

FINAL PROJECT REPORT
WTFRC Project Number: PR09-905

Project Title: Pear rootstock breeding

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Total Project Funding: Year 1: \$4,500 Year 2: \$12,300 Year 3: \$3,500

Other funding sources: None

WTFRC Collaborative Expenses: None

Budget History

Item	2009	2010	2011	2012
Travel	1,000	2,500	500	0
Propagation	3,500	8,800	2,000	0
Plot Fees	0	1,000	1,000	0
Total	4,500	12,300	3,500	0

Objectives:

1. Establish a pear rootstock advisory committee.
2. Review literature and search national and international collections for pear rootstock accessions.
3. Initiate propagation and planting of a new pear rootstock collection in Washington State.
4. Develop strategy for pre-selection of seedling populations.

Significant Findings:

1. Rootstock germplasm was selected at the pear collection in Corvallis; propagated trees were planted in the parental collection at Sunrise orchard in spring 2012.
2. Rootstock germplasm was selected at the Westwood interspecific *pyrus* collection at WSU Puyallup; propagated parental trees should be available to plant at Sunrise orchard in spring 2013.
3. Pear rootstocks and selection techniques have been highlighted as the focus for a new SCRI rootstock proposal.

Methods:

1. A pear rootstock advisory committee made up of industry and research experts will provide input on the objectives, activities and future planning for a pear rootstock research project.
2. Use internet searches, literature and informed contacts to review wide-ranging pear germplasm to identify possible accessions for a new rootstock parental collection.
3. Access germplasm for propagation from collections and other breeding programs, arrange for importation and propagation at commercial nursery.
4. Meet with Gennaro Fazio (apple rootstock breeder, Geneva, NY) and other experts to discuss possible methods of pre-selection of pear rootstock progenies and develop strategies for handling progenies in a cost-effective, efficient manner.
5. Establish a pear rootstock parental germplasm collection with at least two standard trees of each selection to facilitate future crossing programs.

Results & Discussions:

Literature reviews focused principally on conference proceedings from the most recent ISHS pear conferences as well as the ISHS Integrated Canopy and Rootstocks conferences. Other journal articles were either already on file or were accessed on line. Several popular press articles and websites also proved to be useful for example, <http://extension.oregonstate.edu/catalog/pdf/pnw/pnw341-e.pdf>, and of course, reports of previously-funded PNW pear rootstock trials.

Although there are certainly a number of interesting rootstock selections available for import into the U.S. with a view to establish trials, there is also a wide range of possible parental germplasm already present in the U.S. that should be very suitable for establishing a crossing program in the PNW. The USDA pear repository in Corvallis, Oregon has numerous *pyrus* species as well as several selections from the Westwood program. After visiting with Dr. Joseph Postman and viewing the collection, 17 accessions were selected from the repository in July 2010.

Budwood was supplied in August 2010 to Willow Drive Nursery where the trees were propagated onto OHF 87 rootstock.

The parents selected include *Pyrus communis* 'Old Home', 'Farmingdale', OHF87 and 333 as well as other dwarf and compact *P. communis* scion varieties. Three of the Oregon series of 'P' fire blight resistant dwarf and semi-dwarf rootstocks were also accessed. A diverse collection of other *pyrus* species were also selected to include characteristics such as resistance to fire blight, tolerance to pear decline, resistance to *phytophthora*, resistance to woolly pear aphid, cold hardiness, ease of propagation and a range of different vigors. Five replicates of each tree were planted in the WSU Sunrise orchard in spring 2012.

Further germplasm was assessed during a visit to WSU Puyallup in June 2011. A large collection of interspecific *pyrus* hybrids, originally produced by Westwood, was established at the research and extension center in Puyallup for assessment and possible selection of urban ornamental trees by Dr. Rita Hummel. A subset of 16 accessions from this germplasm was propagated in 2011. Characters for selection focused on dwarfing habit and a diverse genetic background, thus enabling a wide range of potential disease and pest resistance characters to be included in future crosses.

Further germplasm will be accessed from non-U.S. sources as part of project PR-12-109. Initial material transfer agreements (MTAs) are being negotiated for testing of the material only. Once germplasm is in the U.S. and on its way through quarantine, further negotiations regarding using this material for breeding can be addressed.

Discussions remain on-going regarding protocols for rootstock selection in seedlings. Currently there are very few molecular tools that can be used to select for important pear rootstock characters in seedlings, however this may change over the next 5 years so any protocol developed needs to be flexible. A visit to Stellenbosch, South Africa, in November 2010 provided the opportunity to discuss selection strategies with apple rootstock breeder Ken Tobutt. Pear rootstock breeding selection techniques have also been discussed with U.S. apple rootstock breeder Gennaro Fazio. One possible strategy involves planting rootstock seedlings at a fairly close spacing and budding them with a compact standard scion variety. Such a planting allows for the selection of precocity as well as tree vigor within the first few years of growth. Promising seedlings can then be propagated from root cuttings for further trials.

An SCRI proposal is being prepared, led by Dr. Kate Evans, which will include the development of some key selection tools for pear rootstocks, for example DNA markers for dwarfing, using micro-grafting to test for scion incompatibility and the initiation of a pear rootstock breeding program here in the PNW.

Executive Summary

Flowering parental germplasm is essential in order to establish a pear rootstock breeding program in the PNW. We have made the first steps in establishing a parental collection at the WSU Sunrise orchard.

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Non-US germplasm will be added to the collection following the completion of Material Transfer Agreement negotiations and quarantine. Open-pollinated seed or importing seed from non-US pear breeding programs would be one way of establishing progenies; our aim now is to apply for SCRI funding to enable these options to be fully explored.