FINAL PROJECT REPORT
WTFRC/OSCC Project Number: CH-09-902

Project Title: Breeding and genetics program for PNW sweet cherry

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Other funding sources

Agency Name: USDA-CSREES Specialty Crops Research Initiative
Amt. requested/awarded: $3.4M plus equal matching Sept 2009-Aug 2013
Notes: A total systems approach to developing stem-free sweet cherry production, processing, and marketing system. PI: Whiting. Co-PIs include Dhingra and Oraguzie

Agency Name: USDA-CSREES Specialty Crops Research Initiative
Amt. requested/awarded: $2.1M plus equal matching Sept 2009-Aug 2013
Notes: Tfr-GDR: Tree fruit genome resource database with Dorrie Main as PI and Peace, Evans and Oraguzie as Co-PIs.

Agency Name: USDA-CSREES Specialty Crops Research Initiative
Amount awarded: $7.2 mil plus equal matching, Sep 2009 – Aug 2013
Notes: "RosBREED: Enabling marker-assisted breeding in Rosaceae". PI: Iezzoni. Co-PIs include Peace, Oraguzie and Main.

Agency name: WTFRC/OSCC
Amount awarded: $79K from 2010-2012
Notes: Start up funds and support for a full time technician with Oraguzie as PI

Agency name: WTFRC/OSCC
Amount awarded: $62K from 2011-2012
Notes: Understanding the genetic basis of powdery mildew resistance in sweet cherry: PI: Oraguzie with Peace, Dhingra and Grove as Co-PIs

Total project funding: **286, 738**

Budget

Organization Name: WSU-Prosser **Contract Administrator:** Mary Lou Bricker
Telephone: 509 335 7667 **Email address:**mdeseros@wsu.edu

Item	2009	2010	2011
Salaries	15,960	16,598	**17,262**
Benefits	9,895	10,291	**10,702**
Wages	13,000	13,000	**13,000**
Benefits	2,340	2,340	**2,340**
Equipment	5,000	5,000	**5,000**
Supplies	6,100	6,300	**6,500**
Travel	5,750	7,750	**5,750**
Virus-indexing services	3,000	3,000	**3,000**
Plant material	2,500	2,500	
Plot establishment and maintenance	25,500	29,500	**37,500**
Total	89,405	96,279	**101,054**

Footnotes: Salaries include a 1/2 time associate-in-research (2010) responsible for seed collection, raising seedlings in the lathhouse and greenhouse, and tree maintenance in the orchards. Wages are for the equivalent of 4 temporary assistants during bloom and 4 during the summer months Equipment includes propane tanks and frost pots. Supplies include propane, fertilizers, soil, pots, stakes, tree guards, tree labels, nets, chemicals and other lab consumables. $5, 750 is for domestic travel to see various production areas and micro climates, and visiting with operators and handlers while the additional $2000 for travel in 2010 is to attend the Rosaceae genomics conference (RGC5) in South Africa. Virus indexing services include annual ELISA testing of parents used in the breeding program and establishment of virus-free clones in NRSP5 for WSDA virus-free certification status.

OBJECTIVES

The goal of this project is to develop high-quality sweet cherry cultivars ideally suited for PNW growing regions. The specific emphasis of this project will be to:

- Establish and implement best management practices that insure optimal plant materials and protocols for sweet cherry breeding along with active renovation of seedling selection blocks to assure efficient use of field space.
- Assemble support personnel, establish linkages with other researchers and identify resources required for the breeding program.
- Produce genetically-variable sweet cherry selection populations that segregate for important target traits, then select best individuals within outstanding families for those traits.
- Propagate selections that out-perform target market-leading cultivars for performance and adaptation trials in a range of environments.

PROPOSED SCHEDULE OF ACCOMPLISHMENTS

End of year 1 (2009)

1. Establish and implement a written protocol for best nursery and field management that will ensure optimal tree growth for trait selection.
2. Germinate and maintain in the greenhouse ~1200 seed from crosses made in 2008
3. Develop a crossing plan emphasizing inter-mating of cultivars and other germplasm with novel fruit traits and pest and disease resistances.
4. Plant the remaining ~1000 seedlings from 2006 crosses and ~1000 seedlings from 2007 crosses in the field.
5. Evaluate fruit from fruiting seedlings after 5 days storage at 0-4°C for flavor, firmness, fruit size, bitterness, astringency, and skin and flesh colors.
6. Identify superior selections from 2004 & 2005 crosses
7. Propagate elite selections from 2004 & 2005 crosses.
8. Propagate trees to establish a new crossing block at WSU-Prosser.

End of year 2 (2010)

1. Update best management protocol
2. Germinate and maintain in the greenhouse ~2000 seed from crosses made in 2009.
3. Plant ~1000 seedling trees generated from 2008 crosses in the field
4. Develop a crossing plan emphasizing inter-mating of superior selections identified in the previous year.
5. Validate superior selections from 2004 & 2005 crosses and identify superior selections from 2006 crosses that will begin fruiting.
6. Implement selection tests for postharvest pitting and rain cracking for superior selections identified from 2004 & 2005 crosses.
7. Propagate more elite selections from 2005 crosses and superior selections from 2006 crosses.

End of year 3 (2011)

1. Update best management protocol
2. Germinate and maintain in the greenhouse ~2000 seed from 2010 crosses
3. Plant ~2000 seedlings from 2009 crosses in the field
4. Cross superior selections identified in the previous years
5. Implement selection tests for postharvest pitting and rain cracking for superior selections identified from 2004, 2005 & 2006 crosses.

6. Validate superior selections from crosses made in 2004, 2005 and 2006 and identify superior selections from 2007 crosses fruiting for the first time
7. Plant elite clones from 2004 & 2005 crosses at multiple testing locations.
8. Remove seedlings from 2004 & 2005 crosses and prepare land for planting.
9. Propagate superior selections from 2006 & 2007 crosses

The section below on results and discussion will focus on the milestones for 2011.

1. Update best management protocol

A draft of the best management protocol (BMP) for sweet cherry breeding has been developed to provide practical guidelines on breeding program operations such as seed collection and handling, seedling maintenance in the greenhouse and the lath house, tree planting and maintenance in the field, horticultural manipulations to encourage bloom and fruiting, fruit sampling and evaluation to pollen collection and artificial pollination. Additions to this document this year include new protocols for seed planting and seedling maintenance that guarantee ~95% seedling survival at the baby stage under controlled conditions including a temperature of 76 F, RH of 40-45% and 24 hours lighting supplied by grow lights. In the greenhouses, we can generate trees that are over 3 ft tall within 2 months. This accelerated seedling development necessitated field planting of less than a year old trees that are over 3 ft tall. In the previous years it took 2-3 years to generate seedlings of adequate size for field planting. In collaboration with Drs Iezzoni and Peace, standardized phenotyping protocols have been developed for both sweet and tart cherry breeding. These methods were used for the first time in 2010 for fruit quality assessment. Included in the BMP also are horticultural manipulations to slow trees down in the fall months prior to winter.

Table 1. Summary of seedling material developed during 2009-2011 in the PNW sweet cherry breeding program.

	Year		
	2009	2010	2011
No. of new parents used	5	29	6
No. of crosses made	55	107	74
No. seed	5000	2610	1162
% Germination	61	60	na
No. of seedlings	3000	1580	na
No. of seedlings in field	1994*	776*	na
No. of full sib families > 9 individuals	26	7	na

* following marker-assisted seedling selection (MASS). na = not available.

2. Germinate and maintain in the greenhouse ~2000 seed from 2010 crosses

Approximately 4000 seeds were generated from crosses made in 2010 of which 2610 were viable (Table 1). Mean seed germination across crosses was 60% which was very close to the number recorded in 2009. Over 1500 seedlings were raised in the greenhouses. The current main challenge for accelerated seedling development is prolonged seed germination. More than half of the seeds can germinate within six months following cold stratification while about 20-30% depending on cross may not germinate until a year or so later. Experiments are on-going in the

breeding labs to achieve more uniform germination to facilitate more streamlined seedling establishment and field planting.

3. Plant ~1000 seedling trees generated from 2010 crosses in the field

We have continued to stream line tree planting with just two field plantings performed this year (in spring and fall) unlike last year that we had 3 field plantings. Observation of vigor on trees planted in the October of 2009 suggested that the effect of winter freeze was minimal. The staggered nature of the planting was due to a combination of prolonged germination period as mentioned above and accelerated seedling establishment whereby trees grow over 3 ft tall in the greenhouses within 2 months of transplanting. Marker-assisted seedling selection (MASS) was used to cull inferior seedlings and of 1580 seedlings submitted for genetic tests based on DNA markers for self fertility and large fruit size, 776 that had favorable alleles for these traits were identified and planted in the field. To our knowledge, this is the only sweet cherry breeding program in the world that practices MAB. Apart from reducing orchard costs, MAB guarantees that only genotypes that have the potential to yield desired phenotypes are field planted.

4. Develop a crossing plan emphasizing inter-mating of superior selections identified in the previous year.

The crosses performed this year emphasized powdery mildew resistance, large fruit, pistil doubling and both early and late ripening. For large fruit size, advanced selections including FR1T7 (Sweetheart x Chelan), FR2T68 (Sweetheart x Ambrunes) and FR2T72 (Selah x Van) were pollinated with FR3T31 (Lapins x Chelan (13 g), 'Jubile' (14 g fruit) and 'Salihi' (18-20 g fruit) both from Turkey. Crosses for early ripening utilized FR2T10 (Gold x Dzherlo), Chelan, Brooks, Big Burlat, Index and 7146-11 crossed onto 'Kiona', an early variety. Late ripening was combined with powdery mildew resistance using advanced selections and/or cultivars such as DD, BB, Regina and Sweetheart, to ensure late progeny that are powdery mildew resistant since late cultivars are more vulnerable to powdery mildew attack than early ones. We did not use a lot of F_1 seedlings as seed parents due to poor fruit set. Also, many of the seedlings had low flower numbers and were better kept for fruit production. For successful inter-mating of F_1 seedlings it would be worthwhile to bud them on a rootstock.
Hand pollinations started in early April and continued up until the 25th of April. Approximately 70,000 flowers were hand pollinated in Prosser in the rainy and cold weather with a crew of 16. Up to 10 frost events were recorded during this period.

5. Validate superior selections from 2004 & 2005 crosses and identify superior selections from 2006 crosses that will begin fruiting.

Three advanced selections identified in 2009 from 2004 crosses were planted in Phase 2 trials in 2011 while the remaining 4 will be planted in the spring of 2012 at WSU Prosser, OSU MCAREC, Hood River, OSU The Dalles and in grower trials. A majority of these advanced selections had the '255' allele of 'BPPCT034' associated with large fruit. The 5 selections that were discontinued performed below the threshold value for fruit size (10 g), firmness (250 g/mm), soluble solids content (20%) and acidity (0.5%) (Table 2). Based on fruit evaluation of selections identified in 2010, we were able to select 8 individuals for planting in Phase 2 trials in 2012 (Table 3). The selection criteria focused mainly on the threshold values for fruit size, firmness, soluble solids content and titratable acidity. Other criteria for elimination of genotypes include pitting and cracking incidence as well as bitterness and astringency. Apart from fruit quality issues, FR2T38, FR3T75 and FR10T23 were eliminated

because they tested positive for *Prunus* necrotic ring spot virus (PNRSV) and *Prunus* dwarf virus (PDV). FR3T41 and R33T75 were eliminated as well because they had the '223' bp allele of BPPCT034 associated with small fruit. As you will notice, some parents and/or standard cultivars have larger fruit size than these selections. This is because the selection criteria focused not only on large fruit size but also on threshold values of other desirable traits as well. Two of the individuals chosen for powdery mildew resistance (from 'PMR-1') have 'Sweetheart' as a common parent. Although these are not as late ripening as 'Sweetheart', they do constitute an important part of our breeding strategy to develop a suite of new mid- and late-season disease resistant 'spray-free' selections. Finally, 'FR11T59', was selected for higher brix (28%) than those of the two parents including 'Rainier' and 'Regina'. Some fruit from this individual had brix up to 35%.

Another set of 20 individuals were identified for advancement to the Phase 2 following fruit evaluation in 2011 (Table 4). Several of these selections have already been evaluated for 3 years while the majority will be evaluated again in 2013 before identifying selections for planting into Phase 2 trials using a combination of DNA marker information and phenotypic data. It is important to note that the individuals identified fit into 5 target market categories and 5 of these including FR6T97 (Sweetheart x CC), FR7T26 (Sweetheart x CC), FR8T74 (GG op), FR9T89 (Kiona x Chelan) and FR13T54 (Sweetheart x BB) have powdery mildew resistance.

6. Implement selection tests for postharvest pitting and rain cracking for superior selections identified from 2004, 2005 & 2006 crosses.

We are still working on our methodology for recording pitting and rain cracking. In the mean time, we use 'incidence' which is calculated as the number of fruit that had pitting or cracking divided by the total number of fruit evaluated, to record these attributes on seedlings and advanced selections.

7. Propagate more elite selections from 2005 crosses and superior selections from 2006 crosses.

Twenty advanced selections identified in 2011 from 2004, 2005 and 2006 crosses (Table 4) have been propagated on Gisela 6 at Willow Drive Nurseries. These will be evaluated one more time in 2012 to choose individuals for planting into Phase 2 trials.

Table 2: Sweet cherry advanced selections first identified in 2009, their target market group and market leading cultivars for comparison.

Selection Tree Id. No.	Target market category	SI/SF	Harvest date			Fruit wt (g) Threshold 10g			Fruit firmness Threshold 250 g/mm			Fruit SSC Threshold 20%			Fruit TA (%) Threshold 0.5%		
			2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011
	Chelan	*SI*	*25 Jun*	*17 Jun*	*27-Jun*	*8.7*	*10.0*	*8.5*	*251*	*>250*	*282*	*17.9*	*18.0*	*21.6*	*0.98*	*0.73*	*0.78*
FR3T62	ESM	SF	18-Jun		27-Jul	8.0		10.6	239		360	22.3		20.3	0.88		0.62
FR3T13	Valentine[X]		23-Jun		21-Jul	12.0		14.8	196		260	15.7		19.3	0.59		0.58
	Early Robin																
FR1T7	ESB	SF	12-Jun	2-Jul		11.7	10.5		314	317		16.9	20.6		0.93		
FR1T36	Freestone	SI	6-Jul	8-Jul	25-Jul	10.2	11.4	11.9	329	285	331	20.6	18.8	18.0	0.52	0.64	0.69
FR3T10	Freestone	SI	22-Jun		18-Jul	12.1		12.4	209		206	21.0		19.0	0.62		0.63
	Rainier	*SI*	*20-Jul*	*12-Jul*	*14-Jul*	*6.8*	*10.6*	*11.2*	*295*	*300*	*312*	*18.2*	*23.0*	*22.8*	*0.8*	*0.67*	*0.87*
FR2T30	LSB		6-Jul	15-Jul	27-Jul	10.0	9.2	12.8	233	329	287	19.6	20.7	16.0	0.85	0.63	0.87
FR1T14	LSB	SI	1-Jul	8-Jul		11.9	12.6		177	201		21.4	18.6			0.71	
FR2T63	LSB	SF	1-Jul	8-Jul	21-Jul	10.6	11.6	14.0	253	292	331	22.1	21.7	17.0	0.59	0.66	0.61
	Sweetheart	*SF*	*17-Jul*	*!4-Jul*	*29-Jul*	*7.7*	*9.71*	*10.6*	*272*	*297*	*348*	*16.1*	*18.0*	*17.1*	*0.9*	*0.78*	*0.61*
FR1T73	LSM	SI	9-Jul	21-Jul	27-Jul	11.2	10.3	15.0	209	251	258	24.5	27.2	22.0	1.12	0.89	0.89
FR1T74	LSM	SF	2-Jul	21-Jul	21-Jul	13.1	11.6	14.0	250	294	336		23.0	19.0		0.78	1.09
FR1T68	LSM	SI	14-Jul	21-Jul		11.7	11.0		226	254		20.5	21.4		1.1	0.82	
FR1T65	LSM	SI	1-Jul	8-Jul		10.0	12.5		194	204		25.9	18.5		0.7	0.62	

Individuals in red have been discontinued. TA=titratable acidity; SSC-soluble solids content.

Table 3: Sweet cherry advance selections first identified in 2010, their target market groups and market leading cultivars for comparison.

Tree Id. No.	Target market category	Cross	SI/SF	Harvest date			Fruit wt. Threshold 10g			Fruit firmness Threshold 250 g/mm			Fruit SSC Threshold 20%			Fruit TA Threshold 0.5%		
				2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011
	Chelan		***SI***	*25-Jun*	*17-Jun*	*27-Jun*	*8.7*	*10*	*8.5*	*251*	*>250*	*282*	*17.9*	*18.0*	*21.6*	*0.98*	*0.73*	*0.78*
FR3T41	ESM	Lapins x Chelan	SI	1-Jul	14-Jun		6.3	10.5		257	~280		20.7	20.0		1.09	0.56	
	Early Robin																	
FR2T72	ESB	Selah x Van	SI	30-Jun	29-Jun	25-Jul	11.5	13.0	15.3	166	~270	271	21.4	25.0	21.0	1.05	0.88	0.61
	Bing		***SI***	*24-Jun*	*1-Jul*	*27-Jul*	*10.8*	*9.0*	*12.8*	*266*	*271*	*283*	*22.3*	*20.0*		*0.67*	*0.73*	*0.87*
FR1T5	MSM	Swrt x Kiona	SI	12-Jun	27-Jun	6-Jul	8.0	10.5	9.9	333	~280	297	16.7	19.0	16.0		0.74	0.83
FR10T51	MSM	EE x Lapins			1-Jul	21-Jul		11.0	10.2		>300	299		20.0	20.0		0.90	0.89
FR6T93	MSM	Swt x CC			1-Jul	21-Jul		12.0	11.0		300	267		19.0	22.5		0.68	0.71
FR7T37	MSM	Swt x CC			1-Jul	21-Jul		11.5	11.9		300	288		20.0	23.0		0.68	0.98
	Rainier		*SI*	*20-Jul*	*12-Jul*	*14-Jul*	*6.8*	*10.6*	*11.2*	*295*	*~300*	*312*	*18.2*	*23.0*	*22.8*	*0.80*	*0.67*	*0.87*
FR11T59	LSB	Rainier x Regina			8-Jul	21-Jul		11.0	14.8		>250	263		28.0	24.0		0.83	0.81
	Selah		*SF*	*7-Jul*	*8-Jul*	*21-Jul*	*11.7*	*13.5*	*16.8*	*184*	*219*	*275*	*18.8*	*20.0*	*23.4*	*0.75*		*0.97*
FR3T75	E-MSM	Selah op	SF	26-Jun	29-Jun	18-Jul	11.2	11.0	13.6	199	300	210	20.5	19.0	21.0	0.88	0.52	0.61
FR2T68	E-MSM	Selah x Van	SF	30-Jun	21-Jul	25-Jul	10.2	12.0	12.9	200	>270	292	17.6	19.0	18.8		0.73	0.76
	Sweetheart		*SF*	*17-Jul*	*!4-Jul*	*29-Jul*	*7.7*	*9.7*	*10.6*	*272*	*297*	*348*	*16.1*	*18.0*	*17.1*	*0.90*	*0.78*	*0.61*
FR6T59	LSM	Swt x EE			5-Jul	18-Jul		11.5	10.0		>300	288		19.0	22.0		0.74	1.01
FR6T63	LSM	Swt x EE			5-Jul	18-Jul		11.5	12.2		>300	292		22.5	20.4		0.85	1.1
FR10T23	LSM	Lapins x BB			19-Jul			11.0			>270			20.0				
FR2T38	LSM	Lapins x Ambrunes	SI	21-Jul	22-Jul	3-Aug	7.1	10.5	9.2	256	~220	307	19.8	20.0	14..9	0.67	0.61	0.49

FR3T075 and FR10T023 tested positive for PDV while FR2T038 have PNRSV, and have been discontinued along with FR2T68 and FR3T75. TA=titratable acidity; SSC=soluble solids content.

Table 4: Sweet cherry advance selections first identified in 2011, their target market groups and market leading cultivars used for comparison.

Tree Id. No.	Target market category	Cross	SI/SF	Harvest date			Fruit wt. (g) Threshold 10 g			Fruit firmness (g/mm) Threshold 250 g/mm			Fruit SSC (%) Threshold 20%			Fruit TA (%) Threshold 0.5%		
				2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011
	Chelan		***SI***	***25-Jun***	***17-Jun***	***27-Jun***	***8.7***	***10.0***	***8.5***	***251***	***>250***	***282***	***17.9***	***18.0***	***21.6***	***0.98***	***0.73***	***0.78***
FR9T89	ESM	Kiona x Chelan				23-Jun			10.1			301			16.0			0.64
FR9T33	ESM	Swt x Moreau				23-Jun			10.1			296			16.0			0.75
	Rainier		***SI***	***20-Jul***	***12-Jul***	***14-Jul***	***6.8***	***10.6***	***11.2***	***295***	***~300***	***312***	***18.2***	***23.0***	***22.8***	***0.80***	***0.67***	***0.87***
FR1T70	LSB	Swrt x Regina	SI	26-Jun	19-Jul	29-Jul	8.5	10.1	13.1	283	232	300	21.9	23.6	21.0	0.59		0.86
FR2T24	LSB	Selah x Sunburst	SF	23-Jun		29-Jul	12.5		13.6	178		277	17.8		23.0	0.76		0.51
FR9T37	LSB	DD x Lapins				18-Jul			11.4			302			21.0			0.69
FR4T29	LSB	Selah x Krup				25-Jul			13.1			312			22.0			0.76
FR49T83	LSB	Swtt x Tieton				3-Aug			12.9			339			20.0			0.4
	Bing		***SI***	***24-Jun***	***1-Jul***	***27-Jul***	***10.8***	***9.0***	***12.8***	***266***	***271***	***283***	***22.3***	***20.0***		***0.67***	***0.73***	***0.87***
FR8T74	MSM	GG op				18-Jul			12.5			286			20.0			0.85
	Selah		***SF***	***7-Jul***	***8-Jul***	***21-Jul***	***11.7***	***13.5***	***16.8***	***184***	***219***	***275***	***18.8***	***20.0***	***23.4***	***0.75***		***0.97***
FR5T40	E-MSM	Selah x Selah				25-Jul			11.3			330			20.0			0.49
FR13T71	E-MSM	Selah x Moreau				25-Jul			10.2			272			27.0			0.81
	Sweetheart		***SF***	***17-Jul***	***!4-Jul***	***29-Jul***	***7.7***	***9.7***	***10.6***	***272***	***297***	***348***	***16.1***	***18.0***	***17.1***	***0.90***	***0.78***	***0.61***
FR6T97	LSM	Swt x CC				18-Jul			12.4			307			20.0			1.00
FR7T26	LSM	Swt x CC				27-Jul			13.3			285			22.0			1.04
FR7T45	LSM	Regina op				3-Aug			10.4			338			20.0			0.62
FR7T47	LSM	Regina op				18-Jul			11.3			329			21.0			0.87
FR8T28	LSM	Rainier x Summit				21-Jul			11.1			312			23.0			0.49
FRIT50	LSM	Swrt x Regina	SI	26-Jun	6-Jul	27-Jul	9.9	13.3	13.2	209	278	346	18.0	19.9	20.0	0.83	0.81	0.8
FR2T62	LSM	Lapins x Ambrunes			15-Jul	27-Jul		8.2	10.6		282	360		19.7	20.0		0.64	0.62
FR13T4	LSM	Swrt x BB				29-Jul			15.3			329			21.0			0.77
FR13T10	LSM	Swt x BB				25-Jul			10.7			319			27.0			0.97
FR13T54	LSM	Swrt x BB				25-Jul			10.2			303			24.0			0.77

TA=titratable acidity; SSC=soluble solids content.

EXECUTIVE SUMMARY

- The program has developed a work in-progress best management practice document which provides guidelines on all aspects of sweet cherry breeding from seed collection to seed germination, seedling development in the green houses, tree management in the lathhouse, field planting and tree establishment, horticultural manipulations to encourage quick bloom and fruiting, fruit sampling and phenotyping protocols to selection criteria.
- There are 2 full time technicians in the program; one funded by WTFRC/OSCC and the other by the University. There is active collaboration with scientists within and outside of WSU as well as with overseas scientists. Infrastructure such as post-harvest fruit quality and molecular labs, greenhouses, shade house and orchard facilities constitute the foundation of a state-of-the art sweet cherry breeding and genetics program.
- Crosses have been made to date that emphasize novel sources of self fertility, large fruit size, powdery mildew resistance, novel flavors, bacterial canker resistance, cracking resistance, extended ripening date, high firmness, high soluble solids content, mechanical harvesting, reduced pistil doubling, cold tolerance, less bitterness and astringency. The germplasm base includes commercial cultivars, advanced/elite selections, wild and/or exotic germplasm, and ancestor cultivars. The crosses made in the last 2 years resulted in a total of 6580 seedlings of which 2772 were field planted following marker-assisted seedling selection. The crosses made in 2011 resulted in 1162 seeds which are currently under stratification in the cold room.
- Fruit evaluation was conducted for the first time in the program in 2009 and in subsequent years resulting in the identification of 15 advanced selections. Three of these have already been planted into Phase 2 trials at WSU Prosser, OSU MCAREC Hood River and The Dalles, as well as, in a grower trial in N Wenatchee. The remaining 12 genotypes will be planted in the spring of 2012. The 20 potential advanced selections identified in 2011 will be evaluated one more time in 2012 to eliminate individuals that do not have consistent performance or those that perform below threshold values for priority traits. Chosen individuals will be planted in Phase 2 trials in 2013.
- A parental crossing block has been established at the Roza orchards with 66 cultivars/F_1 seedlings and advanced selections. The first parental set planted in 2009 fruited for the first time in 2011 and these will be used for crosses in the spring of 2012.
- Approximately 1.0 acre of the seedling block at Roza orchards including 2004 and 2005 crosses have been pulled out following completion of fruit evaluation and identification of advanced selections in those blocks.
- Marker assisted breeding (MAB) is now routine in the breeding program. S-locus markers for self (in) compatibility have been in use since 2009 and these markers help to determine cross-compatibility and /or self fertility. Marker-assisted parent selection (MAPS) based on G2 markers is used to select parents to cross to encourage a high proportion of genetically superior progeny while marker-assisted seedling selection (MASS) is used to cull genotypes that have undesirable alleles for fruit size and firmness before field planting.
- The first set of virus clean advanced selections (18 in number) were planted at the pear acre orchards to provide a source of virus clean wood for phase 3 tree propagation.
- Bird netting has been installed at the seedling block at the Roza orchards covering an area of 8.0 acres.
- The powdery mildew advanced selections including AA, DD, GG and JJ from Sagemoore farms in Pasco as well as from WSU Prosser orchards were evaluated again in 2011. We will be compiling data from these genotypes collected since 2006 for presentation to the Cherry advisory committee who will then make a final decision to either advance or discontinue these genotypes.