SAES-422 Multistate Research Activity Accomplishments Report

Project No. and Title: NC140 Improving Economic and Environmental Sustainability in Tree-Fruit Production Through Changes in Rootstock Use

Period Covered: 10-2011 to 09-2012
Date of Report: 21-Nov-2012
Annual Meeting Dates: 08-Nov-2012 to 09-Nov-2012

Participants
ULR for the Minutes: www.nc140.org

Brief Summary of Minutes of Annual Meeting

A report on each trial was given by planting coordinators. Current status of seven existing or recently terminated plantings and four future plantings were shared with the group. Sites for future meetings were confirmed. Next year’s meeting will be coordinated by Essie Fallahi and will be located in Boise, ID. The following year’s meeting will be in South Carolina, organized by Greg Reighard, and in 2015 in California by Rachel Elkins. Washington State’s membership was confirmed with Kate Evans as the voting member.

Accomplishments

Objective 1. To evaluate the influence of rootstocks on temperate-zone fruit tree characteristics grown under varying environments using sustainable management systems.

Apple Sub-Committee (T. Robinson, Chair). John Cline reviewed plans for a trial to be planted in 2014 and a list of cooperators committed to planting it. Terence proposed a new planting for 2016 with new genotypes from the UK, New Zealand and including some Geneva selections. Plans for an organic rootstock trial were also discussed. Manuscripts have been prepared for the 2002 trial and 2003 physiology trials.

Cherry Sub-Committee (G. Lang, Chair). 2010 sweet cherry systems trial is still in progress with 9 sites. A tart cherry trial is planned for 2015 to be coordinated by Matt Stasiak with MSU selections in 6 locations. A sweet cherry trial is planned for establishment in 2015 to be coordinated by Greg Lang with 7 other cooperators. A new trial to test training systems designed for platforms and mechanization was proposed.

Peach Sub-Committee (G. Reighard, Chair). Greg is preparing a paper on the 2009 trial. An apricot rootstock trial was proposed with four cooperators.

Pear Sub-Committee (T. Einhorn, Chair). 2013 is the anticipated date for the next planting with collaborators in NY, CA and OR. Propagation was delayed by cold temperature injury. There are plans for a future quince trial with 22 genotypes selected for hardiness. A manuscript for the 2002 trial is completed and ready for review.
Concluded projects:
2002 Pear rootstock trial has concluded and a paper ready for review.
2003 Apple Physiology study was completed with one paper published, one in press and two potential papers to be prepared.
2003 Apple rootstock trial data collection is in its final year. Data will be summarized for a paper.

Ongoing projects:
2004 Pear rootstock trial compares 3 rootstocks at 3 locations in North America.
2004 Apple dwarf and semidwarf rootstock trials in MI.
2005 Pear rootstock trial at 6 locations in North America.
2005 Cherry high tunnel systems in MI.
2006 Cherry physiology trial compares the yield and fruit size of a dwarfing cherry rootstock at 4 locations in North America.
2009 Peach rootstock and physiology trials at 13 sites.
2009 St. Jean apple rootstock trial to compare 6 rootstocks in 1 site.
2010 Apple rootstock trial.
2010 Cherry rootstock and training systems.
2011 Apple rootstock trial in VA with 10 rootstocks and 3 cultivars.

Objective 2. To develop and improve rootstocks for temperate-zone fruit trees with breeding and genetic engineering, to improve propagation techniques for rootstocks, and to acquire new rootstocks from worldwide sources.

Rootstocks from the California peach breeding program have been patented and released with an additional rootstock to be released at a future date. Quince selections in OR are being screened as potential size-controlling pear rootstocks. Pyrus germplasm was established in a collection in WA to evaluate for size control, disease resistance and biotic tolerance of pear trees. Germplasm will also be used for future pear breeding.

Efforts to transform Gisela cherry rootstocks with genetic resistance to Prunus necrotic ringspot virus were successful. Field testing of elite cherry genotypes continued in WA and MI.

Tissue culture propagation has enhanced rooting of Geneva apple rootstocks and increased the number of stock plants. Efficient methods for existing pear, cherry and apple rootstock micropropagation have been developed in WA for rapid multiplication of new rootstocks.

Objective 3. To study the genetics and developmental physiology of rootstock/scion interactions in temperate-zone fruit trees.

In WA, genomics and transcriptomics approaches are being tested to understand rootstock/scion interactions to ensure the compatibility of new rootstocks.

Objective 4. To better understand the response to and impacts of biotic and abiotic stresses on scion/rootstock combinations in temperate-zone fruit trees.
Biotic stresses. Apple rootstock tolerance to replant disease continues in NY to categorize 36 genotypes as resistant, intermediate or susceptible. The 2006 apple replant trial continued in some sites. A 2006 apple fumigation trial in NJ and MA continued. A 2009 peach replant study continued in NC. Russian and Geneva apple rootstocks were evaluated for fireblight tolerance in NY. In VA, 10 rootstocks showed differing susceptibility when inoculated with fireblight bacteria.

Abiotic stresses. Evaluation of peach rootstock tolerance to soil alkalinity continued in Utah. Apple rootstock tolerance to soil pH is also being evaluated in NY. Cold hardness evaluation of new apple rootstocks continues in ME with 3 Vineland and 12 Geneva genotypes. Cold hardness of quince selections for pear continued in OR. In MO, a study to determine the relationship of blackheart and tree performance continued. Few rootstocks differences in peach bud survival occurred in the 2009 rootstock trial in SC, MO and UT despite warm winter temperatures.

Impacts
The NC-140 plantings are regularly used as demonstration plots of new rootstock for growers, nurserymen, visiting scientists, and graduate students. The NC-140 comparative plantings have helped speed the testing and commercialization of the disease resistant stocks CG rootstocks. Rootstock trials on grower’s farms have yielded invaluable information on adaptability that was not known from experiment station trials. Apple and peach rootstocks with tolerance to replant disease are being identified to improve survival and productivity without the use of fumigants. Apple and pear (quince) rootstocks with superior cold temperature tolerance are being identified to improve survival and productivity. Results from NC-140 research continue to direct the commercialization of tree fruit rootstocks. High density apple, pear and sweet cherry orchards that employ several dwarfing rootstocks have stimulated growers to expand commercial acreage.

Over the last 15 years, there has been a large change in rootstock use in the United States and Canada. Changes in rootstock use were documented in Indiana. Previously, approximately 80% of apple orchards in the state were planted on more vigorous rootstocks. In plantings made in the last 15 years, use of the preferred dwarfing rootstock has increased 660%. The use of this rootstock can increase crop value by more than $12,000 per acre. On a state-wide basis, this is an increase of $8.8 m per year.

Publications
Collaborative research under this group led to 17 refereed research publications, 38 nonrefereed publications, and numerous Extension presentations that reached fruit growers throughout North America. Seven articles in trade journals highlighted the impact of rootstock research on tree fruit production.


Other Publications (Abstracts, Fact Sheets, newsletters, reports)


http://www.ag.iastate.edu/farms/11reports/Horticulture/PerformanceGibsonGoldenDelicious.pdf


http://www.ag.iastate.edu/farms/11reports/Horticulture/SecondYearHoneycrisp.pdf


Lang, G. 2012. Integrating new technologies, germplasm, and physiology into innovative strategies for producing high quality sweet cherries. OPGMA Today (Summer issue).


Rothwell, N. and G. Lang. 2012. Fall foliar nitrogen applications should be applied now. MSUE News (also NW FruitNet), September.


Articles in Trade Journals


Sigler, D. Apples: How to Know What to Plant. Fruit Grower News, April 2012.


PRESENTATIONS / FIELD DAYS

Domoto. Jan. 27, Iowa Fruit and Vegetable Growers Conference, Ankeny, IA, 150 attendees

http://www.aaes.auburn.edu/comm/pubs/pubsbytype/rebull2125.php


Elkins, R. Spring Irrigation and Field Meeting. May 20, 2012, Talmage, Mendocino County, California.

Fallahi. Idaho State Horticultural Society Summer Tour, July 18, 2012 (110 attended)

Fallahi. Idaho and Washington Fruit Growers March Field Day, March 14, 2012 (65 attended)

Fallahi. University of Idaho Pomology Program Fruit Field Day, September 14, 2012 (900 attended)

Cowgill. North Jersey Fruit Meeting, March 2012; Broadway, NJ, 62 attendees, growers

Cowgill. North Jersey Twilight Fruit Meeting, April, 11; Rutgers Snyder Farm, Pittstown, NJ 44 attendees, growers

Cowgill. North Jersey Twilight Fruit Meeting, May 3; Phillips Farm, Milford, NJ 66 attendees, growers

Cowgill. North Jersey Twilight Horticultural Research Meeting, Rutgers Snyder Farm, September, 2012; sponsored by RCE and NJ NOFA – 48 growers participating

Coneva. NC-140 2009 Peach Rootstock Trial. Chilton County Regional Peach Production Meeting, February 2, 2012, Clanton, AL. (Attendance 89).
