

2013 NC-140 Minutes, Meridian, Idaho, Idaho hosted by Dr. Essie Fallahi, Pomology Program, University of Idaho

Minutes taken by: Rachel Elkins, University of California

Assisted by: Essie Fallahi, University of Idaho

Thursday, November 7, 2013

Introductions, remarks and introductory business:

Meeting held at the Marriot Meridian Hotel, Boise, ID. The business meeting was preceded by and all day field tour of commercial orchards and research plantings the Parma, ID, University of Idaho campus.

Essie welcomed the group and introduced Dr. Fultz (Dean of College of Agriculture and Life Sciences). He complimented meeting host/chair Dr. Essie on the importance of his work both locally and nationwide, as well as emphasized the importance of the fruit industry to the economy of Idaho. Essie emphasized the importance of NC140 to the local growers.

Members were introduced, 32 attendees (members and guests). New members: Stefano Musacchi (WSU, replacing Kate Evans), Amaya Atucha (Colorado State, replacing Ramesh Pokharel).

Dr. Ron Perry, NC 140 Administrative Advisor, reviewed the procedure in becoming an official member of NC 140. He suggested that the first step is for interested participants to request approval from their local institution Ag Experiment Station administration for approval. They will send it to the NCRA, then Dr. Perry will review the request for approval. He reminded the group that financial support regarding participation is up to each AES administrative unit. Everyone was reminded to check the website and make sure their information is up to date (with email). Dr. Perry informed committee members that the NCRA has hired a staff member to write impact statements for regional projects. The statements will be gleaned from individual project accomplishment reports and summarized from the NCRA. Annual accomplishment reports must include four areas: outcomes, impacts (no more than 1 page), external funding, and a list of publications. Much information on the four areas is in the state reports but needs to be consolidated into the accomplishments report. Win will get the verbiage from Dr. Perry and revise the template. Dr. Perry will work with the Executive Committee (previous year's chair (2013), current (2014), next year's (2015) plus commodity chairs, "data handlers" and Wes) for the mid-term review. Members of the NC 140 committee expressed interest in having accomplishments considered for the regional project award. Dr. Perry and Dr. Rich Marini will work on seeking the proper protocols for submission. Dr. Perry emphasized the importance of committee members estimating extramural funding related to the NC 140 project. Reviewers of the 5 year project renewal proposal suggested that the information submitted in the document was needed. Therefore, to make it easier in compiling the report and subsequent follow-up

reviews of the project, members are being requested to provide this information annually for their individual states. There will be a mid-term review in May 2014 and a spreadsheet with this information should be in the 2016 rewrite. All funding should be included where the funding is associated with objectives listed in the project, for example. tuition for graduate students, post doctoral candidates, matching funding, grower cooperator in-kind support (land and equipment for maintenance of trial sites).

Terence Robinson reminded the group that anything related to rootstocks should be in the annual reports if it meets the four NC14 objectives, not just the uniform trials. Everyone should use the template.

2012 minutes were approved and seconded.

Participants discussed the scheduling and hosting opportunities for future meetings. The 2014 meeting will be hosted likely by Dr. Greg Reighard at Clemson (preferred) or in Greenville, SC. Preferred dates for the meeting will likely be November 5 (tour), 6-7 (meeting); November 12-14 is the back-up. Mike Parker, NCSU, will check on facilities. The 2015 meeting will be hosted by Rachel Elkins, University of California, The participants passed a motion to have the 2016 meeting hosted by Dr. Greg Peck of West Virginia.

Fruits from the University of Idaho Pomology Program, Parma Research and Extension Center were enjoyed during the breaks.

Rootstock trial reports (trial details are in the individual reports)

2003 Apple Physiology (Rich Marini): 3 manuscripts are in progress/completed. Rich Marini stated that flower density is the number of clusters/cm² branch area. Crop density affects flower density but also crop does (independently). This varies a lot between locations.

2003 Dwarf Apple Rootstock (Rich Marini): Data completed in 2012. Rootstocks were grouped for the paper. How to designate CG rootstocks was discussed: use 3 digit release names or if unnamed, have 4 digit numbers. Has one paper in progress for JAPS. He is also working on a manuscript for next year: stability analysis (like breeders): how does genotype perform in different locations? and repeated measures analysis to see how long to keep a trial based on TCSA. Need at least 7-8 years to separate out based on size and cumulative yield efficiency. There was a discussion on the value of blocking vs. complete randomization design. Also, a biennial bearing index based on the number of fruit is a good idea but will delay publication.

2009 Peach Rootstock (Greg Reighard, not present, Mike Parker reports): The 5 year paper for ISHS discussed. (From later in the meeting: a new peach trial coordinator will be needed within a few years).

2009 Peach Physiology (Scott Johnson has now retired). Discussion on trial coordination. It was moved and approved to change focus to fruit size measurements across climates with early/mid/late season; high to low crop load in 2014 with Rich Marini as coordinator. Scott showed his temperature effects. 8 data sets. 3 cultivars. He will write a protocol for how to adjust crop load. Cooperators will collect temperature data during the growing season up to harvest date using an onsite datalogger (e.g. Hobo).

2010 Apple Rootstock (Wes Autio): Proper protocols for collecting and presenting data were discussed. There is an article on proofing the data sets on the website. It is also expected that data is submitted if you are committed to the trial. If cooperators don't perform then the stocks were wasted. Discussion on contacting participants not present. 2013 submission protocol is in the annual report.

It was emphasized to conduct the trial for 10 years at each location. A 5 year report will be written based on 2014. Wes favors the "subjective" evaluation "Clements' Tall Spindle Index": using a 0 to 3 scale (see MA report). Wes said to measure the length of shank above the union and to check each tree and eliminate those that are scion rooted. Essie will lead an effort for those that wish to measure fruit quality for extra 5 year report papers. Terence Robinson reminded everyone to bend tall spindle branches more; vigorous trees need more work than others. 2012 data is grouped across the sites and each individual site in the report.

2010 Sweet Cherry Rootstock and Training Systems (Greg Lang not present; Ron Perry reports): Greg contacted trial participants prior to the meeting since he could not attend. A 3-Year "Training Systems Establishment Phase" paper is being written. The original 13 trial sites have dwindled to 5-6 due to diseases, cooperator retirements, deer damage, etc. Greg is proposing to initiate a new trellised sweet cherry systems trial for 2015 if there is interest.

2014 Apple Rootstock (John Cline): 14 cooperators for Honeycrisp, 6 for Aztec Fuji. Tissue culture trees being propagated by Willow Drive (Roger Adams). Only 60 B10s are available; need to decide who will get these. V1 not from virus certified; nursery doesn't have a certified stool bed that can be approved for shipment to Canada. John will coordinate with help from Wes and Rich. Design will be a spindle-type system; not decided. The final Honeycrisp cooperator list will be decided at the apple meeting.

2015 Tart Cherry Rootstock x Harvest System (Greg Lang not present; Matt Stasiak reports): Rootstocks are being propagated for 2017, for evaluation with two harvest systems: trunk shaker and over-the-row. Cooperators are Matt S., Brent Black, Greg L., and perhaps Terence Robinson. WI will have non-irrigated and irrigated, and both high density and trunk shaker. Crossover of rootstocks is unlikely for these two systems (higher vigor for trunk shaker, lower vigor for high density over-the-row harvest). to get MSU rootstocks (40-50% size) for tarts due to WA demand for use with sweets). Details will be discussed at the cherry subcommittee meeting.

2017 Sweet Cherry Rootstock (Greg Lang not present; Matt Stasiak reports):. Matt explained that this trial is being coordinated in tandem with the tart cherry trial, with regard to rootstock genotypes.

2014 Organic Apple Rootstock (Terence Robinson): Trees are being “knip” in the nursery row at Waffler Nursery in NY and planting delayed to 2015. 8-10 signed up so far. CA (Elkins) will replace NY Hudson Valley; Stefano will check if David Granatstein at WSU might be interested; MN and WI dropping out – too cold; let Terence know by December 31 if interested). 10 rootstocks (2 more can be bench grafted and a year behind), Variety undecided yet; choices discussed; perhaps Modi, an Italian club variety owned by CIV (Stefano offers many comments). Main factors are disease resistance, vigor, ability to compete for water/nutrients. Management protocol: should be on certified ground. There was a long discussion of design, factors, i.e. weed control, nutrients, pest management.

2014 ? Apricot Rootstock (Terence Robinson). Terence Robinson led a discussion regarding interest by members in establishing an apricot rootstock trial with trees propagated by Fowler Nurseries. No plum group after Anderson retired. Discussion of possible locations, rootstock options, spacing/training.

Subcommittees met in late afternoon: apple, cherry, pear prior to dinner.

Friday, November 8, 2013

Project Administration

Website report by Win Cowgill and Jon Clements: \$60 of the registration fee goes to maintain the website. How to log in was explained. There have been more than 2000 visits, most from U.S., Canada, Mexico. All USDA requirements were met. Utilized for meeting registration, member list (update your own information) minutes, annual reports, links to eXtension. For publications, members can directly upload published abstracts, supply links to non-referred publications should be linked. Each planting coordinator should visit their page(s) and send Jon an email. Chair Essie thanked Win and Jon for their assistance with registration.

2013 Annual Report: past reports are on the website for formatting in Word. Essie and Rachel will write as Greg Reighard is absent. Include: impact statement, external funding (including in kind), publications, outreach related to the objectives. Win and Jon suggested verbiage from Dr. Perry on format content and then email it out to everyone (done). Essie and Rachel will then collate individual sections for the report. Fiscal year is October 1 through September 30.

Win indicated that the eXtension Community of Practice (COP) on apples (eapples.org) was an outgrowth of NC140)

State and Province Cooperator Reports

Minnesota (Emily Hoover): 2010 Honeycrisp: zonal chlorosis variable. Long, cold spring, poor pollination weather, so 1/10 of crop vs. 2012. 2003 Snowsweet and MN1914 trials: B9 not recommended for slender spindle; too weak, small. Apples bloomed about May 28, harvest began October 10. She discussed how the measured canopy volume discussion: total height, height to first branch, width across the row and width within the row; cone/cylinder, averaged them).

Washington (Stefano Musacchi): He began at WSU in August. He has begun a trial for WA 38 rootstocks and training systems. He was a pear breeder in Italy and developed dwarfing genotypes, in vitro; he is getting them to quarantine to multiply to test in the U.S.

Wisconsin (Matt Stasiak). Many froze in 2012 so heavy 2013 crop, not enough market, so left on trees after storage filled. Lots of winter injury: Honeycrisp on B9 (unexpected); had been good before at 30 below, so surprised. This year, 2012 droughty, then in late January, early February lost snow cover so roots in shallow soils were damaged. Discussion of options to control biennial bearing (rootstocks, crop load management). Matt is interested in a thinner other than lime sulfur.

Iowa (Paul Domoto). Showed slides of freeze damage on B.9 attributed to root injury under conditions of severe drought and lack of snow cover, Soil temperatures of 13F (-10.6 C) were recorded on site at 4 inch (10 cm) depth and at the 8 inch (20 cm) depth at an official recording site on February 1..

Virginia (Greg Peck): He had no official trial but reported on two other trials: 1) apple spacing and systems trial (handout). 2013 was a long season with early rain, a big crop, and short labor. Photos showed problems stemming from dirty budwood where growers grow their own trees. His spacing is wide or some rootstocks (e.g. B9 in same trial as MM111 but he will estimate yields at various spacings using the croploads in this trial). 2) covered and screened sweet cherry planting: 50-75% of fruit shed off about dime size or bigger due to cool pollination weather (or frost at bloom/petal fall?). Terence Robinson thinks its CHO deficit, since fruit were larger, like apple model look for CHO deficits about 10 days before the drop. Essie advised that frost damaged fruit will drop before pit hardening). Birds can be a problem: two got in and built nests; preferred certain varieties, similar to grapes.

Keith Yoder: Fire blight resistance of interest. But not well-tested for tomato Ringspot virus (TmRSV) susceptibility with dagger nematode vector; should test them to avoid union necrosis problem. Dave Rosenberger inoculated TmRSV in his Geneva collection trees in Hudson Valley, they will also do this in a test planting in Winchester, VA, projected for 2015.

Utah (Brent Black): Temperature dropped to -20C 5 nights in a row, led to bud kill in peaches. There were then spring freezes in April at bloom or near, so 50% of buds died. Lost some king bloom in apples. Has an iron chlorosis rootstock trial. In Kaysville is

having a hard time getting crop to set and so trees are very vigorous. Related plan of work: Fe chlorosis and effect on rootstock hardiness; he will apply differential treatments and then perform freeze tests on the rootstock.

South Carolina (Greg Reighard absent but posted his report): Data from the 2009 peach rootstock and peach physiology trials were analyzed and collated for papers presented and submitted for the June 2013 ISHS Peach Symposium in Matera, Italy. 5-year data for the rootstock trial will be submitted to JAPS. South Carolina will host the 2014 NC140 meeting.

Pennsylvania (Rob Crassweller): Reported 2012 yields, but no 2013 crop due to frost. Apples: Adams County Nursery propagated Geneva rootstocks for them. CG4210 will not be commercialized; doesn't propagate well (Table 3). 2007 Honeycrisp physiology (with Jim Schupp): There are lots of missing trees, he is only reporting those with enough reps for analysis. WES WANTS ALL THE DATA IF ALIVE, EVEN IF IT IS ONLY ONE TREE. Peach: Redhaven trial at Biglerville (with Schupp). They are testing John Boy at several locations). Krymsk 1 mortality is high, it dies if there are January temperature fluctuations; if it gets cold and stays cold there is no mortality problem.

Indiana (Peter Hirst): No written report (deer destroyed his trees). He presented a robotic pruning system trial (SCRI, grape and apple) video. The major problem is to locate fruit position since things are moving (vines wobbling, shakes). Possible prototype available next year? Will compare machine to human pruning, productivity; it is equal to human pruning now. Will need to pre-prune with hedger. Apple objectives: 1) creating 3D images of canopies using scanning and computer graphics to manipulate; then put leaves on, 2) pruning rules for apples, then apply. Jim Schupp is developing the rules to apply to the 3D model. They will validate the rules with different types of labor (students, commercial workers etc.). He supports using technology to change the way we do research. There are new modeling platforms that are easier to use.

Ontario, Canada (John Cline). Objective 1: To evaluate the influence of rootstocks on temperate-zone fruit tree characteristics grown under varying environments using sustainable management systems.

Apple Rootstocks : 2013 Vineland Apple Rootstock Experiment: Ten trees each of Honeycrisp on 7 different rootstock (V.5, V.6, V.7, M.7, M.9T337, M.26 and MM.106) were planted in 2013 at the University of Guelph, Simcoe Horticultural Experiment Station, at a spacing of 1.3m within and 4.0 m between rows (1923 trees.ha⁻¹; 779 trees.acre⁻¹). Trees are planted using a vertical axe type training system and are trickle irrigated. Trees will be monitored annually for trunk circumference growth, tree height and spread, yield, fruit size, rootstock suckering and longevity.

2014 Vineland Apple Rootstock Experiment: Ten trees each of Honeycrisp and Aztec Fuji on 17 different rootstock. John discussed this 2014 planting at different sites and announced that he has extra trees on certain rootstocks.

Peach Rootstocks: 2010 Peach Spacing Experiment: Coralstar' and 'Allstar' peach trees on 'Bailey' rootstock are planted in 30 m plots with trees within each plots spaced 1.0, 1.25, and 1.50 m within the row and 4.0 meters between rows. Treatments are replicated 4

times. Tree density ranges from 1667 –2500 trees/ha at these spacing. Trees are planted using a ‘Fusetto’ central leader type spindle system with wire trellis and are trickle irrigated. Trees will be monitored annually for trunk circumference growth, yield, fruit size, suckering and longevity.

Sweet Cherry Rootstocks 2012 Experiment: Twelve trees each of ‘Stacatto’ and ‘Sentennial’ on three different rootstock –Krymsk 5 (*P. fruticosa* x *P. lannesiana*), Krymsk 7 (*P. lannesiana*), and Weiroot 13) were planted in 2012 at the University of Guelph, Simcoe Experiment Station, at a spacing of 2.5 m within and 4.0 m between rows(1000 trees.ha-1). Trees are planted using a Vogel (wire trellis and supported) training system and are trickle irrigated. Trees will be monitored annually for trunk circumference growth, tree height and spread, yield, fruit size, rootstock suckering and longevity.

Tart Cherry Rootstocks: 2012 Montmorency Rootstock Experiment: Eight trees each of Montmorency on 5 different rootstocks (Mahaleb, Gisela 6, Krymsk 6, Krymsk 7 and Weiroot 13) were planted in 2012 at the University of Guelph, Horticultural Experiment Station, Simcoe at spacing of 1.5, 2.0, 3.0, and 4.0 m within row and 4.5 m between rows, Tree density ranges form 556-1481 trees/ha; 225 –600 trees/acre. Trees are not supported (free standing) and are trickle irrigated. Trees will be monitored annually for trunk circumference growth, tree height and spread, yield, fruit size, rootstock suckering and longevity.

2013 Montmorency Rootstock Experiment: Five 3-tree plots of Montmorency on 5 different rootstocks (Mahaleb, Weiroot 13, Weiroot 158, Weiroot 10, and Weiroot 72) were planted in 2013 at the University of Guelph, Horticultural Experiment Station, Simcoe at a spacing of 1.35m within row and 4.5 m between rows 1646 trees. Ha-1; 666 trees.acre-1),. Trees are not supported (free standing) and are trickle irrigated. Trees will be monitored annually for trunk circumference growth, tree height and spread, yield, fruit size, rootstock suckering and longevity.

Nova Scotia (Suzanne Blatt): She replaces and gives regards from Charlie Embree, who retired. Her background is entomology. Presenting 3 trials: 2004 Dwarf Pear Rootstock trial, 2010 Apple Rootstock (Honeycrisp) and 2010 Sweet Cherry trial. For the Honeycrisp, how do you rate “patchy” with respect to Honeycrisp chlorosis that is not throughout the entire tree? She did not get the scald and bitter pit on some of these new rootstocks for Honeycrisp following storage for 3 months. Essie commented that it is good she is measuring postharvest fruit quality because even if yield and size are good, but if the fruit get bitter pit or scald in storage, then it is no good (Mosbah – put in 36F storage out of the field; fruit won’t get soft scald). Postharvest results will be reported next year. She got graft union breakage with Honeycrisp on some of the dwarfing stocks. The pear trial on the Kentville station went organic and failed, trees located off-site and produced using conventional production methods are just coming into bearing years. Wishes to continue trial for another year or two? Terence Robinson is in agreement, will seek support from commercial grower as his commitment was to the original 10 years of the trial. Sweet cherries produced again this year but due to perfect conditions for brown rot, much of the crop was lost, despite treatment.

North Carolina (Mike Parker): Will be close to 80 inches of rain in 2013. Glomerella (a cousin of bitter pit from Brazil that affects leaves and fruit) is now a problem due to wet climate. Growers must use maximum fungicide rates of registered products at tighter intervals. Will it be confined to the southeast (TN had it about 10 or 12 years ago)? 2010 apple rootstock: fire blight very bad in 2012 with virtually none in 2013. 2009 peach physiology: bacterial canker (short life) in peaches; HBOK 10 AND 32 have very good survival, yield and yield efficiency and are potential size-controlling rootstocks. Guardian is the standard. Would like to see Sharp and MP29 from USDA, but can't get this. A good trial would consist of: Lovell, Guardian, Sharp, MP29, HBOK 10, and HBOK 32.

New York (Terence Robinson). Apple: Overall it was a good year, all did well. 2010 Honeycrisp rootstock: (Hoying has Fuji in Hudson Valley; no data): left higher crop loads (>7) last year (Year 3), but came back okay this year, so should a (biennial bearing) index be used to evaluate rootstock effect? Crop load averaged 5 – 11 fruit/TCSA in 2013, so he is leaving it high this year and see what comes back next year. Tissue culture G41 trees in the trial are less precocious and less productive than trees from cuttings; but this is not consistent with commercial experience. All commercial production is tissue culture. Tissue culture trees are better rooted in nurseries vs. cuttings and the trees are large. He thinks it's just the trial as they started out with very small trees and not a universal problem. Cornell licensed 5 new nurseries in 2012-13. Number of liners in 2012 is 2.3 million; most is G11, then G41, but 41 will surpass 11 this fall. Liners should be available. Terence Robinson described the attributes of the various rootstocks for the group; will make a table to post on the website. 2004 pear rootstock: good production for about 4 years; will keep trial another year (11 years). There were few differences for Concorde; for Taylors Gold Comice. OHxF 97 looks slightly better. Pyrodwarf looked better than in other trials; okay on Concorde? 2005 pear rootstock: Horner 4 doing okay, biggest trees, not yield efficient; 708-36 looks good for him, smallest trees. Pyro 2-33 good: dwarfing, high yields, okay fruit size. For 8 years, good production from year 3. Fruit size: Bartlett/Pyro 2-33 170 gm, 87 150 gm, Pyrodwarf 146 gm. Pyrodwarf and BM2000 sucker (especially Bosc). 2010 cherry rootstock: KGB (Spanish bush): Regina throws out a long shoot off from each bud you cut to and grows wild. Lapins look good. For spur types, UFO, spindle, bush good; for shoot types, use tall spindle, let them grow, benefit from the growth habit. Must head the trees to make the KGBs when you get them from the nursery. Nurseries should cut the KGB to 15 inches, let 3 or 4 shoots grow and they do fine (will survive frost) rather than stripping the buds below 24 inches. Peach: likes Bailey (not in trial) and Lovell. Lovell grew well this year. Controller 5 grew well in the past; survives cold; smaller fruit this year.

New Jersey (Win Cowgill): He is still maintaining the fumigation trial (others are too). 2010 Honeycrisp rootstock: Good bee hives but poor pollination in NJ this year; not a lot of wild bee activity. Low yields but large fruit. Didn't evaluate chlorosis early, did last week; not a lot (to date). Lots of bending, need more in vigorous trees on very good soil.

Michigan (Ron Perry for Greg Lang): Essie read an email from Greg on the future sweet cherry trial. NC140 apple and cherry trial data are in the Michigan report submitted by

Greg. Ron's comments on other MSU trials: 1) over the row harvesting on sour cherries (like Brent); Ron has 45 acres of "early adopter" plantings; one grower bought a machine, which was used to harvest 20 acres in 2013. Growers have gone from skeptical to interested because they cannot make money on the traditional spacing. New MSU rootstocks in the guard rows. Very dwarfing (60%) and precocious; will see if they "runt and stunt"; could "make or break" the high density system. He aims for 15 lbs. per tree yield. 3) SSCD/Chemigation study: using microsprinklers, 8.3 gph built for greenhouse misting, but getting better distribution in apple due to drift and sparse tree canopy depth. Applied 15 sprays this summer, getting good pest control, excellent thinning. In 10-12 seconds applies the right amount of chemical per tree. Cherry coverage has been more problematic due to large leaves and denser canopy than apples. Now has an irrigation engineer out of Cal Poly helping him. Jim Flore used a CR21 controller for evaporative cooling flower buds in late winter to delay bud break in apple and sweet cherry. Now waiting for SCRI to come out. WSU has an equivalent system in Prosser and at Sunrise. Apples: G935 not in the 2004 Belding trial; would be a nice stock for MI (too vigorous for tall spindle). He likes CG5087, but G935 is equivalent; Terence: CG5087 could be released if MI growers "put the pressure" on. Different rootstocks in the trial were discussed.

Kentucky (Dwight Wolfe): 2009 peach rootstock and physiology: The growing season began late due to cool and rainy weather. For the 2009 peach rootstock trial, trees on Bright's Hybrid and Viking have had the highest mortality rates, 50% and 25%, respectively. The time of 90% bloom averaged less than two days from first to last with scions on Bright's Hybrid and Krymsk 86 being the earliest and those on *P. americana* and Controller 5 being the latest to bloom. Maturity was the latest for scions on Lovell, and earliest by about six days for scions on Krymsk 1 and *P. americana*. Scions on *P. americana* and Krymsk 1 averaged the greatest number of root suckers, as they did in 2012. Microbac continues to be the most vigorous rootstock and Krymsk 1 the least vigorous in this trial. Yield per tree was highest for scions on Atlas and lowest for scions on Krymsk 1. Cumulative yield was highest for Atlas, but was not significantly different from that of Lovell, KV010-123, Viking, Guardian, KV010-127, Microbac, or Krymsk86. Scions on Atlas also had the highest cumulative yield efficiency. Fruit size did not differ significantly among rootstocks. Early March freezes killed blooms on 'Crimson Lady' trees in the 2009 peach physiology trial. Significant differences among the other two cultivars were observed for fruit size at both harvests, but not for the brix readings. The above average rainfall in 2013 most likely contributed to the relatively low brix readings in 2013. For the 2010 apple rootstock trial, three trees (one with M.9 Pajam 2 and two trees with B.71-7-22) succumbed to fire blight infections in 2013. Trees on PiAu 9-90, and B70-20-20 rootstocks are the largest, and trees on B.7-20-21 and B.71.7-22 are the smallest. Yield was greatest on G.4004, G.935N, and G.202N and lowest for B.7-20-21 and B.71-7-22. Root sucker growth was highest for M.9 Pajam 2, followed by G.4814 and B.70-20-20. G.4003, followed by G935N, G.5222, Supp.3, and G.11 had the highest cumulative yield efficiency.

Colorado (Amaya Atucha): No report; will upload. They had huge trees with no fruit in 2013 due to frost. Vigorous almond/peach hybrids (Viking, Atlas) perform the best so

don't get Cytospora vs. the dwarfing rootstocks, but hard to get due to almond demand in California. Lovell not good due to high soil pH. Looking at root distribution/lifespan, mycorrhizal colonization (at station) in replant situations using mini-rhizotron. Cadaman has done well but what happened to it (Terence said Fowler will bud on it by order, but not "off the shelf"; Mexico likes it in high pH soils? Guardian has not done well.

Massachusetts (Wes Autio): 2009 peach, 2010 Honeycrisp. Included the "Clements Tall Spindle Index" results (Jon Clements describes). Multiple criteria rated at harvest on 0 (poor), 1 (fair), 2 (good), 3 (excellent) in order to answer "If this was my orchard would I like this tree?" Accompanying photos are on the NC140 web page; click on the rootstock then see the picture.

Maine (Renaë Moran): No coordinated trials; starting a Honeycrisp trial in 2014 as growers are now considering high density plantings and want data. Fang Geng (Renaë's PhD student) discussed remedies for micropropagation rooting problems: 1) chilled to promote shoot elongation. 2) adjusted the light quality (blue, red, white, control); red promoted shoot growth of B9, G30, G41. Renaë discussed cold hardiness experiments. She is repeating to see if consistent from year to year. Some rootstocks were more tender in October, but became harder in December than others. She tests twice, first before cold, second after a mild freeze. Injury occurs when temperatures fluctuate in the spring, not when very cold in the dead of winter.

Idaho (Essie Fallahi; has a Powerpoint): 2010 Fuji rootstock: Hard to get going, but survivors okay, reaching to the top (7th) wire, most with good columnar structure, have slowed with cropping. Blocked to eliminate effect of cold going to bottom of hill. Terence Robinson noted: re-head to a weak leader next year). G11 is very tall. He likes G935. Described canopy architecture, rootstock project: 4th leaf; central leader based on 4 permanent branches or tall spindle 40 t/ha in 2013 (5th leaf), next year will get 60-70? Must adjust crop load based on the total yield per acre in mind and then by setting a certain number of fruit per tree. Nurseries in the Pacific Northwest should produce better feathers to establish the tall spindle system and regular cropping.. He does postharvest evaluations. The need for a fertilizer program due to low soil organic matter (OM) was discussed. Goal: fill space as fast as you can. There was an extensive discussion on fertility programs and whether this should be addressed in a future SCRI grant proposal, i.e. fruit and leaf samples of the different rootstocks, especially Ca and B due to bitter pit, cork spot. Can you predict Honeycrisp storage? Boron damage happens early after petal fall (cell membrane development; cork spot). Later in the season it's Ca, with bitter pit. If no bitter pit at harvest, the amount of Ca at harvest is the determinant so must measure Ca at harvest N:Ca is important; high N fruit doesn't have enough Ca supply in the fruit.

British Columbia, Canada (Denise Neilsen): British Columbia (Denise Neilsen): Both Cheryl's and Denise's data are uploaded. 2010 sweet cherry trial: first fruited in 2012, no cumulative yield differences due to slight frost in 2013; Gi3 on UFO is the weakest. There is a good relationship between trunk area and canopy leaf area. But canopy volume is not well related to TCSA. Good fruit size in all; more related to crop, not to rootstock. If want fruit larger than 10.5 gms, can only have 30 fruit/cm² TCSA. Need

more years to draw fruit quality conclusions. Discussed fertility program (P, Ca, N (samples leaves from new, non-bearing, mid-shoot leaves mid-July to mid-August), K, Zn). (Terence: need 2X as much K as N for high density apples vs. a standard orchard). Will begin evaluation of fruit nutrient levels to develop fruit quality standards. With nematologist Tom Forge, looking at effect of root lesion nematodes (more on Gi 3). Gi 3 is less vigorous than Gi 5, 6; lagging behind, not commercially viable?

Maryland (Bryan Butler for Chris Walsh): Chris will send in the report.

Brazil (Guest: Andrea Rufato, Vacaria (Embrapa)): 1.3 million tons (Gala, Fuji) in Santa Catarina state. She described her 2011 apple trial: sandy soil, so Terence is urging them to test more vigorous rootstocks. They interstem Moruba, which is a lot of work. There are also 5% OM soils. Soil pH is low and low chilling. There are 2 genotypes of 213 in stool beds (Brazil has the true one).

New Mexico (Shengriu Yao): No trials. Cropping is difficult due to freezing. She is focusing on crops that are hardy, including jujubes.

California (Rachel Elkins): See the report for details on the peach and cherry trials (there are no current apple trials). 2009 Redhaven peach rootstock (Scott Johnson, Ted DeJong, Kevin Day): There was a full crop and trees are at ultimate height. Signs of moderate incompatibility were seen in several selections. Tetra, HBOK 10 and 32 are the best dwarfing and Atlas and KV010-127 are the best standards so far. 2005 'Bartlett' pear rootstock: Horner 4 continues to be the best performer overall and is the largest tree. 2013 will be the final trial year and data will be collated and written up for the Journal of APS, along with the other 'Bartlett' locations. 2013 'Bartlett' high density systems trial: This is one of four trials, the others are in OR, WA and NY. Trees were planted in May 2013 and trained during the growing season: tall spindle, bi-axis (headed at planting to a "knip"), 2-leader (single leader headed to a 2-leader parallel to the row), and "V" trellis as alternating leaning trees at 22 degrees at the base (unheaded). Survival was excellent and over 2000 flower clusters were removed after planting to prevent fire blight infection. Data was collected from trials planted in 2012: 1) 3 selections of Amelanchier and 1 of Quince (with OSU) and 2) 3 OHXF rootstocks (69, 87, 97) that were planted in 2012 in a commercial orchard. 2010 'Benton' cherry rootstock (Greg Lang, Joe Grant and Chuck Ingels): Gi3, a low vigor rootstock, has the highest mortality due to oak root fungus which has resulted in increasing mortality among trees. Gi12 has suffered the least mortality. Tall spindle/Axe trees had the highest yield and largest overall fruit size.

Oregon (Todd Einhorn is absent; Rachel Elkins provided brief remarks): 2002 d'Anjou rootstock: 10-year trial results were submitted and published in the Journal of the American Pomological Society in 2013. 2005 d'Anjou pear rootstock: 87 and Pyrodwarf had the highest yield and yield efficiency, despite their relatively large trunk size. Horner 4 produced the largest tree, but also had high yields. Across all rootstocks, yield efficiency was quite low, signifying the high vigor and poor precocity of 'd'Anjou'.

Additional trials with continuing progress were Horner Series on-farm evaluations and Quince cold hardiness.

Subcommittee Meetings

Apple: The 2014 Apple planting will be coordinated by John Cline who has also agreed to analyze the data. Rich stated that blocking was not helpful and adds unnecessary complexity to the data analysis. Based on this, the group voted in favor of a completely randomized design without blocking. Known and measurable variables such as trunk circumference can be used as covariates. Each site will have its own randomization. This trial has two semidwarfing rootstocks that may be too large for a 3-foot spacing. The group voted in favor of extending this to 4 feet in the row and 12 feet between rows with the cultivar Honeycrisp, but keeping the tall spindle system. For Fuji, it was agreed to extend the spacing to 5 feet in the row, 13 feet between rows and a vertical axe training system. This spacing was selected since our goal is to maximize the rootstock effect. Terence will email all participants instructions on tree training for the tall spindle system. Each site will select a pollinizer variety since some sites are very limited in adapted varieties. Outside guard rows are also expected. Terence is organizing another trial with an expected planting date of 2019. Potential rootstocks are from the East Malling series and New Zealand selections.

Cherry: Members: Brent Black, Suzanne Blatt, Jon Clements, John Cline, Win Cowgill, Todd Einhorn, Greg Lang, Stefano Musacchi, Denise Neilsen, Greg Peck, Matt Stasiak, Terence Robinson (not all were present at annual meeting). The 2010 Sweet Cherry Rootstock x Canopy Training System Coordinated Trial began with 13 sites; these have dwindled to 5-6 due to diseases, cooperator retirements or transitions, deer damage, etc. Work has begun on the first trial paper (Training Systems Establishment, Years 1-3) with adequate data expected from CA, MI, NY-Geneva, NY-New Paltz, NS, and BC. Of this group, CA likely will drop out for the next phase (Initial-Maturation Yields – Years 4-6) due to excessive mortality from Armillaria. Greg Lang will send out a call for missing data sets, as well as a draft of 2014 training and data protocols for subcommittee input, during January. Results from the project thus far have been presented at several international scientific conferences (ISHS-Canopy Physiology, Rootstocks, and Training Systems 2012; ISHS-Cherry 2013) and regional/international grower meetings (MI, MO, PA, WA, IFTA, Chile, New Zealand). The initial fruiting results from 2013 are limited, but interesting in that certain canopy architectures appear to have a potential influence on fruit quality traits such as soluble solids and firmness. Two 2010 Tart Cherry Rootstock x Canopy Training System Independent Trials were established in UT (Brent Black) and MI-Traverse City (Greg Lang/Nikki Rothwell/Ron Perry). The focus is on examining rootstock x canopy training interactions to develop hedgerow-type trees for over-the-row mechanical harvest. Both sites remain on track; an initial paper on establishment has yet to be discussed. Three new rootstock genotype evaluation trials are being discussed (Matt Stasiak and Greg Lang, organizers), probably for 2017 planting (liner propagation in 2014, nursery planting and budding in 2015, nursery production and digging in 2016):

- 1) tart cherry rootstocks (higher vigor) for trunk shaker harvest systems
- 2) tart cherry rootstocks (moderate vigor to dwarfing) for over-the-row harvest systems
- 3) sweet cherry rootstocks for high efficiency fresh market production

The new rootstock genotypes of interest for these trials include standards, 4-6 from MSU, several from Krymsk, several from Gisela, and perhaps one or more MxM stocks.

Greg Lang initiated discussion of a new potential (2015) trial focused on trellised sweet cherry systems, i.e., single and dual (“V”) fruiting wall canopy architectures, if there is interest from other subcommittee members.

Pear: Members present were: Amaya Atucha (CO), Suzanne Blatt (NS, Canada), Rachel Elkins (CA; Acting Chair for Todd Einhorn, who was absent), Stefano Musacchi (WA), and Terence Robinson (NY). Stefano offered that he was introducing 13 out of 32 dwarfing pear genotypes from the breeding program at the University of Bologna. They are being processed in vitro through the National Clean Plant Network at Prosser. They would be released after 2 years (2016). The 2002 Pear Rootstock trial was published in JAPS. The 2004 Pear Rootstock trial is completed and Terence and Suzanne will collaborate on writing this up and presenting at the ISHS Pear Symposium in Belgium in July 2014. The 2005 Pear Rootstock trial will finish after the 2014 season; data to-date will be presented in Belgium, but the final harvest data will not be available until Fall 2014. Rachel will prepare the JAPS article. The 2013 training/rootstock/spacing trial just completed its first season. Cooperators are Todd (2 sites; Bartlett and Anjou), Terence (Bosc), and Rachel (Bartlett). Trees were grown by Willow Drive Nursery in WA. Todd had suggested a new trial of quince selections from the ones he had tested for freezing tolerance. In addition to OR, there was interest from: CA (not for cold hardiness; Bartlett, Bosc), CO (Bartlett), NY (Bartlett, Bosc), Nova Scotia (Bartlett, Bosc), and WA (Bartlett, Anjou). The group suggested: a Beurre Hardy interstem done in the nursery to ensure compatibility for Bartlett; Terence described an apple example: Golden Delicious is budded onto the rootstock, then when the trees were knipped (i.e. the 1-year-old stem headed after the first growing season), the desired scion bud was inserted. Suggested spacing was 1-1.5 m x 3.5 - 4 m. Standards would be all commercially available Quince (A, C, BA29, another?) and OHF87. Projected planting is for 2016 or 2017, presuming material is available (tissue culture plants of the quince selections are being grown by North American Plant in Oregon).

Concluding Business

Terence: 1) ISHS in late March, applied fruit crop physiology, honor retiring physiologists of the 1970s. Summarize 40 years of fruit crop physiology. Can submit an abstract. 4 topics: light, carbon, environmental (biotic/abiotic), physiological. Apple, cherry, peach, citrus, apple, pear. 3 days. March 26-28, 2014. Posters. What is greatest idea (2 slides) (wants 40 people).

A motion was made by Mosbah Kushad and approved via a vote to acknowledge Essie Fallahi's efforts in hosting and chairing the NC 140 meeting. The group also unanimously approved a motion to annually have the participants express their appreciation to host/chairs of meetings by presenting them with a plaque. Essie

responded that the growers are glad the group came. His technicians are very appreciative; they learn. Terence demonstrated how to make the cuts. After 2 days of learning/discussion, “agree to be disagreeable”. Science and democracy is about this. Please come to Idaho again and cooperate with them. Come with families.

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