

1. a. Title: Evaluation of New Cranberry Germplasm for Fresh Fruit Production in the Pacific Northwest
- b. Principal Investigators: Kim Patten, Washington State University Long Beach Research and Extension Unit, 2907 Pioneer Rd., Long Beach WA 98631, 360-642-2031, pattenk@wsu.edu
- c. Cooperators: Nick Vorsa, Rutgers University

2. a. Reporting Period Covered: 2006 to 2009

3. Progress Report

a. Abstract: A replicated field planting of advanced selection of cranberries from the breeding program at Rutgers University and elsewhere was established and maintained. Comparisons were made to standard cultivars. Yield, fruit size, color, rot and keeping quality, disease resistance, and suitability for dry harvest parameters were collected for four years. 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. BE4 and CNJ95-37 distinguish themselves for fresh fruit potential based on yield and low fruit rot. Of the two new releases, Crimson Queen and Mullica Queen, only Crimson Queen has distinguished itself as a superior cultivar for the fresh fruit production in the PNW. Based on these results, both BE4 and Crimson Queen would be highly desirable new cultivars for both processed and fresh fruit cranberry production in the PNW. BE4 is being renamed Willapa Red and will be available for the industry in 2010. Crimson Queen is currently beginning to be extensively planted by growers. CNJ 44-83, CNJ95-37, and CNJ93-9-42 have been established in new germplasm trials for additional comparisons.

b. Objectives:

- 1) Maintain the new cranberry germplasm planting on the Pacific Coast Cranberry Research Farm in Long Beach, WA.
- 2) Assess horticultural traits (yield, berry size, color, return bloom, vine cover, vigor, and upright density) of the germplasm.
- 3) Assess the incidence of diseases (fruit rot, cottonball, rose bloom and fresh fruit keeping quality) of germplasm.

c. Methods and Materials: A field planting, using a randomized complete block design, was established in summer 2003. Vines were obtained from the cranberry 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 USDA 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. Minimal fungicides have been used to protect against plant pathogens. Once vines came into production, yield, fruit size, fruit BRIX, fruit color, field rot, keeping quality and foliage disease data were collected. Three grower field days have been held on the sites and growers have rated plots for their preference and ease of harvest with a dry harvester.

d. Accomplishments / Progress Report: Based on yield alone, none of the new selections out-yielded the standard cultivar – Pilgrim (Table 1). BE4, Crimson Queen, CNJ 44-83, CNJ95-

37 and CNJ93-9-42 all had excellent yield records and would be suitable for commercial production. There were only minor differences in BRIX between selections (Table 2). Of the high producing selections, Crimson Queen had the largest fruit size and BE4 the smallest. All of the Rutgers selections had full red color by mid-September and would be excellent for the early fresh market (data not shown). None of the advanced selections distinguished itself in terms of resistance to foliage disease or fruit rot at harvest or after storage, although BE4 and CNJ95-37 consistently had lower rot than other selections (Tables 3 & 4). 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 (data not shown). Of the two new releases from Rutgers, Crimson Queen and Mullica Queen, only Crimson Queen has distinguished itself as a superior cultivar for the PNW. These are both patent-protected and only available to Ocean Spray growers. Overall, BE4, a USDA Aviator x McFarlin cross from their early breeding program 50+ years ago, 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. BE4 is being renamed Willapa Red and a propagation bed established to make vines available to the industry in 2010.

e. Reasons why goals and objectives were not met: All objectives met.

f. Charts, graphs and/or diagrams:

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/0.2 5m 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 weeks storage 2006	Harvest rot 2007	Rot at 6 weeks storage 2007	Harvest rot 2008	Rot at 6 weeks 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

g. Is this a final report?: Yes

4. a. Potential Significance to Industry: This project has been very successful. In 2009, 1/4 of all new plantings in Washington were Crimson Queen. That will expand in subsequent years with additional plantings of Crimson Queen and with Willapa Red as it becomes available. These trials have also been instrumental in obtaining funding to establish additional germplasm trials with over 36 new selections. These trials have also confirmed that the Pilgrim cultivar for overall production tonnage is superlative. This is critical information for growers targeting the process market. As new germplasm replaces the traditional cultivars over the new 10-15 years, the long-term impact of this project will be very significant.

b. Other Funding Sources: This project received supplemental funding from the Washington State Cranberry Commission during its duration (~ \$2,000/yr or ~25% of total).