

FINAL PROJECT REPORT

Project Title: Maintenance and evaluation of sweet cherry breeding program germplasm

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Collaborators: Cameron Peace (WSU), Todd Einhorn (OSU),
Cooperators: Tom Auvil (WTFRC), Ines Hanrahan (WTFRC)

Total Project Request: Year 1: \$129,350

Budget 1: WTFRC Collaborative expenses

Organization Name: WA Tree Fruit Research Commission (WTFRC)
Contract Administrator: Kathy Coffey **Telephone:** 509 665 8271
Email address: Kathy@treefruitresearch.com

Item	Proposed 2016	Actual 2016
Salaries		22,767
Benefits		5,758
Wages	8,366	15,145
Benefits	3,256	2,517
Supplies	200	277
Travel to plots	2,160	
WTFRC staff	1,500	
Total	15,482	46,464

Budget 2:

Organization Name: WSU Prosser
Telephone: 509 786 9283

Contract Administrator: Hallie Faulk
Email address: prosser.grants@wsu.edu

Item	2016
Salaries ¹	38,250
Benefits	12,699
Wages ²	2,640
Benefits	422
Supplies	3,053
Travel	1,000
Plot Fees ⁴	9,025
Plot establishment /maintenance	64,500
Subtotal	\$131,589
Carry over from 2015	\$49,538
Total 2016 request	\$82,051

¹ Salary and benefits for Associate in Research to supervise greenhouse, field, and lab activities; collect data and collate data; coordinate activities with WSU and WTFRC personnel. Additional salary will be provided by the WSU ARC.

² Wages and benefits for temporary employees to assist in foliar and fruit evaluations

⁴ Land use fee \$475/acre.

Budget 3: Todd Einhorn
Organization Name: OSU-MCAREC
Telephone: 541-737-3228

Contract Administrator: Russell Karow
Email address: Russell.Karow@oregonstate.edu

Item	2016
Salaries¹	4,357
Benefits²	3,006
Wages³	13,000
Benefits⁴	1,084
Equipment	0
Fees and Supplies⁵	4,304
Travel	0
Miscellaneous	0
Total	25,751

¹Estimated salaries for: 0.096 FTE (5 weeks) for full-time technician for orchard maintenance and data collection.

²Actual OPE rate 69%.

³Wages for 1,000 hours for three part-time employees (\$13/hr) to assist with tree planting, weeding, bird netting, harvest, data collection and analyses.

⁴Benefits for part-time employees is 8.34%.

⁵Supplies include tree guards/paint, training materials (bamboo, spreaders, tape, fertilizer, filters and buffers for juice analysis, lab tape, and labels). Fees include per acre research plot fees: \$3,104/acre and 2 months cold storage room fee (\$0.94 per square foot).

Budget 4

Organization Name: Willow Drive Nursery Inc. Contract Administrator: Hal Leedy
Telephone: 509 787 1555 Email address: Hal@willowdrivenursery.com

Item	2016
Salaries	
Benefits	
Wages	
Benefits	
Equipment	
Supplies	
Tree propagation¹:	
advanced selections	
Parents	
Miscellaneous	
Total	6,066

¹ Tree propagation fee is \$11.23 per tree, with a target of 60 trees per genotype. Purchased trees include 5 PNWSCBP selections and 5 commercial cultivars.

OBJECTIVES

The Pacific Northwest Sweet Cherry Breeding Program (CBP) was established to develop superior new cultivars for the Oregon and Washington State industries. Germplasm maintenance and breeding activities require consistent and effective management of greenhouse, lath house, field and lab operations. Furthermore, phenotypic evaluations of tree characteristics and fruit attributes must be well-documented and commercially relevant. The 2016 proposal aimed to continue the focus on improving efficiency and productivity and targeting genotypes in critical market classes.

Specific objectives

1. Continue improvement of horticultural practices in greenhouse, lath house, and field plots
2. Implement standardized phenotyping protocols in field and lab evaluations
3. Improve maintenance of P2 plantings at Pasco, Roza, and Hood River
4. Conduct tree, foliar and fruit evaluations of selected genotypes in P1 and P2 plantings

SIGNIFICANT FINDINGS:

- Horticultural management practices were improved by applying contemporary horticultural techniques and regular observation of the blocks during the season.
- Guidance by representatives of the CBP Advisory Committee and WTFRC staff facilitated the assessment of overall condition and identify specific needs.
- By utilizing nutritional diagnostic tools, specific deficiencies, weak root development, and drainage problems were identified and are being remedied when possible.
- Identification of viruses (visual symptoms, Elisa and PCR techniques) allowed the identification of viruses in the CBP which resulted in the removal of eight complete acres (F block) and another 80 trees in C block.
- In P1, 7% of 3710 seedlings were evaluated in the laboratory for fruit quality. Among the evaluated trees 37% meet the size and firmness thresholds and 8% (15 seedlings for Mahogany and 5 seedlings of blush) were considered very promising and will be followed in the coming years.
- In P2, a total of 39 selections (21 first bearing) were evaluated in three locations (Prosser, Pasco, Hood River) in 2016. Three blush and two mahogany selections (fully bearing) met minimum industry thresholds, but when considering additional horticultural traits, no recommendation for advancement to P3 is currently warranted.

RESULTS & DISCUSSION

Objective 1 (horticulture):

1.a) The historical data base of field plots (maps) from 2009 to 2015 was analyzed and organized into a single data base, trees were identified and relabeled according to the location and available information of crossing, parents, planting year and historical evaluation data, for accurate field identification and laboratory analysis. Labels in the field contain bar code technology to track the identification throughout the field evaluation process and laboratory analysis which facilitated the identification process in the laboratory.

1.b) Horticultural practices in 2016 are detailed in Table 1 and were implemented by WSU with guidance from the WSU Cherry Breeding Program Advisory Committee (BPAC; D. Ybarra, J. Cleveringa, M. Hanrahan, E. Shrum, D. Crouse and M. Whiting) and input from WTFRC staff members (I. Hanrahan and T. Auvil). Blocks were inspected weekly to assess overall status and to ascertain plot-specific needs. A total of four written updates on program activities was prepared during the season and shared with BPAC.

Table 1. Timeline of 2016 crop management activities for WSU Prosser CBP field plots.

Activity	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pruning ¹	*	*			*	*	*				
Weed control		*	*	*	*	*					
Fungicide ²				*	*	*					
Insecticide ³				*	*	*	*				
Irrigation			*	*	*	*	*	*	*		
Planting ⁴			*								
Netting ⁵				*							
Harvest				*	*	*					
Fertilizer ⁶		*	*	*	*			*			
Mowing			*	*	*	*	*				
Tree removal ⁷				*	*	*				*	*

¹Summer pruning was performed during harvest time with WSU crew to promote better light interception inside the tree and blocks. We incorporated mechanical pruning to reduce tree size.

²Fungicide spray in all Cherry Breeding blocks except in seedling (C 51-52 and F 12 -18).

³Insecticide application for WCFE, SWD and mites.

⁴Planting of 53 trees (B 52 Row 1)

⁵ For P1 netting was performed in early maturing trees only.

⁶ Foliar spray of Metalosate B and Metalosate Zn early spring. N-P-K (16-16-16) applied in new planting. Iron DP was applied to targeted trees through soil, and foliar spray of Zn sulfate donated by GS long. Elemental S was applied in Row 8 to the soil, product donated by Simplot.

⁷ Tree removal was performed during the season as soon as identified as virus infected tree, bacterial canker (on the trunk), or weak trees. F block removal will be performed in November – December.

1.c) Health Diagnostics

We incorporated standard horticultural techniques for orchard diagnostic, which included visual analyses and symptomatology descriptions soil and foliar nutrient analyses, soil profile identification and laboratory testing for viruses. Nutritional deficiency symptoms were identified in individual trees. To associate the symptoms with nutrient deficiencies, absorption problems or diseases, we evaluated the roots and soil of both healthy and unhealthy trees. Soil and foliar samples were sent for chemical analyses.

After analyzing soil nutrient availability and the nutrient content in the tree, we observed zinc (Zn) deficiencies in leaves and generally low potassium (K) level. However, nutrient content in the soil showed high levels of phosphorous (P) and potassium (K). In some cases, we observed high levels of boron (B) in leaves. High levels of both P and K in the soil are a consequence of many years of fertilization, as both nutrients have low mobility in a silt loam type of soil. Even though high levels of P and K are not toxic to the plants, they can affect the absorption of other micronutrients and fruit quality. High levels of elements in the soil and low in the leaf indicates absorption issues associated with pH, deficient or excess of water in the root zone, pathogens, or other factors.

Root analyses revealed high variability in development and condition in the seedling blocks that were highly correlated with nutrient status. The smaller trees showed very low root development and lack of fine roots and root growth only within the potting substrate (mixture that differ greatly from the soil) while larger trees had better root growth.

A similar situation was observed in the young trees in C block where the trees were planted with the pot. Multiple trees were evaluated and in most cases the pot is still in good conditions (not degraded) and roots haven't been able to penetrate to the soil. Also, the soil of the pot and the site was very different in texture, porosity, density and organic matter, which generated a physical barrier for water

infiltration and roots growth. As a consequence, the roots are unable to grow beyond the pot and substrate.

Consequently, in the seedlings block the fertilization should be accomplished via foliar applications. For higher demand of macronutrients, the application should be made locally in the root zone. Unfortunately, it is likely that the root condition of these trees can hide the real potential of the seedling.

Trees with symptoms of viral infection were analyzed. In total, 13 samples were tested for PDV (Elisa), PNRSV (Elisa) and/or TriFoCap (PCR, broad spectrum test). Four samples were positive to PDV and six were positive to TriDoCap. Two samples were positive to both and no sample was positive to PNRSV. Virologists Bill Howell and Dan Villa or helped identifying symptoms in the field were we could find also Rusty Mottle Disease.

Trees from C block infected with virus or with clear virus symptoms were removed immediately and the trunk painted with glyphosate herbicide. Adjacent trees are continuously monitored, as both viruses can spread by grafting. The complete F block (eight acres) will be removed during winter to prevent disease spread and also to reduce the foot print of the CBP.

Objective 2 protocol: In 2016, all protocols utilized in 2015 were improved and further standardization of methods accomplished. For example, all selections in P2 were evaluated for doubling, received green fruit thinning followed by netting and finally an on-tree cracking evaluation if sufficient rain fall was received within two weeks of commercial harvest. All postharvest evaluations were coordinated between B. Sallato and the WTFRC team, based on agreed upon standardized procedures.

Four different protocols for evaluation of powdery mildew were developed and tested during the season: 1) orchard assessment of primary infection 2) assessment of secondary infection e to ascertain the spread of disease after primary infection, 3) a standardized leaf disk assay in the laboratory for foliar incidence and severity evaluation, and 4) evaluation of inoculated fruit in the orchard. As a result, all the protocols are developed and were able to give useful information regarding susceptibility. Orchard evaluations (protocols number 1 and 2) provided information regarding primary infection, which adds another layer to susceptibility/resistance evaluation. Protocol number 3 facilitated the standardization of assessments of foliar susceptibility, and protocol 4 (evaluation of inoculated fruit) permitted the identification of less susceptible selections. However, 2016 was an atypical powdery mildew year with late primary infection. It is unclear how many fruit from the breeding blocks 'escaped' infection.

Objective 3 (maintenance of P2): All horticultural practiced detailed in Table 1 were also performed in P2 blocks at Roza. Other P2 plantings at Sagemoor and Hood River were managed separately. All P2 plantings followed horticultural observations as detailed in the *WSU Cherry Breeding Protocol*. This series of protocols was developed collaboratively by WTFRC, WSU, OSU and others to ensure consistent and continued data collection, regardless of program staff turnover. Major tasks were synchronized across all locations include: full bloom timing observation, green fruit thinning and netting, preharvest evaluations (doubling, cracking, heat damage), harvest timing determination, harvest, and storage. Evaluated selections observed were not treated with GA. Fruit storage time was increased from two to three weeks in 2016. Fruit was held at 33F in clamshells.

Objective 4 (P1 and P2 results):

P1; B. Sallato, WTFRC staff and BPAC members inspected established P1 selections twice per week in order to identify selections for harvest and laboratory evaluations to make general orchard observations.

Fruit considered large and firm with less than 10% observed defects and good flavor were harvested for laboratory evaluation. Mahogany type fruit were harvested with color between 4 and 5 (according to a CTIFL chart) while blush types were harvested when more than 25% of the fruit had blush color and 17 brix. For trees with sufficient yield (more than 100 fruits), we performed up to two harvests. Of a total of 3710 productive trees in P1, 263 seedlings (7%), were selected for laboratory analysis (202 mahogany and 61 blush). The following figure shows a detailed sequence of trees and harvest date for mahogany and blush seedlings. Standards from the advance selection block (Jun 2: Early Robin, Chelan, June 6: Rainier, June 16: Bing, June 30; Sweetheart) were included as references.

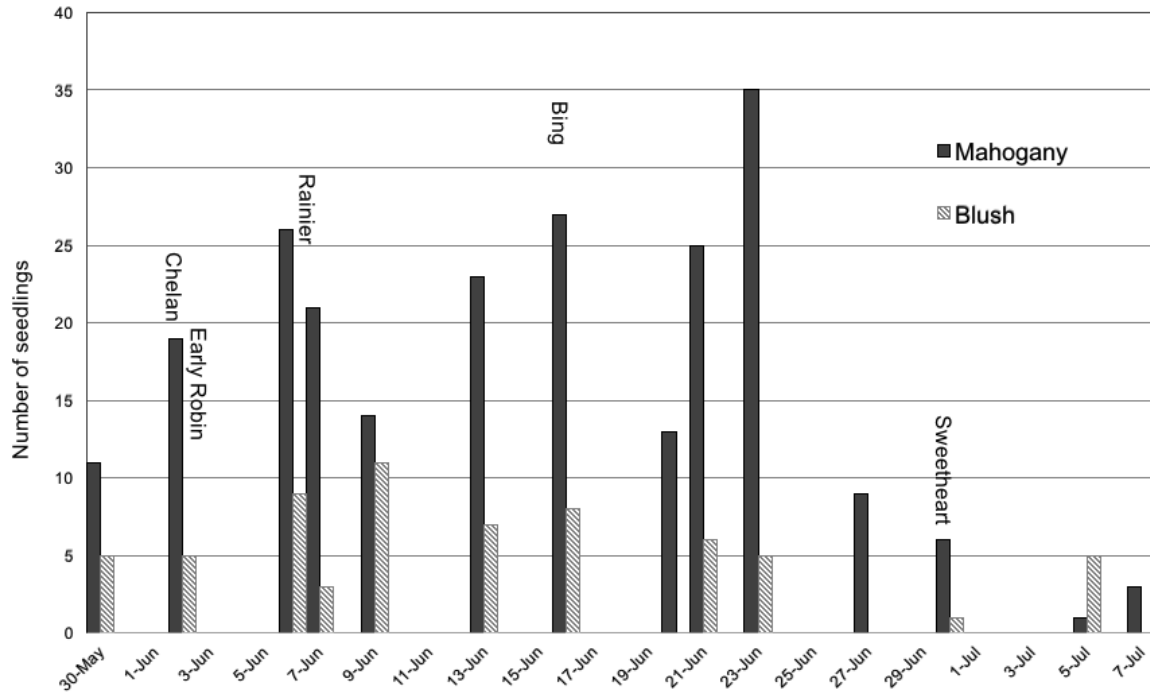


Figure 3. Timeline of number of seedlings by harvest date for mahogany and blush at Roza in 2016.

The percentages of early, middle, and late season mahogany were 38%, 39% and 23% respectively, and for blush cherries, were 48%, 34% and 18% respectively. The seedlings that met size and firmness BPAC thresholds, were 38% for mahogany and 36% for blush cherries (data not shown). Listed in Tables 2 and 3 are seedlings considered very promising for each market class. These selections met the size and firmness in 2016, plus additional traits like flavor, defects, soluble solid content and titratable acidity.

Table 2. Most promising selections for mahogany market class.

Market Class	Harvest date	Location	Fruit Wt. (g)	Row size	Firmness (g/mm)	Pull Force (Kg)	Color (1-7)	SSC (Brix)	TA (% Malic)
Control	6/2	Chelan	8.1	10.5	312.0	1.60	4.9	18.3	0.9
EM	5/30	FR39T121	11.9	9.2	306.4	1.18	4.2	19.0	0.9
EM	6/9	CR08T07	11.1	9.3	286.1	1.09	6.8	23.4	-
Control	6/16	Bing	8.7	10.2	310.0	1.40	5.3	23.1	0.9
MM	6/16	CR6T22	10.8	9.4	468.4	0.86	4.2	22.3	0.9
MM	6/20	FR39T117*	15.2	8.5	326.5	0.76	6.1	22.6	0.8
MM	6/20	FR39T112	13.6	8.9	286.4	0.84	7.0	23.2	0.9
MM	6/20	FR40T112	16.5	8.5	308.1	0.59	5.9	21.5	0.9
MM	6/21	FR52T60	11.4	9.6	478.7	0.89	4.2	18.9	1.2
LM	6/23	CR1T79*	12.3	9.1	409.2	0.75	5.0	21.1	0.9
LM	6/23	CR10T11	11.1	9.4	355.9	0.98	5.0	23.8	1.0
LM	6/27	CR1T69	12.4	9.3	306.4	0.47	4.5	17.6	0.7
Control	6/30	Sweetheart	8.9	10.4	350.0	0.90	4.1	23.6	0.9

*Selections considered good in others years.

The gray boxes in Table 2 indicate excellent values for size and firmness (row <8.5 and firmness > 400 g/mm). In these cases, even though some did not meet the BPAC firmness threshold (> 300 g/mm), they had a firm or crunchy taste. The advanced selections FR39T117, currently being propagated in the nursery, also showed excellent quality. Standards from the advance selection block (B48) were thinned (30 fruit per foot), while the seedlings were not thinned.

Table 3. Most promising selections for blush market class

Market Class	Harvest date	Location	Fruit Wt. (g)	Row size	Firmness (g/mm)	Pull Force (Kg)	Color (1-7)	SSC (Brix)	TA (% Malic)
Control	6/2	Early Robin	12.0	9.5	362.0	1.90	B	17.1	0.6
Control	6/6	Rainier	7.5	10.5	257.0	1.50	B	18.4	0.7
MB	6/9	FR40T108	13.5	8.9	281.8	1.43	B	NA	NA
LB	6/13	F070T089	14.0	8.5	320.0	0.82	B	NA	NA
LB	6/23	C03T124	13.5	8.9	308.0	0.83	B	21.4	1.0

All promising selections will be followed next season and evaluated for other traits including storage, while the F seedlings will be propagated by WSU personnel on Gisela rootstock to preserve the material.

P2: In P2, 39 selections (21 first bearing) were evaluated in Prosser and Pasco led by Ines Hanrahan (WSTFRC), and 14 selections (R2,5,6,7,8,9,12,13,14,15 and 16) were evaluated by Todd Einhorn in Hood River (OSU).

During bloom, the WTFRC team visited the Roza and Sagemoor plantings twice a week to assess bloom stage, record full bloom dates and GDD's at full bloom (not shown). Briefly, we had a very narrow peak bloom distribution between cultivars. At Sagemoor, all selections reached full bloom within eight days, while full bloom dates at Roza were recorded in a mere three day span. At Hood River, full bloom was recorded between the 5th and 11th of April. In addition, full bloom fell in one of two basic patterns: 1) full bloom peaks at one observation date, 2) full bloom plateaus for up to 4 days (not shown).

Plantings were visited weekly after bloom. The amount of fruit doubles present in each selection was assessed on April 25-28. In general, the amount of doubles in 2016 was low. Several advanced selections showed doubling presence at similar rates to known standards (R 13,14,16,10) while another group of selections had no doubles (R 1,3,4,5,11,17,18). The WTFRC team performed green fruit thinning (30 fruit/foot) at Roza on May 5th, while Dave Allan directed green fruit thinning at Sagemoor.

In summary, R25, R2, R14, R10 and the standards Bing, Sweetheart and Rainier required heavy thinning, while R1 and R4 were not thinned due to low fruit set. All trees were pruned (topping) mechanically by Matt Whiting to facilitate netting. All trees were netted on May 11 under the leadership of Kyle Tynan utilizing both WSU and WTFRC staff. We recorded all rain events and assessed cracking percentage of fruit if more than 0.1 inches of rain (in a single event) was received within 14 days of respective harvest. Fruit maturation was tracked bi-weekly.

Table 4: Performance of all selections evaluated in 2016 at Roza P2 planting when considering minimum BPAC requirements (firmness and size)

Harvest date	Cherry color	Selection	Market class	min. BPAC threshold met	Better than standard	Years observed*	Firmness		Row size (8-13)
							g/mm	% > 300	
6/2	blush	Early Robin	early	standard	standard	2	362	90	9.5
6/2	blush	R16	early	yes	no	2	302	48	9.5
6/6	blush	Rainier	midseason	standard	standard	2	257	9	10.5
6/6	blush	R10	midseason	yes	yes	2	315	60	9.9
6/13	blush	R9	late	yes	yes	2	355	91	9.4
6/16	blush	R7	late	no	yes	1	536	100	10.4
6/16	blush	R11	late	yes	yes	1	461	99	10.0
6/16	blush	R5	late	yes	yes	1	348	88	9.1
6/2	mahogany	Chelan	early	standard	standard	2	312	56	10.5
6/2	mahogany	R25	early	no	no	2	313	62	10.6
6/6	mahogany	R2	early	no	no	2	230	6	10.5
6/9	mahogany	R14	TBD	no	TBD	2	284	34	9.8
6/16	mahogany	R8	midseason	yes	yes	2	319	63	9.7
6/16	mahogany	Bing	midseason	standard	standard	2	310	54	10.2
6/16	mahogany	R6	midseason	yes	yes	2	327	76	9.1
6/27	mahogany	Selah	late	standard	standard	2	315	59	9.1
6/27	mahogany	Lapin	late	standard	standard	2	353	88	9.7
6/30	mahogany	Sweetheart	late	standard	standard	2	350	85	10.4
6/6	mahogany	R3	early	no	no	1	288	71	9.1
6/6	mahogany	R15	early	no	no	1	252	1	10.0
6/9	mahogany	R13	TBD	no	TBD	1	340	80	10.4
6/9	mahogany	R12	TBD	yes	TBD	1	383	96	8.2
6/13	mahogany	R1	midseason	yes	yes	1	347	80	9.1

None of the selections with fully mature trees at Sagemoor met all quality criteria set by BPAC for their respective harvest time frame (not shown). At Roza, selections that met all criteria including the blushes R16, 10, 9 and the mahogany R6, 8 (Table 4). Some selections bearing for the first time this year have shown promise by meeting all established benchmarks: R3 (mahogany, Sagemoor only), R24 (blush, Sagemoor only), R11 + R7 (blush, Roza); R1 (mahogany, Roza). Selections that met both thresholds at Hood River were the mahogany R6 and the blushes R12, R7, R9, however all selections showed high percentage of cracking (R6 and R12 over 49%; no data for R9; Table 6). More than 14 inches of rain were recorded at MCAREC recorded by Jun 6.

Table 5 shows all five selections harvested from mature trees that met minimum BPAC requirements (Roza data only) and the results for additional traits. When considering eight additional horticultural traits and six postharvest quality indicators, none of these selections warranted immediate advancement to P3. All exhibit at least two major flaws (i.e. performing below industry standard). R6 exhibited two potentially fatal flaws, by showing a propensity for pitting and shrivel when compared to Bing.

Table 5: Additional horticultural traits of P2 selections (Roza only) of all mature selections meeting minimum BPAC performance requirements in 2016

Color		Blush			Mahogany	
Selection		R16	R10	R9	R6	R8
Class		early	midseason	late	midseason	midseason
Horticultural traits (units)						
Harvest time	days \pm the standard	0 (Early Robin)	0 (Rainier)	+ 7 (Rainier)	0 (Bing)	0 (Bing)
90% above 300g/mm	yes/no	no	no	yes	no	no
Self-fertility	DNA-tested	No	yes	TBD	Yes	TBD
Powdery mildew sensit.	yes/no	TBD	TBD	TBD	TBD	TBD
Cracking	%	5.7	4.6	0	0.42	0.56
Doubling	%	1	0.6	0	0	0
Flavor at harvest	better than standard	yes	yes	yes	yes	no
Thinning need	yes/no	yes	yes	yes	yes	yes
Better yield efficiency	yes/no	no	no	no	no	no
Postharvest						
Pitting	better than standard	no	yes	yes	no	no
Induced pitting	better than standard	yes	yes	no	no	no
Stem browning	better than standard	yes	yes	yes	yes	yes
Shrivel	better than standard	yes	yes	yes	no	yes
Luster	better than standard	no	no	no	no	yes
Flavor	better than standard	yes	yes	yes	yes	no
Fatal flaw*						
					pitting shrivel	

*at least 100% worse than standard

Table 6. P2 Harvest data, MCAREC. Data are means of 5 reps. FF, fruit firmness; PRF, pedicel retention force; SSC, soluble solids; TA, titratable acidity. n.d, no data.

Cultivar	Harvest Date	Yield (lbs/tree)	FF (g/mm)	Fruit diam. (mm)	Fruit sz (row sz)	Fruit wt. (g)	Skin color (ctifl)	Cracking (%)	PRF (g)	SSC (%)	TA (%)
Early Robin	6-Jun	< 1	304.2	31	9	12.2	BLUSH	n.d.	n.d.	17	0.64
R 16	6-Jun	1.3	289.8	30.9	9	11.9	BLUSH	49.4	614.8	17.5	0.98
FR1T5	9-Jun	< 1	339.3	29.2	9.5	10.7	4.7	100	681.3	18.7	0.74
R 2	10-Jun	2	234.4	26.4	10.4	8.8	4.7	29.6	701.8	17.3	0.88
R 15	16-Jun	3.7	248.3	28.7	9.6	10.2	5	50.5	638	18.2	0.96
R 6	16-Jun	7.7	321.3	31.8	8.7	11.4	4.5	27.5	776.5	19.2	0.88
Rainier	16-Jun	7.4	222.3	30.3	9.1	n.d.	BLUSH	n.d.	633.8	17.8	0.46
R 8	21-Jun	5.3	274.9	29.3	9.4	10.9	4.7	28.7	812.4	16	0.68
R 13	21-Jun	32.4	277.1	27.7	9.9	9.8	5.6	22.2	595.1	16.3	0.68
R 14	21-Jun	14.4	244.8	30.2	9.1	12.3	5.3	19.6	595.7	17.5	0.91
Bing	21-Jun	11.9	222	28.3	9.6	9.6	4.6	16	173.8	18.4	0.65
R 5	22-Jun	< 1	261.7	29.7	9.3	11.1	BLUSH	49	457.2	17.6	0.71
49T83	22-Jun	< 1	375.3	31.8	8.7	13.4	BLUSH	37.5	798.5	17.3	0.44
R 12	22-Jun	< 1	372.9	30.8	9	12	BLUSH	70.1	456	17	0.56
R 7	22-Jun	< 1	401.4	30.6	9	11.1	BLUSH	18	773.2	17.6	0.68
13T4	30-Jun	< 1	318.5	31.6	8.7	13.7	4.6	39.5	552.5	20.2	0.77
R 9	30-Jun	< 1	309.3	31.8	8.7	12.8	BLUSH	n.d.	744.8	18.8	0.73
Sweetheart	7-Jul	2.3	355.2	29	9.5	10.7	4.5	7	372	20.7	0.82

Note: the cultivar identification has been change to Roza identification to facilitate the analyses.

EXECUTIVE SUMMARY

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Major accomplishments in 2016 include:

- Horticultural management practices were improved by applying contemporary horticultural techniques and regular observation of the blocks during the season.
- Guidance by representatives of the CBP Advisory Committee and WTFRC staff facilitated the assessment of overall condition and identify specific needs.
- By utilizing nutritional diagnostic tools, specific deficiencies, weak root development, and drainage problems were identified and are been taking care of when possible.
- Identification of viruses (visual symptoms, Elisa and PCR techniques) allowed the identification viruses in the CBP which resulted in the removal of eight complete acres (F block) and another 80 trees in C block.
- In P1, 7% of 3710 seedlings were evaluated in the laboratory for fruit quality. Among the evaluated trees 37% meet the size and firmness thresholds and 8% (15 seedlings for Mahogany and 5 seedlings of blush) were considered very promising and will be followed in the coming years.
- In P2, a total of 39 selections (21 first bearing) were evaluated in three locations (Prosser, Pasco, Hood River) in 2016. Three blush and two mahogany selections (fully bearing) met minimum industry thresholds, but when considering additional horticultural traits, no recommendation for advancement to P3 is currently warranted.