

2002 - 2004 Final Research Report

WTFRC Project #: CH-01-02

Title: Identification of sweet cherry dwarfing rootstock candidates from MSU's tart cherry germplasm collection.

PI: Amy Iezzoni

Organization: Department of Horticulture, Michigan State University (MSU)

Co-PI's: none

Cooperators: Matt Whiting (WSU-Prosser), Bill Howell (NRSP5, Prosser) & Ron Perry (MSU)

Objectives: Identify rootstock selections from MSU's vast cherry germplasm collection that may have commercial potential as dwarfing precocious rootstocks for sweet cherry. MSU selections included as rootstock candidates in field trials at MSU and WSU will have been demonstrated to propagate well and to be virus tolerant.

Significant accomplishments:

- Virus screening of the rootstock candidates was completed in 2002.
- Test plots for the MSU rootstock trees with Bing and Hedelfingen scions were established at MSU and WSU Research Stations in Clarksville, MI and Prosser, WA, respectively.
- 92 MSU rootstock selections, totaling 363 trees, are under test at Clarksville (Fig. 1).
- 21 MSU rootstock selections, totaling 117 trees, are under test at Prosser (Fig. 2). An additional 35 selections, totaling 126 trees, have been propagated and will be planted in Spring 2005.

Significant findings:

- Approximately 60% of the rootstock candidates were sensitive to PDV and/or PNRSV and eliminated from further testing. This ability to eliminate selections prior to budding proved to be an extremely efficient pre-screening approach.
- In general, the MSU rootstock selections induce precocity with flowering in the second year after planting.
- Observations for the Clarksville plot indicate that some rootstocks confer different levels of freeze tolerance with a few selections appearing to confer increased hardiness compared to GI 6.
- Two rootstock selections have shown symptoms consistent with graft incompatibility at both the Prosser and Clarksville plots and have been eliminated from further testing.

Methods:

Virus testing: Screening for tolerance to PDV and PNRSV was done by Bill Howell at NRSP5. A bud inoculation strategy was used and the symptoms were visually rated.

Budding and plot establishment: Vegetatively propagated rootstock cuttings were planted at Hilltop Nursery and Meadow Lake Nursery for budding. Bing and Hedelfingen scions were budded onto rootstock selections intended for planting in Prosser and Clarksville, respectively. Trees were planted in the test plot with 10 feet between each tree and 18 feet between each row.

Evaluation: The following data was collected: tree survival and health, trunk cross-sectional area, flower number and/or bloom density and fruit number or crop load.

Mother block establishment: Five cuttings of each test rootstock selection were planted in a block at Clarksville. The plot location is distant from the cherry plantings to minimize the possibility that these trees would become infected by the pollen born viruses PDV and PNRSV.

Results and Discussion:

Years 2002 to 2004 represented transition years in which virus testing and budding were sequentially completed. Plot establishment will be completed in 2005. Flower and fruit evaluations began in 2003.

Plot Establishment

There are currently 92 MSU rootstock selections, totaling 363 trees, under test in the plot at CHES (Fig. 1). The control is GI 6. The majority of the scions are Hedelfingen. However, because a decision was made to delay the planting of the Prosser plot until 2002, some of the rootstock selections planted in 2001 have Bing scions. The pollinator is Ulster/GI6. Eighteen additional trees of the MSU rootstock selections will be planted in 2005. These trees were produced from sleeping eye buds inserted in August 2003. In 2004, these trees were grown in a polyhouse at Clarksville.

There are currently 21 MSU rootstock selections consisting of 117 trees planted at Prosser (Fig. 2). An additional 35 MSU rootstock selections represented by 126 trees were supposed to be planted in this plot in 2004. However, extensive deer damage to the trees in the commercial nursery required that the trees remain one more year in the nursery. If tree planting goes as predicted in 2005, the final counts at the Prosser plot will be 56 MSU selections under test represented by 243 trees.

A total of 103 selections totaling 390 trees are planted in the mother block at Clarksville.

Rootstock evaluations

- The vast majority of the MSU rootstock selections induced flowering and fruiting one year after planting. This is similar to GI 6.
- The majority of two-year-old trees exhibited less flowering and fruiting compared to GI 6 (Fig.3). On a scale of 0 being no crop to 5, a very heavy crop, 2 year old trees on GI 6 were rated “3” while the majority of the MSU rootstocks were rated “2”.

- Average yearly trunk growth for the 4 year-old MSU rootstock selections was slightly less than that for the GI 6 (Fig. 4).
- Two MSU rootstock selections exhibited severe symptoms of graft incompatibility at both Prosser and Clarksville and were eliminated from further testing. These selections are I 56 (40) and I 59 (81) (Fig. 5).
- The MSU rootstock selection, III 4 (33) appeared to increase the mid-winter cold hardiness of Bing (Fig.6), however, it also exhibited poor anchorage at the Clarksville plot (Fig. 7).

Recommendation

- Minimal pruning allowed us to evaluate the rootstock's influence on scion growth habit. However, the minimal pruning also resulted in trees that are not of comparable stature. Therefore, next year we shall evaluate yield using a yield component strategy on paired branches.

Acknowledgements: The contributions of Audrey Sebolt, David Ophardt, and Jim Olmstead are greatly appreciated. Pollinator and rootstock trees were generously donated by Hilltop Nurseries.

Budget

Title: Identification of sweet cherry dwarfing rootstock candidates from MSU's tart cherry germplasm collection.

P.I.: Amy Iezzoni

Project duration: Propagation Phase (1997-2001), Transition Phase (2002-2004).

Project total (3 years): \$30,489

Year	Year 1 (2002)	Year 2 (2003)	Year 3 (2004)
Total	\$10,600	\$9,962	\$9,927

Budget breakdown:

ITEM	Year 1 (2002)	Year 2 (2003)	Year 3 (2004)
Salaries ¹	\$2,015	\$4,010	\$4,211
Benefits ²	621	1,280	1,516
Labor ³	1,000	800	700
Supplies ⁴	200	400	400
Fee for virus screen	3,000 ⁵	-	-
Travel	3,000	2,500	1,500 ⁶
Tree and freight costs	764	972	600 ⁷
Plot costs at MSU	0	0	1,000 ⁸
TOTAL	\$10,600	\$9,962	\$9,927

¹ This represents partial funding for technical support to oversee the technical aspects of this project {develop spreadsheets describing each rootstock selection and the status of all the grafted trees, collect data, and manage, analyze, and summarize the data from the 2 field plots}.

² Benefits for YRs 2002, 2003 and 2004 are calculated at 30.8%, 31.9%, and 36 %, respectively.

³ Student labor will assist with planting, data collection and management.

⁴ Supplies to include mouse guards and other field supplies, computer diskettes etc, and poster supplies.

⁵ Fee from NRSP5 for virus screening 50 selections for PDV + PNRSV @\$60 each.

⁶ Travel to WSU for field map development, tree labeling and data collection. Besides the obvious benefit of looking at the trees ourselves we are familiar with all the rootstock nomenclature and can more easily verify the accuracy of the labeling, and data collection.

⁷ This just represents shipping costs. Trees for the MSU and WSU plots will be generously donated by Hilltop Nurseries and Meadow Lake Nurseries and the pollinator trees will be donated by Willow Drive Nursery.

⁸ Starting in 2004, plot fees will be charged at all MSU Horticultural Research Stations. These costs are based upon a fee structure that reflects cost of standard plot maintenance.

Fig. 1. The cumulative number of live MSU rootstock selections and trees currently planted and projected to be planted in Clarksville, MI. The majority of the rootstock selections have Hedelfingen scions while some selections have Bing scions.

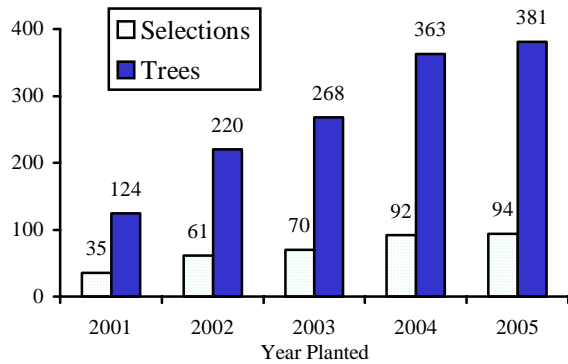


Fig. 2. The cumulative number of live MSU rootstock selections and trees currently planted and projected to be planted in Prosser, WA. All of the rootstock selections have Bing scions.

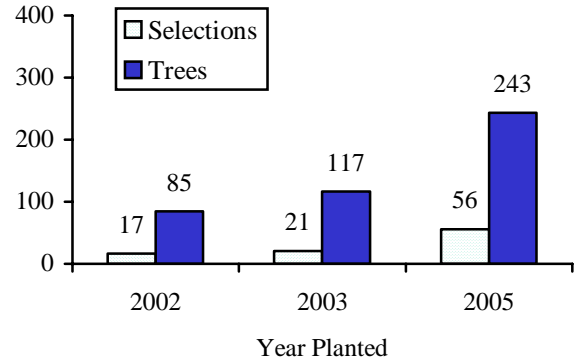


Fig. 3. Average crop rating for MSU selections with Bing as its scion at Prosser, WA. Trees were planted in 2002. *Denotes GI 6. Crop rating is based on 0 being no crop and 5 a very heavy crop.

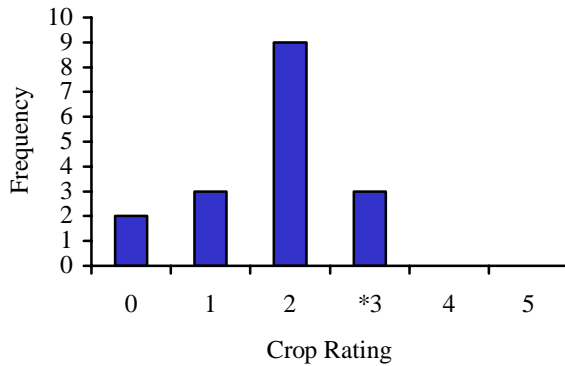


Fig. 4. Average trunk growth (mm) for MSU selections with Bing or Hedelfingen as its scion at Clarksville, MI. Trees were planted in 2001. *Denotes GI 6.

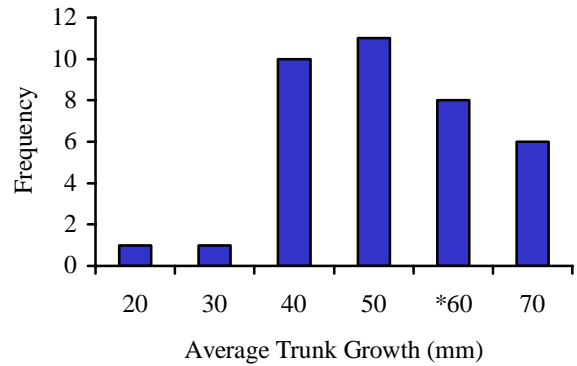




Fig. 5. A grafted Bing/MSU rootstock tree at Prosser, WA exhibiting graft incompatibility.



Fig. 6. Bing scions on two different MSU rootstock candidates illustrating the cold hardiness difference between the two rootstocks.



Fig. 7. Hedelfingen trees grafted onto the MSU rootstock selection III 4 (33) exhibited poor anchorage [YR 2004, Clarksville plot].