small side, it should be ideal for the fresh market. Vines are not patent-protected.

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

Selection	Yield bbl/ac				
	2005	2006	2007	2008	2005 to 2008
Crimson Queen	77 cd	179 bc	347 abc	242 abc	846 bcd
NJS95-37	85 c	277 a	322 bcd	246 abc	931 bc
Mullica Queen	23 cde	20 d	252 cd	178 bc	473 fg
CNJ96-44-83	54 cde	204 b	288 bcd	270 ab	816 b-e
CNJ95-20-20	32 cde	181 bc	253 cd	173 bc	639 ef
CNJ93-9-42	61 cde	187 bc	451 a	266 ab	964 ab
CNJ93-13-100	46 cde	136 c	295 bcd	213 bc	690 de
BE4	150 b	217 b	383 ab	229 abc	980 ab
AR	16 cde	223 b	290 bcd	239 abc	768 cde
Bain Favorite	46 cde	178 bc	212 d	200 bc	636 ef
Pilgrim	257 a	202 b	327 a-d	345 a	1132 a
Stevens	3 e	48 d	209 d	138 c	398 g
NJS98-65	11 de	201 b	335 a-d	196 bc	743 de
NJS93-13-100	27 cde	172 bc	352 abc	153 bc	704 de
LSD (P=.05)	61	46	112	104	161
Treatment prob (F)	0.0001	0.0001	0.0088	0.0371	0.0001

Table 2. BRIX and fruit size from 2003 cultivar/advanced selection trials in Long Beach WA

Selection	BRIX		Fruit size (g/fruit)		
	2007	2008	2006	2007	2008
Crimson Queen	8.1 c	7.87 bcd	1.87 b	1.56 bc	1.56 a
NJS95-37	8.8 abc	7.87 bcd	1.48 fg	1.18 hi	1.06 fg
Mullica Queen	8.8 abc	8.83 ab	2.09 a	1.52 cd	1.42 ab
CNJ96-44-83	9.1 ab	8.63 abc	1.78 bc	1.39 ef	1.26 cd
CNJ95-20-20	8.2 c	8.13 a-d	1.44 g	1.23 gh	1.17 def
CNJ93-9-42	8.3 bc	8.20 a-d	1.53 efg	1.34 fg	1.23 cde
CNJ93-13-100	8.6 abc	8.93 a	1.52 efg	1.10 i	1.00 g
BE4	8.3 bc	7.27 d	1.23 h	1.11 hi	1.00 g
AR	8.7 abc	8.07 a-d	1.69 cd	1.42 def	1.20 de
Bain Favorite	8.1 c	9.00 a	1.89 b	1.73 a	1.44 ab
Pilgrim	8.9 abc	7.77 cd	1.89 b	1.48 cde	1.31 bcd
Stevens	9.3 a	8.20 a-d	1.62 def	1.09 i	1.10 efg
NJS98-65	8.9 abc	8.20 a-d	1.93 b	1.65 ab	1.37 bc
NJS93-13-100	8.9 abc	8.07 a-d	1.65 cde	1.46 c-f	1.26 cd
LSD (P=.05)	0.7	0.8	0.141	0.112	.13
Treatment prob (F)	0.03	0.01	0.0001	0.0001	0.0001

Table 3. Foliage diseases in 2003 cultivar/advanced cranberry selection trials in Long Beach WA

Selection	Misshapen fruit % by wt harvest 2008	Foliage diseases			
		Red leaf spot rating 0=none 5=100% infested October 2004	Rose bloom # infested uprights/0.25m^2 May 2007	Rose bloom % infested uprights May 2008	Rose bloom # infested uprights/ft^2 Rating 1=0, 5>20 June 2008
Crimson Queen	8.1 ab	3.1 ab	13.3 bcd	15.0 a	4.7 ab
NJS95-37	0.4 ef	3.1 ab	13.5 bcd	8.3 a	3.0 cd
Mullica Queen	3.8 bcd	2.2 cde	11.3 bcd	9.0 a	4.0 abc
CNJ96-44-83	6.4 bc	2.9 abc	57.5 ab	8.7 a	4.0 abc
CNJ95-20-20	14.0 a	2.8 abc	19.6 bcd	8.3 a	3.0 cd
CNJ93-9-42	2.7 b-e	3.2 ab	14.5 bcd	7.7 a	3.7 a-d
CNJ93-13-100	0.6 def	2.6 a-d	30.6 a-d	9.3 a	2.7 cd
BE4	0.7 def	2.7 abc	52.9 abc	20.0 a	5.0 a
AR	0.5 ef	1.8 de	5.6 cd	6.7 a	2.3 d
Bain Favorite	2.0 def	2.8 abc	70.2 a	6.0 a	2.7 cd
Pilgrim	2.8 b-e	2.4 b-e	40.4 a-d	5.0 a	2.7 cd
Stevens	0.1 f	1.8 e	3.6 d	10.0 a	2.3 d
NJS98-65	1.7 c-f	3.3 a	35.3 a-d	10.7 a	3.3 bcd
NJS93-13-100	2.2 def	2.3 b-e	20.0 bcd	11.7 a	4.0 abc
LSD (P=.05)	6.1	0.74	40.74	10.20	1.29
Treatment Prob (F)	0.0001	0.0023	0.0427	0.3267	0.0020

Table 4. Fruit rot in 2003 cultivar/advanced cranberry selection trials in Long Beach WA

Name	% Rotten fruit					
	Harvest rot 2006	Rot at 6 week storage 2006	Harvest rot 2007	Rot at 6 week storage 2007	Harvest rot 2008	Rot at 6 week storage 2008
Crimson Queen	1.9 a	0 a	8 a	14 a	22.1 abc	1.7 a
NJS95-37	0.5 a	0 a	2 a	2 a	7.0 cd	0.2 a
Mullica Queen	2.2 a	0 a	7 a	4 a	21.3 ab	4 a
CNJ96-44-83	1.6 a	0 a	11 a	16 a	19.4 a-d	0.7 a
CNJ95-20-20	1.2 a	0 a	17 a	2 a	7.8 cd	0.7 a
CNJ93-9-42	1.2 a	0 a	10 a	7 a	15.9 a-d	0.5 a
CNJ93-13-100	1.2 a	1 a	35 a	4 a	11.5 bcd	1 a
BE4	0.7 a	0 a	3 a	2 a	6.6 d	0.2 a
AR	1.0 a	1 a	9 a	4 a	11.3 bcd	0 a
Bain Favorite	0.7 a	1 a	15 a	9 a	28.3 a	1.3 a
Pilgrim	0.6 a	0 a	5 a	2 a	16.6 a-d	1.3 a
Stevens	4.2 a	2 a	3 a	2 a	10.7 bcd	0.4 a
NJS98-65	0.7 a	0 a	7 a	2 a	9.8 bcd	0.6 a
NJS93-13-100	3.1 a	2 a	8 a	6 a	9.9 bcd	0.4 a
LSD (P=.05)	3.1	1.7	25	11	10	3
Treatment Prob(F)	0.4	0.3	0.5	0.2	0.02	0.7

Project Proposal for 2009
Cranberry Varieties Trials

Project No.: Continuing 13C-4167-1217

Title: Cranberry Varieties Trials

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

Year initiated: 2003 **Current year:** 2009 **Terminating year:** 2009

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. Currently, Stevens and Pilgrim are the varieties of choice because of their high yield potential, larger fruit and good color. Based on data obtained from our 1993 genotype planting (13 varieties and 3 selections), both Pilgrim and Gryleski #1 are now being planted commercially in this area. Selecting a variety that takes fewer years to reach full production might help growers recover their investments in new and/or replanted beds. While consistent year-to-year high yields are important, so are the reactions to insect pests and diseases.

Selecting a variety (or varieties) with pest resistance or some level of tolerance may 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. This is a function of fresh fruit-keeping quality and ease of dry harvesting. For the fresh fruit industry in Grayland to continue, it is imperative that superior varieties for the fresh fruit market be developed. 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 planting on the Pacific Coast Cranberry Research Farm in Long Beach with 9 new genotypes from a New Jersey breeding program, 3 selections from a former Wisconsin breeding trial and 2 standard varieties.

2. Gather data on yield, disease resistance, and fruit quality.

Procedures:

A field planting, using a randomized complete block design with three blocks (replications) was planted in summer 2003 on the research farm of the Pacific Coast Cranberry Research

Foundation farm near Long Beach, Washington. These plots will be maintained to insure maximum productivity. During the 2009 season, two varieties, BE4 and Pilgrim, will be mowed to establish larger genetically pure propagation beds. The remaining plots will continue to be evaluated for yield, fruit size, color, keeping quality and fruit rot. Future release of any of these selections will be dependent on Rutgers University and Ocean Spray. Particular attention will be paid to CNJ 44-83, CNJ95-37 and CNJ93-9-42 in that regard.

Anticipated benefits and Information Transfer:

Information generated by this research project will be provided to cranberry growers in the region (Washington, Oregon and British Columbia) in a number of ways, including newsletters, field days, grower workshops, extension publications, etc. The information will be shared with other research and extension workers at regional and national meetings and the publication of journal articles.

Budget:

Amount allocated by Commission for 2008: $3,705.

*Request for FY 2009**.

Category	**2009**
Wages	$1,800
Benefits at 10%	180
Goods & services	625
Total	**$2,605**

* We will also be requesting several years of support from the NW Center for Small Fruit Research and Ocean Spray.

Sources of Support

TITLE OF PROJECT	SUPPORTING AGENCY AND AGENCY ACTIVE AWARD/PENDING PROPOSAL NUMBER	TOTAL AMOUNT	EFFECTIVE AND EXPIRATION DATES
PATTEN	**Active Grants:**		
Weed and other pest control systems for cranberries	Cranberry Commission	$9,000	01/2008- 2010
Cranberry Varieties Trials	Cranberry Commission	$2,000	01/2008- 2010
Reduced risk pesticide management strategies for blackheaded fireworm and perennial weeds	Cranberry Institute	$6,600	5/2008-4/2009
Development of effective management strategies for tipworm, girdler, fireworm and perennial weeds	BC Cranberry Growers Association	$19,956	3/2007 –11/09
Evaluation of new cranberry germplasm for fresh fruit	Northwest Center for Small Fruits Research	$5,640	08/2008-07/2009
Breeding and genetics of field fruit rot resistance in cranberry	USDA, SCRI, Rutgers University	$65,400	10/01/08 to 09/31/12
	Pending:		
Perennial weed and insect management in PNW cranberries using low-risk alternative pesticides.	WSCPR	$18,200	1/2008-12/2008

Progress Report for 2008

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:** 2008 **Terminating Year:** 2010

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 registration 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.

<u>New herbicides:</u> Several herbicides were screened for efficacy and phytotoxicity. A summary of findings and recommendations is provided in Table 1. Quinclorac and rimsulfuron are promising. Quinclorac is currently in an IR4 program; rimsulfuron is proposed for 2010. These will be powerful new tools to use once they get registered. Results on Princep, penoxsulam and KSU 12800 were not favorable. Both 2,4-D amine and triclopyr have potential for dominant season sprays. Their support by the registrants is questionable, so it will be an uphill battle to obtain registrations. Liquid Casoron showed promise and did not result in the crop damage the registrant was worried about. It has potential for use in accurate spot treatment on cranberry beds. Work with the registrant is in progress.

Table 1. Summary of WSU's herbicide screening for perennial weed control in cranberries.

Herbicide	Objective	Efficacy	Crop safety	Next Steps
Princep	Assess synergy with Callisto	No improvement over Callisto alone	Minor on established, moderate on new	Not enough efficacy to warrant renewal of label; label will be cancelled.
2,4-D amine	Efficacy and crop safety for new SLN – dormant broadcast	Good on arrowgrass	None at 0.5% v/v rate	Product no longer registered; data suggested there is a need to work with Nufarm to obtain a new SLN.
Penoxsulam	Screening	Moderate on arrowgrass	Minor	Inadequate efficacy to continue.
Quinclorac	Screening	Good on yellowweed and other species when used in combination with Callisto	None	Obtain additional efficacy data to allow for a Section 18 in 2010.
Triclopyr	Screening for dormant treatment of brambles	So-so	None	Additional data needed.
Carfentrazone-ethyl	Screening for moss	So-so	Moderate	Drop.
Liquid Casoron	Screening	Good	None	Recommend addition of cranberry to label.
KSU 12800	Screening	Excellent	Too hot	Drop.
Rimsulfuron	Screening	Good to excellent	None	Obtain additional efficacy to allow for an IR4 in 2010.

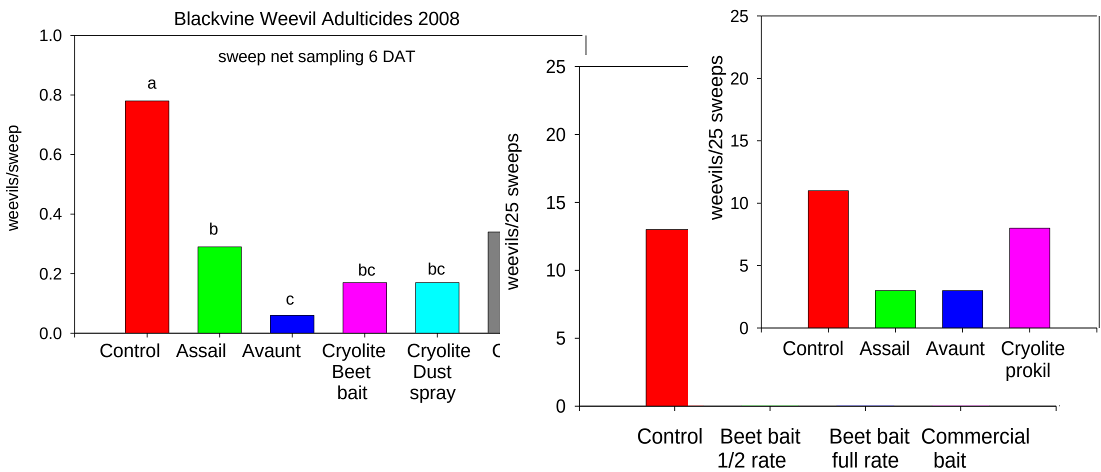
Improving the efficacy of Callisto: Callisto lacks efficacy on several recalcitrant weed species. A range of experiments was conducted to determine if that efficacy could be enhanced (Table 2). The most notable finding was the herbicide synergy observed with quinclorac and rimsulfuron. The combination of these herbicides with Callisto suggested that we could obtain excellent control of lily and yellowweed. Additional research in this area will be continued. There was no synergy with Princep, which is not what is reported in the literature on other crop/weed systems. Modifying the spray tank pH had no effect on Callisto's efficacy. Chemigation of Callisto for some weeds, like lotus or new and young plantings, seems promising. A label modification will be sought for this use pattern. Application of Callisto to weeds under the crop canopy seemed to improve when applied with higher volume. Apparently, achieving adequate weed leaf surface contract with broadcast spraying can be problematic with some weeds and spray timings. The results for ultra-low volume applications were mixed and no real trend for improved efficacy was found.

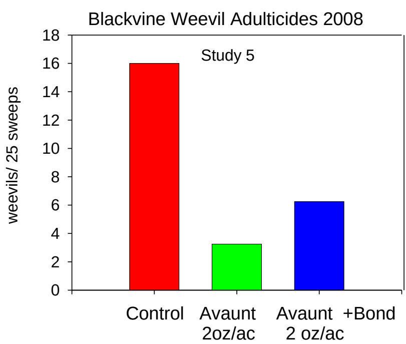
Table 2. Summary of assessment of methods to enhance the efficacy of Callisto for use on cranberries.

Treatment	Efficacy	Crop safety	Next Steps
Herbicide synergy with Princep	No improvement over Callisto alone	Minor on established, moderate on new	Not enough efficacy to warrant renewal of label; label will be cancelled.
Herbicide synergy with Quinclorac	Improved control for loosestrife and false lily of the valley over either product alone	No phytotoxicity noted	Seems a particularly effective mixture for lily control. Worth additional screening to assess timing effects.
Herbicide synergy with Rimsulfuron	Improved control for loosestrife over either product alone	No phytotoxicity noted.	Worth additional screening to assess timing effects.
PH buffering of tank mix (decrease to pH 2 and increase to pH 10 to 12)	No effect on efficacy	No effect on phytotoxicity	Drop.
Chemigation	For some weed species, especially if timing was early enough, good post-emergent efficacy was achieved. Some pre-emergent efficacy noted	No phytotoxicity noted	Seek a 2EE label modification for using chemigation.
Very high spray volume	Increase efficacy on Lily and other species under the cranberry canopy at the time of application	No phytotoxicity noted	None.
Ultra low spray volume	No real improvement noted	No phytotoxicity noted	None.

Objective 2: Evaluate biorational insecticides for control of blackvine weevil:

In 2008 we evaluated Assail, Avaunt and various formulations of baits for adult blackvine weevil control. Excellent results were obtained with Avaunt, providing almost immediate kill (see following graphs). Assail was also a good adulticide. None of the bait formulations, including the commercial one used by the growers, had commercially viable efficacy. Data on larvicide efficacy will be collected spring 2009.





Objective 3: *Evaluate biorational insecticides for control of blackheaded fireworm:*

For first generation fireworm control, most chemistries provided excellent control (Table 3). There was no difference between insecticides for the first application. By the second application, fireworm counts were too low to make strong inferences. However, Esteem, Venom and Rimon appeared to be less effective than the other insecticides. Overall there was a slight difference in efficacy between the 3.25 and 6.5 oz/ac rates of Delegate.

For second generation fireworm control, both rates of Delegate were as effective as Diazinon (Table 4). Intrepid was no better than the control.

Only two studies were conducted on fireworm and neither site had ideal conditions for making strong conclusions. Delegate appears to be an excellent contender for replacing Diazinon for application through a chemigation system. Not enough data is available, however, to determine if the 3.5 oz/ac rate of Delegate is adequate for achieving consistent efficacy through chemigation. Altacor is another chemistry that looks very promising but more data will be required to determine if it is consistent.

Table 3. WSU Long Beach blackheaded fireworm insecticide screening # 1 2008.

Treatment	First assessment on 1st generation blackheaded fireworm 5/19/2008								
	Small larvae		Medium larvae		Large larvae		Total		Total Alive + dead
	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	
CONTROL	6.5	4.5	4.0	3.0	0.5	0.0	7.5	11.0	18.5
Delegate 3.25 oz wt/a	0.0	0.5	0.0	0.0	0.0	0.0	0.5	0.0	0.5
Assail 8 oz/a	0.5	0.3	0.0	0.0	0.0	0.0	0.3	0.5	0.8
Avaunt 6 oz/a	0.0	1.3	0.0	0.0	0.0	0.0	1.3	0.0	1.3
Diazinon 2 qt/a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Altacor 0.066 lb ai/a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rimon 40 fl oz/a	0.3	0.5	0.0	0.0	0.0	0.0	0.5	0.3	0.8
Venom 3 oz/a	0.0	0.5	0.0	0.0	0.0	0.0	0.5	0.0	0.5
Tesoro 6.4 oz/a	0.5	0.0	0.3	0.0	0.0	0.0	0.0	0.8	0.8
Calypso 6 oz/a	0.0	0.3	0.0	0.0	0.0	0.0	0.3	0.0	0.3
Esteem 5 oz/a	0.3	0.3	0.3	0.0	0.0	0.0	0.3	0.5	0.8
Delegate 6.5 oz wt/a	0.0	0.3	0.0	0.0	0.0	0.0	0.3	0.0	0.3
LSD (P=.05)	2.30	1.16	2.39	1.18	0.42	0.00	1.98	4.98	6.62
Treatment Prob(F)	0.0001	0.0001	0.0723	0.0004	0.4671	1.0000	0.0001	0.0038	0.0001
Treatment	Second assessment on 1st generation blackheaded fireworm 6/12/2008								
	Small larvae		Medium larvae		Large larvae		Total		Total Alive + dead
	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	
CONTROL	0.3	0.3	0.0	0.3	0.8	0.0	1.0	0.5	1.5
Delegate 3.25 oz wt/a	0.0	0.5	0.3	0.0	0.3	0.0	0.5	0.5	1.0
Assail 8 oz/a	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.5
Avaunt 6 oz/a	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.5	0.5
Diazinon 2 qt/a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Altacor 0.066 lb ai/a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rimon 40 fl oz/a	0.5	0.3	0.3	0.5	0.8	0.3	1.5	1.0	2.5
Venom 3 oz/a	0.0	0.0	0.0	0.8	0.5	1.0	0.5	1.8	2.3
Tesoro 6.4 oz/a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Calypso 6 oz/a	0.0	0.0	0.5	0.5	0.3	0.8	0.8	1.3	2.0
Esteem 5 oz/a	0.0	0.0	0.5	0.3	2.3	1.3	2.8	1.5	4.3
Delegate 6.5 oz wt/a	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LSD (P=.05)	0.47	0.38	0.58	0.72	0.91	1.02	1.41	1.08	1.41
Treatment Prob(F)	0.5458	0.1784	0.4671	0.3356	0.0007	0.1408	0.0092	0.0111	0.0092

4 replications, 7’ x 8’ plots, in a heavily infested McFarlin bed in Grayland WA. Treatment applied to first generation 5/19/2008 and 6/4/2008 with 50 gpa spray volume followed by 620 gpa washoff. Data were collected from 10 sweeps per plot.

Table 4. WSU Long Beach blackheaded fireworm insecticide screening # 2 2008.

Treatment		Second generation blackheaded fireworm assessed 4 days after treatment 7/24/08								
		Small larvae		Medium larvae		Large larvae		Total	Total	Total
		Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	Larvae
Control		0.8	0.0	1.3	1.3	1.8	0.0	3.8	1.3	5.0
Delegate	3.25 oz wt/a	0.0	0.8	0.0	0.3	0.0	0.0	0.0	1.0	1.0
Delegate	6.5 oz wt/a	0.0	0.8	0.0	0.5	0.3	0.0	0.3	1.3	1.5
Diazinon	2 qt/a	0.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0	2.0
Intrepid	16 fl oz/a	0.5	0.5	1.3	1.5	0.3	0.0	2.0	2.0	4.0
LSD (p=.05)		1.29	1.74	0.98	2.46	0.58	0.00	0.58	0.00	3.47
Treatment prob(f)		0.5980	0.7700	0.0176	0.5388	0.0001	1.0000	0.0188	0.9199	0.1153

4 replications, 7’ x 8’ plots, in a heavily infested Stevens bed in Long Beach, WA. Treatment applied to second generation fireworm on 7/21/08 with 50 gpa spray volume followed by 620 gpa washoff. Data were collected from 10 sweeps per plot on 7/24/08.

Objective 4: Evaluate alternative fungicides for control of fruit rots and keeping quality of fresh cranberries:

In 2008 we assessed the effects of different timings of Indar and Abound on three Pilgrim and one Stevens beds. There was a significant treatment effect on yield at two Pilgrim beds, PCCRF and McPhail, with the grower treatment and the untreated plots having the lowest yield (Table 5). Treatment effects, however, were not consistent enough to make a definitive conclusion. The late Abound + Indar appeared to improve yield at PCCRF, but not at McPhail’s. Fruit rot, field and storage, was too low in 2008 to show any real treatment effects (Table 6). Grower treatments had the lowest rots, but those results could be confounded by the fact that these treatments usually had very low yield and fruit were picked further in from the edges.

Detecting an overall consistent pattern in fungicide treatments or timings that can result in grower recommendations has been problematic. Similar results have been found in previous years. Fruit rot levels are too low and there is too much variation between fields to make any inferences. Based on the cost to implement these different treatment arrays, it would be hard to justify use of supplemental Abound/Indar fungicides without more positive data. The most interesting effects appear to be on yield and not fruit rot. Additional studies will have to be done in this regard.

Table 5. Effects of different fungicides and timings on yield in 2008.

Treatment	Yield (bbl/ac at harvest)				Yield (bbl/ac after sorting)			
	Pilgrim			Stevens	Pilgrim			Stevens
	PCCRF	McPhail	Gray	PCCRF	PCCRF	McPhail	Gray	PCCRF
Untreated	214	205	167	137	204	195	161	132
Echo 720 7/22 Dithane M45 8/6	289	218	172	135	270	217	168	128
Abound + Indar 7/8 & 7/15 Echo 720 7/22 Dithane m45 8/6	275	211	174	152	266	208	171	149
Abound + Indar 7/8 & 7/15 & 8/13 Echo 720 7/22 Dithane m45 8/6	320	213	173	142	312	210	168	141
Abound + Indar 7/8 & 7/15 & 8/13	298	207	208	151	274	205	190	149
Abound + Indar 7/8 & 7/15	248	251	192	195	238	247	199	176
Grower treatment	189	142	187	190	186	139	181	180
LSD (p=.05)	72	47	34	51	71	45	36	50
Treatment prob(f)	0.008	0.0037	0.2116	0.1058	0.0161	0.0025	0.3529	0.2646
4 grower beds, 7 replications per bed. Timings were based on % of bloom (30 to 40% -7/8, 50 to 60% -7/15), fruit set 7/22, 14 and 21 days after fruit set 8/6 and 8/13 , grower treatment were -								

Table 5. Effects of different fungicides and timings on field and 6 weeks storage rot in 2008.

Treatment	Field rot %				Storage rot %			
	Pilgrim			Stevens	Pilgrim			Stevens
	PCCRF	McPhail	Gray	PCCRF	PCCRF	McPhail	Gray	PCCRF
Untreated	3.1	0.7	2.5	0.7	3.3	1.3	1.5	1.7
Echo 720 7/22 Dithane M45 8/6	3.8	0.5	1.5	0.5	3.8	0.6	1.9	2.4
Abound + Indar 7/8 & 7/15 Echo 720 7/22 Dithane m45 8/6	2.1	0.2	1	0.2	3.7	0.5	2.3	2.9
Abound + Indar 7/8 & 7/15 & 8/13 Echo 720 7/22 Dithane m45 8/6	1	0.3	2.9	0.3	2.5	0.3	1.3	1.4
Abound + Indar 7/8 & 7/15 & 8/13	2.1	0.3	0.4	0.3	3.8	0.9	0.9	1.2
Abound + Indar 7/8 & 7/15	1.7	0.7	2.4	0.7	4.1	1.1	1.8	3.0
Grower treatment	0.4	0.9	1.8	0.9	0.7	0.6	1.2	1.3
LSD (p=.05)	1.69	0.9	2.77	0.9	2.08	1.08	1.53	2
Treatment prob(f)	0.0054	0.6357	0.5258	0.6	0.0283	0.4837	0.6032	0.38
4 grower beds, 7 replications per bed. Timings were based on % of bloom (30 to 40% -7/8, 50 to 60% -7/15), fruit set 7/22, 14 and 21 days after fruit set 8/6 and 8/13								

Project Proposal for 2009

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:** 2009 **Terminating Year:** 2011

Personnel: Kim Patten, Extension Specialist
WSU- Long Beach Research and Extension Unit.

Justification:

Numerous weeds and insects continue to plague cranberry growers in Washington. To alleviate the damage from these pests, it is critical that new pesticides continue to be registered. To achieve this end, research is needed to evaluate new pesticides for efficacy and crop phytotoxicity, as well fine-tuning the rates and timings needed for use by the industry.

Objectives:

1) Evaluate herbicide combinations of quinclorac, mesotrione and rimsulfuron for control of perennial broadleaf weeds in cranberries.

2) Evaluate biorational insecticides for control of blackvine weevil.

3) Evaluate biorational insecticides for control of blackheaded fireworm.

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

Procedures:

Objective 1: Evaluate herbicide combinations of quinclorac, mesotrione and rimsulfuron for control of perennial broadleaf weeds in cranberries:

Progress towards additional herbicide registrations in cranberries continues. In 2008 there was a Section 3 for mesotrione and an IR4 project on quinclorac. In 2009 Dupont will register chlorimuron. They have also promised subsequent support of an IR4 project on rimsulfuron. Research proposed for 2009 will focus on assessing combinations and timings of these herbicides on the three remaining problematic weed species in cranberry beds in the PNW: yellow loosestrife, marsh arrowgrass and false lily of the valley. Our previous research on false lily of the valley suggested that the combination of quinclorac and mesotrione was particular effective.

Follow-up work is proposed for 2009, which focuses on all three weed species and several herbicide combinations and timings. Quinclorac, mesotrione and rimsulfuron will be applied singularly and in all possible combinations at three timings (May, June and July) to cranberry beds infested with either yellow loosestrife, marsh arrowgrass or false lily of the valley. Plots will be 6’ by 8’, applied at multiple sites for each weed species. Experiments will be factorial design (herbicides by timing) with 3 replications per treatment. Efficacy and crop phytotoxicity will be assessed. An additional plot will be applied on a site with no weeds to assess treatment effect on cranberry yield in 2009 and carryover effects in 2010. The goal of these experiments will be to support IR4 registration data for quinclorac and to obtain new data to support a proposed IR4 project for rimsulfuron in 2010.

Objective 2: Evaluate biorational insecticides for control of blackvine weevil (BVW):

BVW continues to ravage dry-harvested cranberry beds. Damage to numerous farms in 2008 was devastating. In 2008 we evaluated indoxacarb, acetamiprid, imidacloprid, chlorantraniliprole, thiamethoxam, dinotefuran, novaluron and sodium silicofluoride-based baits, and nematodes *(Steinernema kraussei)* for blackvine weevil control. Data collection is still ongoing for total control (larvae + adults), but results on indoxacarb and acetamiprid for adulticides were extremely promising. Within 24 hours of data collection from adult night-sweeping, growers had begun implementing our findings on indoxacarb with excellent results. In spring 2009 we propose to finish data collection on larvae density resulting from our large-scale 2008 adulticides + larvicides treatments (combinations of indoxacarb, imidacloprid and nematodes).

We will also initiate new experiments to assess the best protocol for using indoxacarb and acetamiprid for achieving complete adult weevil control. Our previous data suggest 10 to 14 days suppression was achieved with a single application. At this time we don’t know the frequency or number of applications required to get total control, or if these treatments work with chemigation. Treatments in 2009 will be based on indoxacarb or acetamiprid at first emergence followed by subsequent applications every 7 or 14 days until adults are no longer feeding. Efficacy will be based on night sweeping 2 and 7 days after treatment and larvae counts 8 months after treatment. These results will provide growers with a cost-effective treatment plan required to eliminate BVW damage.

Objective 3: *Evaluate biorational insecticides for control of blackheaded fireworm (BHFW):*

Our 2008 results suggested that Delegate and Altacor had good activity against BHFW when applied through a chemigation system. These results were preliminary and we could not segregate what the lowest effective rates were. There is no chemigation data for another new insecticide, HGW86, which is scheduled for an IR4 project in 2009. Our proposed research for 2009 will be to assess the low and high rates of Delegate, Altacor and HGW86 for BHFW efficacy via chemigation. Trials will be conducted on blackheaded fireworm in growers’ fields. Treatments will be applied using simulated chemigation to six replicated plots (10’ x 10’) in two grower beds with high early instar larvae counts. Efficacy will be based on sweeping data 3 and 7 days after treatment. Data will be used to support an IR4 project for HGW86 and Altacor, and provide data to the industry that there is a cost-effective OP alternative for fireworm control via chemigation.

Objective 4: *Evaluate alternative fungicides for control of fruit rots and keeping quality of fresh cranberries:*

Research on strategies to reduce fruit rot in 2009 will be curtailed. Rather than detailed experiments across several fields, we will only evaluate two supplemental treatments applied to grower beds with high percent of fruit rot in 2008. Those treatments will be Indar + Abound mid-bloom, or Indar + Abound 3 weeks after fruit set. The effect of these supplemental treatments to grower beds will be measured for yield, field rot and storage rot. Six to eight different grower beds will be treated. Plots (6' x 6') will be replicated 8 times at each farm. Fruit rot at harvest and after 6 weeks of storage will be assessed.

Anticipated Benefits and Information Transfer:
Growers will get new products registered for their major weed problems, and new control options for their insect and disease problems. Information from these results will be transferred through workshops, the Cranberry Vine newsletter, and field days.

Budget:
Amount allocated by Commission for 2008: $13,475

Request for FY 2009:

Salaries	$6,622
Salaried employee benefits	$2,544
Hourly workers	$1,200
Hourly benefits	$120
Other (supplies)	$241
TOTAL	**$10,727**

Sources of Support

TITLE OF PROJECT	SUPPORTING AGENCY AND AGENCY ACTIVE AWARD/PENDING PROPOSAL NUMBER	TOTAL AMOUNT	EFFECTIVE AND EXPIRATION DATES
PATTEN:	**Active Grants:**		
Weed and other pest control systems for cranberries	Cranberry Commission	$13,475	01/2008- 2010
Cranberry Varieties Trials	Cranberry Commission	$3,705	01/2008- 2010
Reduced risk pesticide management strategies for blackheaded fireworm and perennial weeds	Cranberry Institute	$6,600	5/2008-4/2009
Development of effective management strategies for tipworm, girdler, fireworm and perennial weeds	BC Cranberry Growers Association	$19,956	3/2007 –11/09
Evaluation of new cranberry germplasm for fresh fruit	Northwest Center for Small Fruits Research	$5,640	08/2008-07/2009
Breeding and genetics of field fruit rot resistance in cranberry	USDA, SCRI, Rutgers University (over four years)	$65,400	10/01/08 to 09/31/12
	Pending:		
Perennial weed and insect management in PNW cranberries using low-risk alternative pesticides.	WSCPR	$18,200	1/2008-12/2008

SUMMARY
BUDGET REQUEST

LAST YEAR FUNDING REQUESTS (2008)

Ongoing Projects (2007)

Project No.	Short Title	Lead Scientist	Amount Requested
Project 13C-4167-1215	Weed Control Systems	Patten	$13,475
Project 13C-4167-1217	Cranberry Varieties Trials	Patten	$3,705

CURRENT YEAR PROJECTS (2009)

Ongoing Projects (2008)

Project No.	Short Title	Lead Scientist	Amount Requested
Project 13C-4167-1215	Weed Control Systems	Patten	$10,727
Project 13C-4167-1217	Cranberry Varieties Trials	Patten	$ 2,605

WASHINGTON STATE CRANBERRY COMMISSION

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2009

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