

## FINAL PROJECT REPORT

**Project Title:** Support for a full time technician

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**Cooperators:** Jim McFerson, Amy Iezzoni, and Fred Bliss

### 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-PI includes 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 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-PI includes Oraguzie

**Agency name:** WTFRC/OSCC  
**Amount awarded:** \$62K from 2011-2012  
**Notes:** Understanding the genetic basis of powdery mildew resistance in sweet cherry: PI: Oraguzie

**Total Project Funding:** \$79, 222

### Budget History:

Item	2010	2011	2012
Salaries	16,340	17,372	18,067
Benefits	8,660	9,207	9,576
Wages			
Benefits			
Equipment			
Supplies			
Travel			
Plot Fees			
Miscellaneous			
<b>Total</b>	25,000	26,579	27,643

## **JUSTIFICATION**

One of the objectives of the WSU sweet cherry scion breeding proposal funded in the last round (WTFRC # CH-09-902) was to assemble adequate personnel to ensure that healthy, vigorous plant materials of adequate size are produced. A lot of progress has been made in this respect over the past year and we now have 1.5FTE technicians assisting the breeder with the day-to-day management of breeding operations. One FTE technician (Blessing Athanson) is funded through WSU-ARC while the other 0.5FTE (Addie Dahl's position) is funded by WTFRC/OSCC. There is also an orchard manager (Clint Graff) funded by WSU-ARC who spends ~33% of his time in the breeding program helping with horticultural manipulations and general orchard management. Jan Burgess with 20 years experience working for the WSU National Clean Plant Network (NCPN) program is hired for an hour/day by the breeding program to advise on seedling development in the greenhouse and lathhouse.

In 2009, fruit were harvested from all crosses made in 2004 and from some 2005 crosses for the first time (i.e., since the breeding program started receiving funding from WTFRC/OSCC) and the best trees with commercial potential have been selected and propagated for more advanced tests. As the program moves to the stage where there is constant fruit production, fruit quality phenotyping, selection of best progenies, propagation, planting and testing of selections in more advanced trials, there is a need for another 0.5FTE technician. This person will be responsible for seed handling, horticultural manipulation of trees in the lathhouse and field, field plot management, and coordination of fruit sampling and tree propagation. The goal of this position is to ensure that healthy, vigorous, precocious and well managed plant materials of adequate size are produced and fast-tracked through to commercialization. The purpose of this proposal is to seek funds to support this position. Addie Dahl (currently funded part-time) is being trained to assume this role if funding request is approved, to provide continuity in the program.

## **OBJECTIVE:**

The objective of this proposal is:

- To acquire support for a full time technician position to ensure that healthy, vigorous seedlings of adequate size and precocity are produced using best horticultural practices.

## **METHODS**

### **1. Support for a full-time technician**

The leadership of the WSU sweet cherry breeding program changed last year with the appointment of a permanent stone fruit breeder. This was followed by active recruitment of staff and infrastructure development to make the program more viable. We have made a lot progress in this direction over the past year (see WTFRC continuing report reference # CH-09-902 for details). For the first time (since the program started receiving funding from WTFRC/OSCC), fruit were evaluated in summer 2009 from breeding selections and their parents and 12 selections that fit into 4 of the target market cultivar groups were identified and propagated for more advanced testing. The installation of bird netting was very instrumental for getting sufficient numbers of fruit for assessment which was not possible the year before. We have also identified a new powdery mildew resistant selection from a "PMR-1" x "Van" cross made in 1998. This is additional to the powdery mildew resistant advanced selections from 1998 crosses already in grower cooperator trials in Washington and at OSU experimental stations in Oregon.

We have initiated experiments in our lab to improve seed germination and seed handling in the green houses to facilitate development of larger numbers of healthy seedlings for field planting. One of the trials involves use of GA to promote the timing and uniformity of germination. Jan

Burgess, who works for the National Clean Plant Network (NCPN) program with 20 years experience working with sweet cherry has been hired for an hour per day, to assist with raising germinated seeds in the green houses. Horticultural manipulation of trees in the field has improved tree vigor and we anticipate that this will impact on precocity. At the moment, less than 5% of own-rooted sweet cherry trees come into bearing in their 4<sup>th</sup> year. Our goal is to get a larger proportion of these trees fruiting at that stage using horticultural manipulations both in the greenhouses and the field. Clint Graf, the vineyard and orchard manager, spends 33% of his time assisting with horticultural manipulations and general orchard operations in the breeding program. Figure 1 shows a schematic diagram of activities in the breeding program from seedling development in a growth room supplied with 24 hours of lighting and maintained at 26 °C and 44% RH to raising the seedlings in the greenhouse and lathhouse before field transplanting.

Due to increased workload over the past year, we had to hire many more time slip employees to work in the breeding program nearly all year round over the past year. We would need a full time technician support to cope with the increased workload and having a permanent employee who is trained to do the job to assume this role would increase efficiency and timely delivery of milestones.

## **RESULTS AND DISCUSSION**

**Objective 1: To acquire support for a full time technician position to ensure that healthy, vigorous seedlings of adequate size and precocity are produced using best horticultural practices.**

With the help of the breeding technicians, 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 in P1. To date, we have recorded 60% seed germination which is up from 35% while seedling survival rate at baby stage is over 90%. Greenhouse management protocols result in accelerated development of large numbers of healthy seedlings less than a year for field planting. Previously, it took 2-3 years to generate seedlings of adequate size for field planting. Best practice guidelines have been prepared for slowing trees down in the fall months prior to winter. As the program enters Phase 3, we will be developing guidelines on field plot techniques, tree training, phenotyping protocols and selection criteria to ensure that only superior genotypes are identified and moved to Phase 3 and from there on to commercial release.

## **SIGNIFICANT FINDINGS AND ACCOMPLISHMENTS**

- A new technician, Sue Watkins, joined the PNWSCBP in 2012. She replaced Andrea Young, who left the program to join WSU in Pullman in December 2011. Ms Watkins has been involved in R & D for ~17 years and knows how to get jobs done efficiently and in a timely manner
- Nine thousand trees in the breeding program have been tagged with bar-coded labels. Bar coding was also used in the lab for fruit quality evaluation to improve the efficiency of data collection.
- Two acres of a mother block for old cultivars at WSU-IAREC, Prosser have been pulled out this year
- A total of 324 F<sub>1</sub> trees including early maturing and powdery mildew resistant mid-season and late crosses were planted in the seedling block

- A total of 3000 seeds were collected from 2011 crosses of which 1162 were viable. Mean seed germination was 60% while seedling survival rate at the baby stage was over 90%.
- We have developed protocols in the greenhouses for raising seedlings over 3 ft tall in less than a year for field planting.
- We planted a total of 14 advanced selections into P2 trials at WSU-IAREC, Prosser and OSU MCAREC, Hood River. Three of these selections were planted at Norm Guitzweiler's orchard in N Wenatchee which represents a late site
- Elisa tests were conducted on 60 selections for use as breeding parents and those that tested positive for PDV, CLRV and PNRSV were eliminated.
- Pollen viability tests were conducted on 60 individuals used as breeding parents
- Hand pollinations carried out this year emphasized early and late ripening combined with high firmness. F<sub>1</sub> seedlings mainly from Sweetheart, Regina, Ambunes and Cowiche crosses with high breeding value for both firmness and late ripening were used for late ripening crosses. Six of those were advanced selections in P2. Individuals that have high breeding value for both earliness and firmness were also chosen for early ripening crosses. Breeding value was obtained from FlexQTL output in the RosBREED project from genomic regions associated with ripening time and firmness. About 70,000 flowers were hand pollinated and fruit set was high although crosses for early ripening had a lower set than late crosses.
- Over 7000 seeds were collected from 2012 crosses while 4139 are viable.
- We thinned ~35 advanced selections identified for potential P2 planting to optimize fruit set
- We evaluated ~6000 trees in the field for fruit quality of which 2000 that had fruit size above 10 g were harvested for further evaluation in the lab. We also collected data from mother trees of advanced selections in the seedling blocks (P1) since P2 trees were not yet fruiting.
- We have sent budwood from the mother tree of FR001T007 for propagation for P3 planting. Budwoods from FR001T002, FR001T004, FR002T074, FR009T049, FR044T083 and FR049T125 for propagation for P2.
- We budded 20 F<sub>1</sub> seedlings on Gisela 6 in a UFO system at IAREC Prosser to examine bud take and potential for cost savings compared to a seedling block.

## **EXECUTIVE SUMMARY**

- The PNWSCBP has organized the human and physical resources necessary to have a world class program
- We have optimized seed germination procedures and a seed germination rate of 60% is now routine in the breeding program
- A seedling survival rate of >90% at the baby stage is common while our greenhouse techniques can generate seedlings of adequate size for field planting within a year
- We have developed and implemented bar coding for tree identification in the field and for fruit evaluation in the lab. This technology will improve tree identification and data recording and along with marker –assisted breeding will increase overall efficiency of the breeding program
- The breeding program has entered a new era with phase 3 operational in 2014. There are ~8000 seedlings in P1, 14 advanced selections in P2 and 5 more advanced selections will be planted in P2 in 2013. The P3 fast-track, FR001T007, is an early selection similar to Chelan in harvest timing but has larger fruit (>10 g) and higher firmness (~300 g/mm) without GA application.