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PSU Ref. No: 219939

Title: Rootstock and Cultivar Evaluation

Submitted to: Patti Keller

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Proposed Project

4/1/2021 - 3/31/2022

Total Project Request: \$16,749

AUTHORIZED UNIVERSITY OFFICIAL

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Please reference PSU Ref. Number in all correspondence.

**Research Grant Proposal
To**

State Horticultural Association of Pennsylvania, Inc.

TITLE: Rootstock and Cultivar Evaluations

PERSONNEL: Robert M. Crassweller and James R. Schupp

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DURATION OF PROJECT: 2016 – 2022 (continuing)

JUSTIFICATION: Rootstocks are the primary method used to control tree size to allow for increased tree density. We know that initial higher density translates into greater early yields and a faster return on investment. One of the three challenges that Tustin (2013) outlined to increasing orchard productivity across all tree fruit crops was the use of rootstocks to control vigor and increase floral precocity. While this has been dramatically increased in apples and to some extent in cherries it still lags behind in pears and peaches. The ongoing thrust of the NC-140 regional research project and the continued efforts that began with the NE-183 regional research project have been the foundation of Penn State's horticultural efforts to keep the Mid-Atlantic fruit industry competitive and up-to-date on the latest technology in rootstocks and cultivar evaluation.

Orchard intensification is a proven method to achieve high fruit quality and hasten growers' return on investment in apple production; however, the primary peach production system is low density open vase, and this system hasn't changed significantly in over 150 years. The missing factor needed for increasing peach planting density is size-controlling rootstocks. Further study of these and other new rootstocks is needed to determine how well trees on these rootstocks survive and perform under our conditions, and what the final tree size of each will be at full maturity.

New cultivars are continuously being released; in particular a number have been released from countries in Eastern Europe. It is essential that these cultivars be evaluated under Pennsylvania growing conditions. Currently, we have in excess of 120 distinct cultivars planted at PSU research stations. We have the largest number of disease resistant apple cultivars on the east coast. An Asian pear cultivar trial was added in 2010 at the Rock Springs and is now yielding valuable information on their performance.

OBJECTIVES:

1. To continue the evaluation of tree fruit rootstock plantings established in previous years including 2014 Honeycrisp and Fuji trials and 2019 Gala trial
2. To evaluate new and promising apple, European and Asian pear cultivars, both disease resistant and non-resistant for their suitability and production characteristics under Pennsylvania conditions.

PROCEDURES:

ROOTSTOCK WORK: (For a complete listing of plantings see Table 1).

An NC-140 peach rootstock trial was planted at FREC in 2017 to evaluate the performance of 8 rootstocks with the cultivar Cresthaven. Multiple four-tree plots were planted at 6 ft. by 17 ft., and trained to perpendicular V. The rootstocks will be evaluated for survival, adaptation to the climate, tree size control, yield, fruit quality, and freedom from physiological

defects, such as root suckers. This trial includes the most recent introductions from Europe and three promising new releases from the breeding program at UC Davis: Controller 6, Controller 7, and Controller 8.

Apples: We continue to maintain and collect data on the 2014 NC-140 uniform rootstock trial of Aztec Fuji and Honeycrisp on Vineland 1, 5, 6, 7, G.214, G.890, G.969, M.9T337 and M.26. In 2016 we added small plantings of Scifresh and Royal Red Honeycrisp on G.41, G.935 and M.9Nic29 and WildTwist on G.11 and M.9T337. In 2017 we added a planting of NZ.1 and NZ.5 rootstocks developed in New Zealand with Royal Red and Minn B42 strains of Honeycrisp. The NZ rootstocks were developed to have resistance to *Photophthora sp.*, woolly apple aphid, fire blight and tolerance to water logging with a range of tree sizes. The standard rootstocks are Royal Red on G.41 and G.890. Royal Red Honeycrisp on NZ.2 with the control trees was planted in 2018.

A uniform NC-140 apple rootstock planting was set in 2019 growing season. The scion cultivar is Gala (Simmons strain). There will be ten rootstocks evaluated: NZ.1, NZ.2, NZ.5, G.41, G.11, G.214, G.4814, G.935, G.969, G.935 & B.10 with M.9T337 and M.26 as comparison controls. New cultivars as pollinizers for the planting were Ludacrisp and Ambrosia

Two new Cornell-Geneva rootstock trials were established at FREC in 2018 (Table 1). Both with Gala, the first consisting of 11 fully dwarfing rootstocks (Bud. 9 to M. 9 size), and the second consisting of 7 rootstocks in the M.26 size category. A planting of Buckeye Gala on G.11, G.935, G.41 and B.9 was planted at FREC in 2020

CULTIVAR WORK:

Scab Resistant Cultivars: A planting of GoldRush on G.11 and Crimson Crisp on M.9Nic 29 was established in 2017 at Rock Springs as part of a multi-site planting in conjunction with the USDA SCRI grant "Supporting Pennsylvania New Farmers in the Start-up, Re-strategizing & Establishing years. Half of the trees were treated with MycoApply mycorrhizal spray to the roots. We are monitoring the growth of the trees in comparison to nontreated trees. We continue to maintain nearly 50 scab resistant cultivars included in these are the Golden Sunshine Series from the Czech Republic.

We continue to monitor performance of new cultivars including Premier Honeycrisp, Lady in Red Cripp's Pink, WildTwist (as outlined in rootstock trials) and three advanced selections from the MAIA, Summerset (MAIA12), MDD3-80 (as yet unnamed) and Rosalee (MAIA11). Ludacrisp (MAIA-L) They are siblings of EverCrisp (Fuji x Honeycrisp crosses). Mt. Evereste and Mt. Blanc crab apple pollinators from France both being resistant to apple scab and fire blight. The former is for early blooming apple cultivars and the latter is for later blooming cultivars. Ludacrisp/B9 and Ambrosia/B10 were added this past year. (We had a few fruit on the Ludacrisp this past growing season, unfortunately, someone stole the fruit before we could harvest the trees Currently we have the following Honeycrisp strains planted at Rock Springs: Standard, Cameron Select, Firestorm, MN B42, Premier, and Royal Red. We continue to maintain the Asian Pear cultivar trial as part of a multi-state trial.

Other Apple Cultivars: A 2014 apple planting at FREC includes Premiere Honeycrisp, compared with another early-maturing selection of Honeycrisp, and trial plantings of MN44, MN55, and Sweet Cheeks. Additional plantings of Premier Honeycrisp and EverCrisp were established in 2019.

European Pear Cultivars: In 2016, a trial of fire blight resistant European pear cultivars was planted, with Harrow Sweet, Harrow Crisp, Sunrise, US446, US69426-038, US84907-069, US84907-140, US84907-144, US84907-160, and US84907-166, compared to Golden Russet

Bosc and Bartlett as commercial standards. All trees are on the precocious, fire blight-resistant OHxF87 rootstock and trained on a 4-wire trellis to bi-axis at 4' x 12' spacing. The trees will be assessed for their growth and productivity, and the fruit will be evaluated for time of maturity, storage, size, and sensory characteristics.

References

Tustin, D. S. 2013. Future orchard planting systems: Do we need another revolution. Acta Horticulturae 1058:27 – 36.

Budget

Salaries	\$7,043	Supplies	\$700
Hourly wages	\$5,880	Travel	N/A
Fringe Benefits	\$2,923	Miscellaneous	\$203
Total	\$16,749		

Budget Notes:

Don Smith (Technician) approximately 13% effort towards

Horticulture wage payroll assistants (TBD) will assist with maintenance of research plots, applying treatments and collecting and analyzing data. They will assist with data collection, data entry and analysis, and preparation of reports.

Fringe Benefits

Fringe benefits are computed using the fixed rates of 34.88% applicable to Category I Salaries, 12.35% applicable to Category II Graduate Assistants, 7.94% applicable to Category III Salaries and Wages, 0.31% applicable to Category IV Student Wages, and 23.88% for Category V, Postdoctoral Scholars and Fellows, for fiscal year 2021 (July 1, 2020, through June 30, 2021). If this proposal is funded, the rates quoted above shall, at the time of funding, be subject to adjustment for any period subsequent to June 30, 2021, if superseding Government approved rates have been established. Fringe benefit rates are negotiated and approved by the Office of Naval Research, Penn State's cognizant federal agency.

Supplies

Miscellaneous supplies, such as flagging, tags, markers, bags and batteries are needed for identifying plots and collecting data in both field plots and laboratory procedures.

Miscellaneous-Land fees

F&A rates are negotiated and approved by the Office of Naval Research, Penn State's cognizant federal agency. Penn State's current fixed on-campus rate for research is 60.50% of MTDC from July 1, 2020, through June 30, 2021. New awards and new competitive segments with an effective date of July 1, 2021, or later shall be subject to adjustment when superseding Government approved rates are established. Per 2 CFR 200 (Appendix III, Section C.7), the actual F&A rates used will be fixed at the time of the initial award for the duration of the competitive segment. **Sponsor does not allow indirect costs**