

NE-1036 Postharvest Biology of Fruits
Minutes of the 2011 Meeting in Wenatchee, WA
May 22-23, 2011

Post-rapture attendees:

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Announcements:

Jim Mattheis:

Get receipts for registration.
Lunch and Food directions

Renae Moran convened the meeting at 8:30 am.

Reminder that all information presented is confidential. Must seek author's permission for use outside of meeting.

Word of the day - Prophylactic

Q? = question, C! = comment

OBJECTIVE 1. Determine genetic and biochemical mechanisms governing loss or retention of fruit quality after harvest.

John Fellman – discussion leader

Peter Toivonen

New CA Storage system. Investigating IEC of new cultivars. SPA813 is an early season, similar to 'McIntosh'. Good flavor retention, and storage potential. Will be doing CA and 1-MCP next year. SPA493, is one of his more promising and hopeful new releases. Trying to establish maturity by tasting... SPA493 does not push a climacteric until Nov, but harvest in Sept. Many challenges in determining proper harvest maturity. Breeders have seen some segregation for scald susceptibility. Q? What is the breeding background. Gala and Splendour. All Summerland crosses. Q? Will you do respiratory climacteric as well? Yes, has already been performed.

Beth Mitcham

John Labovitch – Decay susceptibility on tomato. Pectin changes in tomato and susceptibility to pathogens. Compared 4 different types of tomatoes (ripening mutants). Inoculated 30-40 days post-anthesis. CNR was not resistant. It is called colorless non-ripening. If you reduce expression of expansin, you reduce infection. Expansin and PG are likely playing an important role in disease susceptibility. Design a genetic fruit that is more resistant to decay. Q? Is the original flavor savor more resistant? Yes, that is why it was selected.

Pierce's Disease. Working on genetically modifying the rootstock. (More acceptable to consumer, instead of scion wood).

Sergio – Working with apples with suppression ethylene synthesis. Suppressed ACO and/or ACS, in relation to bitter pit. Ethylene content can influence the amount of BP. Used shade cloth – higher levels of BP. None in the non-shaded. Transgenic had lower BP incidence compared to wt. Shading caused an increase in the total amount of calcium in the fruit. Q? Magnesium binding? Looked at microscopy and CA binding chemicals to visually the location of the mineral. Q? Symplastic flux? Sap flow in relation to temperature, and the movement of ABA during day and night – suggestion to investigate MJ, as it might promote BP in apple. An auxin inhibitor also promotes BP. Calcium translocation is critical for expression of BP. Calcium is loaded early in the season, and is then diluted during the season. Q? If Calcium needs to choose between leaves and fruit, then shading would alter location of the fruit. Q? What was the maturity of the fruit when the shade was applied.

Ngoc Nham – Conditioning of Bartlett pears. Warmer temperatures induced ripening better than 0°C (same length of time). Changes in expression of 5 ripening related genes at 3 different temperatures. David Sugar found that 10°C is the best temperature. Q? Will this result in a change in recommendation? Too early...possibly ship fruit warmer

at 10°C. David Sugar, it is not a storage temp, but a ripening tool. Q? It only works at beginning of the season (prior to the fruit having received adequate chilling).

Carlos Crisosto – mapping for peach and almond cultivars. Developing SNPs. Peach chilling injury. Develop peaches with chilling resistance.

Bruce Whitaker

Does ethylene play a role in SS development? No 1-MCP = scald. Even in ACS and ACO suppressed lines, they still produced AFS in high levels despite the low levels of ethylene. Mutants may become hyper sensitive to ethylene. Q? It is important to work on individual fruit rather than composite samples. Greensleaves are easy to transform – is a good scalding fruit. Trees ripen from the inside out. Related to shading?

Calmodulin regulation in tomato fruit. Systemic resistance/CAMTA gene. Cloned 7 genes, and all have very different expression levels. 2 and 4 are opposite expression during maturation, and they appear to be involved in ripening.

Pathogens - molds in apple. Differences in virulence of the two – acidification of host tissue not a factor.

Wild apples – 175 accessions evaluated. Not very much natural resistance to cultivated apples, and are exploring for wild resistance. Found a few that have high resistance/immune. Trying to identify fruit resistant to both penicillium and colletotrichum. Q? Why looking for resistance to Colletotrichum...relic. Q? Ammonia production or uptake are involved with acidification of the host cell to help pathogen with establishing itself in the host. Q? How long should you wait after wounding? Low temperature is beneficial for reducing ethylene and ethanol type responses by the fruit.

Randy Beaudry

Isoleucine increases at the same time as aroma production. Pathway proposed on page 15. Found in bacterium. Plastid pathway. Looked at gene expression of branched-chain aminotransferase, but it likely not a rate-limiting step (levels decline over time). Very small relative change. PDC1 increases many-fold during ripening. Threonine deaminase does not appear to be genetically regulated. Transferase down in favor, PDC increase in favor.

Carolina Contreras – When do apples start to smell like apples? Used IEC to align two harvest years. 7-10 days prior to ethylene climacteric, people could tell that an apple was an apple. Ripening vs non-ripening fruit tissues. Figure 2 – *cis*-3-hexanal vs hexanal – possible different sources based on top and bottom graphs. Changes in hexanal and acetates increase after the sensory panel could detect the ripening. Great variation on LOX expression during 8 stages of ripening. Bruce – strawberry have a similar pattern of LOX and aldehyde production.

Characterization of volatile profile and storability of fruit from Geneva. Larger fruit make broader diversity of aromas. Large fruit – mammals. Small fruit, birds (poor olfactory). See figure on page 45. Q? Rates of production. But Kazaks were higher than domestic, but not off the chart.

Bob Prange

Xanthophyll cycle and antenna pigments. As oxygen level approaches zero, zeaxanthin content increases, while violaxanthin decreases. Compound first appears around 5% O₂. Ratio can switch based on the atmospheric oxygen level. If zeaxanthin is inhibited by DTT, then the lower oxygen limit is increased.

If you can use the night-light (low-light levels), you can use it to determine the low oxygen level. With granny Smith, (panel A, page 2). 8 single apple fruit. Can use PFM sensor to estimate the low oxygen limit during storage. If you stabilize pigment, you can extend shelf-life. Q? Is there a way to keep zeaxanthin stable so that it stays high? You can use LED lights, but the effect is transient (and occurs quite quickly). Water-stress will enhance zeaxanthin content. Q? Will you alter the Harvest Watch system based on new information? Not likely. Q? Are there differences from red vs green (flavonoids). Should measure sunny side, it is more sensitive to low oxygen. Q? Is there still an interest in determining the absolute lowest O₂ levels, with 1-MCP. 10% organic production in WA, and Europe are both interested. In Europe, you are allowed either 4 or 6 detectable chemicals. Thus, opportunity for not treating with 1-MCP, and treating with something else. Q? What fraction of NS crop goes to UK? Essentially zero. Honeycrunch is coming to N.A.

Chris Watkins

Nigel and Chris exchange pleasantries.

Browning has been observed throughout the fruit, not just on the shoulders in Empire. 1-MCP exacerbates the phenomena.

External CO₂ injury. Nigel is doing sequencing work. Visiting Fellows looking at antioxidant data – largely inconclusive results. Probably over-producing Empire considering browning issues. Fresh-cut like using Empire, but 1-MCP makes fruit more susceptible to browning. Double-edged...examples where storage time was less with 1-MCP than without due to internal browning. Later harvest contributes to browning, and harvest slightly earlier, like they do in Canada. Q? What cultivars are harvested on either side of Empire, Cortland before, Reds after. Jonagold/Jonathan are slightly after Empire.

John Fellman

SCRI grant on Cherry. Develop sweet cherries suitable for mechanical harvesting. Look at ethylene biosynthesis pathways of three cultivars. Have ethylene, but are non-

climacteric. Have low levels of ethylene. ACO activity disappears as fruit ripens. Peak ACO activity varies from 34-44 DAFB. All ethylene activity occurs early in development. Looking at t/o of receptor to see if signal is turned off during development. Hope to look for markers to assist with mechanical harvesting. Looking for markers for stem abscission. Q? Peaches, rapid increase during pit hardening. Q? Market for stemless cherries? Consumer's will eat them if they do not have a choice. Last longer without stem, and simplify quality (non-green stems). Fruit quality is acceptable after mechanical harvesting.

David Rudell

Increase in CO₂ can induce internal browning. Treat with DPA. Injury is promoting fermentation. Q? Does DPA prevent browning, or the damage? Suspect that it prevents the injury itself. Q? How far does DPA penetrate the fruit? To the core.

Steryl esters SE/glycosides. Increase in fruit that have not been treated with antioxidants. SE can either increase or decrease, but levels do remain constant once placed in storage after intermittent warming. ASG's were lower in years with no scald. CA also reduced ASG levels. Q? ASG levels increase during storage. Are they associated with the plastids in apple?

Production of MeOH and methyl esters did not consistently precede scald development, but MeOH is potentially linked to scald.

"I remember being a young fart" (Beaudry, R.)

OBJECTIVE 3. Develop technologies and practices that optimize returns and promote increased consumption of health-beneficial fruits through preservation or improvement of fruit quality attributes.

Discussion Leader: Penny Perkins-Veazie

Beth Mitcham

Carlos Crisosto – Correlating sensory with instrumental analysis of taste and aroma in peach and nectarine. TSS was highly related to degree of liking. Strong relationship between how much they liked the fruit, and how much they would be willing to pay. Premise is that better tasting would increase the consumption of the fruits. Q? figure 3.1.2., were all at optimal maturity? Probably picked at commercial maturity. Q? cultural too, white peaches more popular with Hispanics. Sweetness for N.A. population.

Kiwi Fruit –

"well, you don't call a grapefruit a grape" (Nigel)

If TA was high (>1.2 %) then a high dry matter content was necessary to compensate and satisfy consumers. TA and dry matter correlate with quality and consumer acceptance. Q? Are they looking at NIR? Not sure. Q? Is there evidence that dry matter is a better indicator than TSS. Kiwi are harvested full starch, and end TSS is unknown. Dry matter is better indicator.

Vallone. Aroma profile of melon using zNose. Different peaks are indicators of melon maturity, abundance changes during fruit development. Graphs A and B are identical.

“It’s the Theo Solomos school of presentations” (Fellman).

Volatiles analyzed on whole melons, cut melons, and then work on testing in the field. Will also correlate with sensory panel. Peak 4 is immature fruit, Peak 17 is candidate for ripe fruit. Q? Does it matter what the compounds are? For commercial applications, no. So long as there is no coelution of peaks. Concern about peak abundance associated with costs and price indices, thus, should thread with caution. “We already have enough hammers over our head, don’t give them another reason to reject our products”.

Iphone application for testing of watermelon quality (acoustic)?

Pear ripening and sensory quality. Do ripening conditioning treatments affect sensory quality. Comice untreated controls never really ripened. Bartlett’s eventually ripened. PCA of conditioning treatments vs sensory at three different Newton levels. Ethylene treatments tended to result in fruit with hexanal and green notes. Q? Were fruit analyzed at the same time? No, maturity was not uniform. However, rigorous sensory panel training was performed. Low temperature induced different types of volatiles. C! Regimes of temp and ethylene that take longer tend to produce a better pear.

Pallet shroud system with a sachet to emit CO₂. Bottom of pallet is not sealed. Peakfresh and PrimePro did not accumulate CO₂ even though they advertise themselves as MAP. Pallet shrouds that increased CO₂ did have reduced decay, and weight loss was also reduced. Q? Price difference in technology? Not certain, but is very competitive.

1-MCP in Bartlett pears. How does exogenous ethylene effect ripening of 1-MCP treated fruit. Correlation of ethylene to Smartfresh ratio in headspace, 1:1 found that you could modulate the 1-MCP response (about 50%). Mid and late season, there was no difference in treatments, however, early season there was an effect. Even though ratios work, but treatment at a commercial level would be challenging. Q? How much 1-MCP is being used on pear? Bartlett for Brazil and potential for Russia. Anjou, using them to prevent ripening, and don’t care about whether they ripen, while others are trying to deliver pre-conditioned fruit. Q? Anjou are the trickiest for 1-MCP application. Using 20 ppm. C! There is lot to lot variation within a season. Jim is using 1:1 with mixed results.

Ozone to control ethylene or decay in blueberry. Looking at ability of ozone to scrub ethylene from storage room. Ozone reduced ethylene, but not to the level that was expected. Blueberries, ozone, MAP and air. Did any storage treatments have an

influence on flavor? Will test... High CO₂ (MAP) resulted in off-flavor, but significantly lower decay. Ozone does not work!

Dan MacLean

SCRI grant on mechanical harvest of blueberry. Novel 'crisp' textured fruit are significantly more resistant to damage caused during mechanical harvest operation. In essence, mechanically harvested 'crispy' or 'firm' fruit have similar postharvest quality to hand harvested conventional fruit.

ClearBlue 104 – an pH buffered copper-based sanitizer, was effective at reducing colony counts and postharvest losses due to soft rot pathogens in tomato.

Bruce Whitaker

Eggplant – chlorogenic acid derivatives. Malonation of caffeoquinic acids were two peaks identified. One is related to inflammatory bowel disease. Malonation by acyltransferase of the 6' position of flavonoid ring.

Randy Beaudry

Honeycrisp, seeing some CO₂-like injury. CO₂ in CA storage greatly enhanced CO₂ injury. 1-MCP eliminated injury. No difference between 3 and 6 months. Pre-conditioning works very well at reducing injury. C! Honeycrisp can hold the water very well. C! Are people putting Honeycrisp into CA. Industry is storing some, without symptoms, but it is only a matter of time. C! Stuff that holds up well are fruit that you generally do not want to eat.

Eva Almenar, trans-2-hexenal, GRAS, antimicrobial compound. Works well on blueberries if you treat at a high enough concentration. Cyclodextrin release issues. Q? No phytotoxicity in practical applications. Work was performed at room temperature. Blueberries produce copious amounts of hexenal naturally. May work best as a way of protecting if temperature was compromised.

Chris Watkins

Flesh browning. Appears to be a correlation between glyphosate use in the orchard with flesh browning after harvest. Thus far data suggests a tight correlation with glyphosate application and flesh browning. There is a feeling in the industry that browning disorders have increased over the past few decades. But there are differences in cultivars, management strategies, but orchard management practices have changed as well.

Foliar nutrient management for Empire. Mixed results, without any real obvious benefit. FB – flesh browning, FB severity score, CB Core browning,

Honeycrisp – 6 different CA regimes. Great variation between orchards. Little effect of atmosphere on firmness, TA, etc... Looked at low CO₂ with traditional atmosphere in NY (2-2). Treated fruit with SF either pre-pre-conditioning, or post-pre-conditioning. On Table 7 (p21), if you treat fruit with 1-MCP on day 1, any delay will result in greater injury. Regional effect of TA. TSS macerated tissue versus tip from firmness tester. Firmness tester will result in higher TSS content. Q? What does core browning look like in honeycrisp? Looks like browning in the cortex. Polaris – to increase ripening on sugarcane, Polaris: GA inhibitor. You can treat fruit with 1-MCP after harvest, and you can delay CA for a few weeks. Rooms are being filled more quickly, without adequate cooling. Treat fruit at 2.5, 7.5, 12.5°C, hold for pre-conditioning, then normal storage, you will see greater CO₂ injury.

Label has changed for 1-MCP so that you can do repeat applications. Timing affected browning.

Higher flesh browning in Retain and 1-MCP treated fruit, but not consistently.

Effect of RH on preconditioning period. Humidity can help control soft scald. Defrost cycle can cause an acceleration of softening. Q? Where are growers performing the pre-cond? Barns, hallways, vacant rooms...

Bob Prange

Figure 1 – Bitter pit indicates immature fruit. Senescent breakdown indicates over maturity. Fruit >350g you are going to get BP. Week 5.1 is when IEC was first detected, and was number 6 on the cornell maturity chart. DA is less noisy than starch or ethylene, and is linear, so you can better estimate harvest maturity. Costs about 3000 Euro.

Jennifer DeEll

Northern Spy – processing apple. Need year round supply (13 months). 1-MCP reduced IEC, higher firmness, higher incidence of core browning (stress-type disorder, not important for industry applications), lower flesh browning, lower SS.

Rapid cooling – the neglected fruit. Different cooling regimes. Quicker cooling was beneficial after a year of storage. Resulted in a pound difference in firmness.

Honeycrisp – with low CO₂ you had more soft scald. Effects of amino acid profiles with 1-MCP. Sensory panel can detect differences between air and SF, as well as CA and air. CA and low CO₂ resulted in sweeter (higher TSS).

Multiple applications of 1-MCP – McIntosh and Empire. All treated at harvest (including controls). Second treatment after storage resulted in a 1.5 lb retention of firmness. Q? What were the IEC? Not sure.

Harvista – aerial applications vs ground. Used a helicopter, and is could be an appropriate application technique for terrain in Canada and the Northeast. Comparable to ground application. Priced comparable to ReTain. No pre-conditioning (worst case scenario). Used half rate (60 g/acre).

“Picture of Robert Duval in Apocalypse now” (Whitaker)

John Fellman

If you treat apples with ozone, you increase internal ethylene, no increase in disease control, accelerated ripening. Did not modulate 1-MCP effects. If you used ozone and 1-MCP, then it worked just like 1-MCP. Oxidative stress increased the IEC. Did not effect the fruit. 2 ppm treatment. Green tissues are more susceptible to injury. Ozone is for organic, no residue. If you could oxidize enough ethylene into CO₂ – but that doesn't work either. It will react with everything in the room (stainless steel...).

17:54 – meeting adjourned.

May 23, 2011

8:30 – meeting opens

Renaë – suggestions for next meeting

Nova Scotia

ASHS is in Miami July 31 to August 3 Tuesday – Friday,

ISHS in Malaysia early July

Propose before ASHS meeting

Selected Florida – Ft Lauderdale

Election of new secretary

- Volunteers?
- Randy said he would do it if Peter wouldn't
- Peter is new secretary

Jim Mattheis

Gala - internal browning. Likely chilling injury. Pre-conditioning significantly reduced the appearance of the disorder (10°C). Pre-store fruit at 17 O₂/3 CO₂. Stem end browning by fruit weight, found that larger fruit are more susceptible to the disorder. Found first in the shoulder. No collapse, no cavity, not soft. But is present and well defined. C! Shoulder ripens ahead of the rest of the fruit. Maturity can differ 2-5 days from shoulder to calyx end of the fruit. C! SF changes the appearance of the disorder. In Empire, it was worse at warmer temperatures. Q? Does it involve PPO? Lots of things can cause browning. Need to diagnose based on field management, postharvest treatments, storage conditions. Maillard reaction? Q? Is there a shift by industry to harvest earlier/later? Not this particular grower. SF might not make it worse, just appear a little earlier. Cooling delay helps, but will be unpopular with growers.

Golden Delicious – SF and CO₂ relationship. SF makes CO₂ injury worse. Q? ghosting? It is tannish brown, rough. Ghosting appears to be chilling injury. Fruit for Mexico rooms (30 days at 31°F) with SF, warm production area, cooling immediately after harvest. It is a chilling injury. Diffuse skin browning = ghosting. Warm to immediate storage with immediate SF = disorder.

“Ghosting is a river in Egypt” (Fellman)

David Sugar

Darryl Richardson, Hendrik Stotz – on-campus postharvest position disappeared. Two pear valleys, Medford and Hood River. Position previously held by Paul Chen, Jin Bai, one round, position frozen. Two weeks ago, interviewed Anne Plotto (FL), Keith

Sharrock (NZ), Yan Wang (CA). Full time PH pears and cherries. 5-year 25% of salary paid by industry.

Pear Ripening. Induced cold ripening for Bosc, Comice, d'Anjou. 1) Maturity at harvest in relation to chilling requirement. 2) Also, should fruit be kept as cool as possible during induction? 3) Was 24 hours in ethylene adequate? In order to determine when a pear is conditioned, 24 hours in ethylene at 65°F or higher = conditioned. Using 'Conditioned' instead of pre-ripening, pre-conditioned, ...

For Comice or Bosc, when fruit were picked at a certain firmness (appropriate for the cultivar), for every day later the fruit were harvested, 0.6 days less conditioning would be required. 10°C was the best temperature for conditioning. At 10°C after 21 and 28 days, the fruit turned to mush. Q? Does anyone do the 10°C? Yes, 48 hours ethylene at 20°C, 3 days at 10°C, the cooled and shipped. With this technique, they could move the first shipment from 4 weeks down to 1 week. Q? Does the flavor change with different conditioning periods? Conditioned slowly was better quality than fast conditioning. Mid-November Comice is heavenly. The longer the ethylene (up to 72 hours) and the more time spent at 10°C, the shorter the conditioning period required. Shipping firmness can be as low as 6 lbs, 8 lbs some, 10 lbs is minimum for shipping across the country. 24 h ethylene then 10 d at 10°C, results in higher quality, but more vulnerable to damage during transport. Has had mixed results when doing ratio of SF treatments with ethylene. C! There is a temperature effect by SF concentration. C! Used SF tents. In cardboard containers, moist will adsorb the SF.

BioSave or Scholar for controlling wound decay. Delay of application after harvest. Wound at harvest to simulate stem-punctures, and treated 0,3,6,9 weeks with fungicide. Both worked after 0 weeks, only Scholar after 3 weeks. Pre-harvest fungicides found that Calcium and Pristine 1 week before harvest will reduce the dependence of using TBZ, and/or applying postharvest drenches immediately after harvest. Q? Bin drench is performed with a wand and nozzle. C! In CA, most people will condition just 12-24 hours. They do what they want to do, despite what the label says. Q? Do you need to have labeling on the box to say that the fruit were conditioned to specifications? Not sure if it is USDA enforceable, but it is an industry agreement. Q? Is there a premium? No, but it is a tool for price negotiation. Fruit will actually ripen, so it is a benefit to the industry to ripen properly. C! People were generally displeased with the quality of pears on the market. C! Reluctance to adopt system because of logistics of performing the treatment. They are in vented boxes with liners. Q? Has anyone tested the ability to warm the fruit with vented boxes and perforated bags? Possibly not. Q? Is there a shift in the cultivars? Not really, pears do not change very fast? C! If a new cultivar is released, who will do the work to establish the market?

"I am not really criticizing" (Mattheis). "Yes you are" (Fellman)

Penny Perkins-Veazie

Raspberry – breed for heat tolerance. Piedmont to mountains, found differences in cultivars in flavonoid content. Can alter based on temperature and growing conditions.

Zucchini – lutein. Mixture of cultivars, using colorimeter, SPAD, visual ratings. Color did not correlate with lutein. Chlorophyll extraction was correlated with lutein. Found ethanol was better than methanol. Results in a more stable extraction. C! Cooler the weather, the better the pigment.

Break - Announcements

Peter – Postdoc on cherry

Beth – Prelim approval for Postharvest person

Randy – Sugar beet

Beth – HortCRSP proposals due soon. Sweet potato, seed systems, African indigenous vegetables.

OBJECTIVE 2. Develop or adapt postharvest strategies and technologies to improve quality and market competitiveness of emerging production systems, including organic, local and small-scale.

Beth Mitcham

SO₂, 100 ppm-hr was best for controlling blueberry rots + CO₂ at 6 or 12% gave best control of botrytis and Alternaria pathogens.

Kiwi fruit – SF. No difference between single and double applications. Minimal effect of different SF treatment levels, all better than control. Q? What firmness level do you want a kiwi fruit at consumption. Want to be able to slice it. Q? Will SF treated achieve buttery texture. C! CA kiwi from Costco are bad. Q? Is there a conditioning for kiwi. What is the need for SF in kiwi? Treat for mixed storage, and need ethylene for ripening, especially early season fruit. Q? Does SF have an effect on botrytis rots? 0.1 ppm ethylene is adequate for softening of the fruit.

“Store kiwi’s at room temperature (e.g. Watkins), store kiwi fruit at low temperature”

Plums – Fruit that were treated with SF softened less slowly, produced less ethylene. 10 days at 0°C was enough for chilling injury, but SF looked better. But, do SF fruit ever achieve fully soft levels.

Apply SF during forced-air cooling. Industry demand. Treat for 6 hours of forced air cooling. Used 500 ppb SF, and built a forced-air cooler inside a treatment tent. Concern over the practical application of SF during commercial scale FAC of plums.

Dragon Fruit – Fruit stored at 3 temperatures. 5°C without bag were the best conditions (and no decay). Decay increased with higher temperatures, and also worse with bag (high humidity). Dragonfruit can lose a lot of weight, and bags did reduce weight loss.

Chilling injury appears as a mild blackening around perimeter of the skin. Minor chilling injury at 5°C. Respiration rates were relatively high, and post-storage respiration was higher in fruit stored at 5°C. Q? Produced in Israel, Vietnam, Thailand.

SS in Granny Smith using ultra low oxygen. 10 d exposure to 0.5% O₂ can eliminate the development of SS in Granny Smith for up to 6-8 months. Made tents for small scale treatments. Had trouble maintaining low oxygen in bags. Passive did make it down to 0.5% O₂. Continuous flush worked the best – maintained 0.1% O₂.

“When you publish this, can you put ‘Double-Flush’ in the title” (Beaudry).

MacLean

Pomegranate – Evaluated numerous pomegranate cultivars grown in Georgia for storability (RA and CA for 3 months), and for quality and nutraceutical content. Found a few promising cultivars, Nikitski ranni, Cranberry, and Salavatski. More work will be performed using more cultivars acquired from USDA germplasm repository, and from Croatia.

Muscadine – SO₂ sheets resulted in greater firmness retention and lower mold incidence. Worked better than SO₂ fumigation. Fumigation and BioSave 10-LP biofumigant worked comparably in the control of molds, but neither resulted in firmness retention. 18 different cultivars were also analyzed for anthocyanin content. Looking for a favorable proportion of malvidin, peonidin and pelargonidin content, as they are more stable structures for juice/wine production.

Renaë Moran

Honeycrisp – pre-conditioning was inconsistent with harvest date. Have problems with BP on the tree. Q? What is the starch for harvest? Second and third harvest dates (5.4, 6.8). Honeycrisp in CA at 3 different CO₂ conditions. Used plastic bags, but had some issues with leaking. No soft scald, some cortex browning – independent of treatments. Areas next to skin looks like corking – might be related to high CO₂. Lots of BP. High CO₂ had no effect on BP, and pre-conditioning reduced BP. There was a strong orchard effect. Nutritional status of honeycrisp. Trying to eliminate nutrients for future work. Looking for trends with nutrients, K, P, and B. There was no effect of nutrients on maturity. Huge tree to tree variation in chilling injury. Low B resulted in higher BP.C! Stored at 38°F, and in field with high heat in summer, resulted in some minor pitting at harvest, and resulted in observed symptoms in photos provided. Q? Do you use surfactants? None. Q? Low boron in the soil? Yes, and can contribute to corky tissues.

Chris Walsh

Food safety on tomato – (Donna Pahl). Test use of surface water, and measuring the microbial load. Ground water source and two pond sources. 4 fecal indicator organisms, used by EPA or WHO as standards. Ground water were 0, while surface water had

higher levels. 2.1 log is threshold for fishing. Many samples had levels higher than threshold. Plating of washed fruit, found no difference in water source. Dirty pond water did not translate to more coliforms on fruit surface. Clades do not separate out based on sources. Need knowledge about how bacterium attach to surface, airborne. Different problems in CA (grown on ground), versus FL (staked, off-ground) but has more problems than CA. C! Sponge rollers were problem with packinghouse contamination. Field packing. Lots of potential applications for overhead irrigation, ... 18,000g for 3 hours to pellet DNA of pathogens.

“Skanky mid-Atlantic ponds”

“Salmonella belt”

Brown-marmorated stinkbug (BMSB) – Julia Harshman. Tracey Leskey, SOP for evaluating damage on apple. Q? How do you get a bit on the inside, but not on the outside? Toxin migrating “Spit effect”. “What you see on the outside are not necessarily what you get on the inside”. Found in 39 states. 35,000 found in one house.

“It might be an upset stomach to you, but money to me” Thoughts on food safety by Chris Walsh.

“Don’t want to release something that is bug candy”

Raspberry – evaluation to postharvest fungal pathogens. Black and purple are more resistant to pathogens. Ethylene evolution correlates with infection.

Penny Perkins-Veazie

Blackberry – low chill available in Mexico. Evaluate for quality. Ouachita and Navaho are standards. No significant gain in flavonoids, but were only held a week. Carolina is small, thus had higher concentration. Tupy is bitter, but only half the population can pick up the bitterness.

Grown in tunnels – Himbo Top does not do well in NC. Color is #1 problem (turns brown in high heat) so prefer light colored. And the cells collapse. Raspberries always increase in pigment in color. Strong temperature and chilling link.

Plant Tech – will isolate any compound for you.

Bob Prange

“I didn’t know where to stick this one” (Prange)

SF induces what appears to be a wound-response. Chlorophyll fluorescence increased after the 1-MCP treatment. Experiment was performed at room temperature.

List of publications. Ask of looking over reports. Send a style with the email. Meeting adjourned at 12:11 p.m.