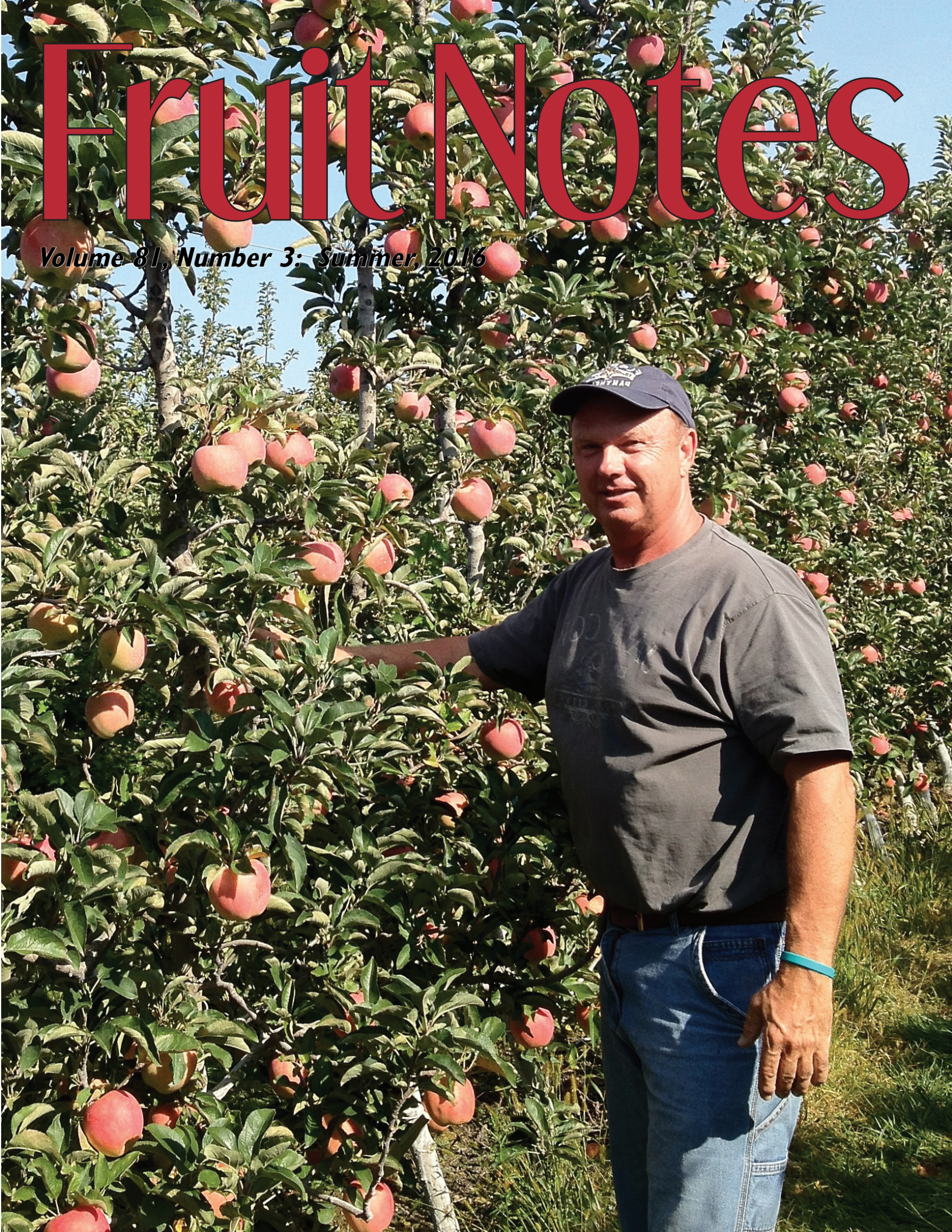
Fruit Notes

Volume 81, Number 3: Summer, 2016



Fruit Notes

Editors: Wesley R. Autio & Winfred P. Cowgill, Jr.

Fruit Notes (ISSN 0427-6906) is published four times per year by the Stockbridge School of Agriculture, University of Massachusetts Amherst. **The cost of a 1-year hard-copy subscription is $40 for U.S. and $50 for non-U.S. addresses. The cost of a 1-year electronic subscription is $20.** Each 1-year subscription begins January 1 and ends December 31. Some back issues are available for $10 each. Payments via check must be in United States currency and should be payable to the **University of Massachusetts Amherst**. Payments by credit card must be made through our website: *http://extension.umass.edu/fruitadvisor/*.

Correspondence should be sent to:

Fruit Notes
Stockbridge School of Agriculture
205 Paige Laboratory
University of Massachusetts Amherst
Amherst, MA 01003

Table of Contents

Cover: Win Cowgill in front of super spindle Fuji trees.

Evaluation of Peach Rootstocks: 2009 NC-140 Peach Rootstock Trial through Seven Growing Seasons

Wesley R. Autio, James S. Krupa, Jon M. Clements, and Winfred P. Cowgill, Jr.
Stockbridge School of Agriculture, University of Massachusetts

Like all other temperate tree-fruit crops, peach varieties are propagated by grafting. Seedlings have long been the norm for rootstock, with most of the seeds coming from prescribed crosses. Lovell and Bailey are among the most common seedling rootstocks used for peaches in the Northeastern U.S. The NC-140 Multi-State research committee has evaluated peach rootstocks for 30 years. Some of the new rootstocks in the NC-140 trials have been clonally propagated and included genetics of peach and other *Prunus* species. The primary goal of NC-140 evaluations has been to find peach rootstocks with greater longevity, particularly under some of the disease pressures of the significant peach-growing regions of the U.S. Some of these rootstocks, however, are interesting for other reasons, such as vigor control and effects on cropping and fruit size.

As part of the 2009 NC-140 Peach Rootstock Trial, a planting of Redhaven on 15 rootstocks was established in the spring of 2009 at the University of Massachusetts Cold Spring Orchard Research & Education Center in Belchertown. See below for the genetics and origin of these rootstocks. Trees grew well in their first seven seasons. It is important to note that these trees experienced a heavy snowstorm at the end of October 2011. Leaves were still present, and some scaffold breakage

Rootstocks included in the 2009 NC-140 Peach Rootstock Trial planted on May 6, 2009 at the UMass Cold Spring Orchard Research & Education Center.

Rootstock	Genetics	Source	Origin
Lovel	Peach	California (1882 selection drying cultivar)	USA -- CA
Guardian	Peach	USDA/Clemson University	USA -- SC
HBOK 10	Peach	University of California Davis	USA -- CA
HBOK 32	Peach	University of California Davis	USA -- CA
KV010-123	Peach	Ralph Scorza, USDA Kearneysville	USA -- WV
KV010-127	Peach	Ralph Scorza, USDA Kearneysville	USA -- WV
Prunus americana	American Plum	Bailey's Nurseries	USA -- MN
Penta	European Plum	Istituto Sperimentale per la Frutticoltura	Italy
Controller 5	Japanese Plum x Peach	University of California Davis	USA -- CA
Krymsk 86	Myrobolan Plum x Peach	Krymsk Breeding & Research Station	Russia
Krymsk 1	Nanking Cherry x Myrobolan Plum	Krymsk Breeding & Research Station	Russia
Bright's Hybrid #5	Almond x Peach	Bright's Nursery	USA -- CA
Mirobac	Myrobolan Plum x Almond	Agromillora Catalana	Spain
Atlas	Peach x Almond x Flowering Plum	Zaiger's Genetics	USA -- CA
Viking	Peach x Almond x Flowering Plum	Zaiger's Genetics	USA -- CA

Table 1. Trunk size, root suckering, yield, yield efficiency, and fruit size in 2015 of Redhaven peach trees in the 2009 NC-140 Peach Rootstock Trial at the UMass Cold Spring Orchard Research & Education Center, Belchertown, MA. All values are least-squares means, adjusted for missing subclasses and for crop load in the case fruit weight.[z]

Rootstock	Trunk cross-sectional area (cm^2)	Root suckers (no./tree, 2009-15)	Yield per tree (kg)	Yield efficiency (kg/cm^2)	Fruit weight (g)
Atlas	180 abc	0.1 b	17 ab	0.10 bc	170 a
Brights Hybrid 5	159 bc	0.0 b	15 ab	0.09 bc	171 a
Controller 5	58 d	0.0 b	11 b	0.21 a	168 a
Guardian	211 a	0.3 b	17 ab	0.08 c	178 a
HBOK 10	148 c	0.5 b	14 ab	0.10 bc	173 a
HBOK 32	144 c	0.3 b	18 ab	0.13 bc	165 a
KV010-123	151 bc	0.5 b	18 ab	0.12 bc	175 a
KV010-127	171 abc	1.5 b	16 ab	0.10 bc	174 a
Krymsk 1	82 d	3.8 b	12 b	0.16 ab	198 a
Krymsk 86	174 abc	0.0 b	16 ab	0.10 bc	175 a
Lovell	186 ab	0.0 b	20 a	0.11 bc	177 a
Mirobac	151 bc	3.3 b	17 ab	0.12 bc	162 a
Prunus americana	88 d	129.8 a	18 ab	0.22 a	171 a
Penta	160 bc	9.4 b	14 ab	0.09 bc	178 a
Viking	174 abc	0.0 b	16 ab	0.10 bc	198 a

[z] Means were separated within columns by Tukey's HSD (P = 0.05).

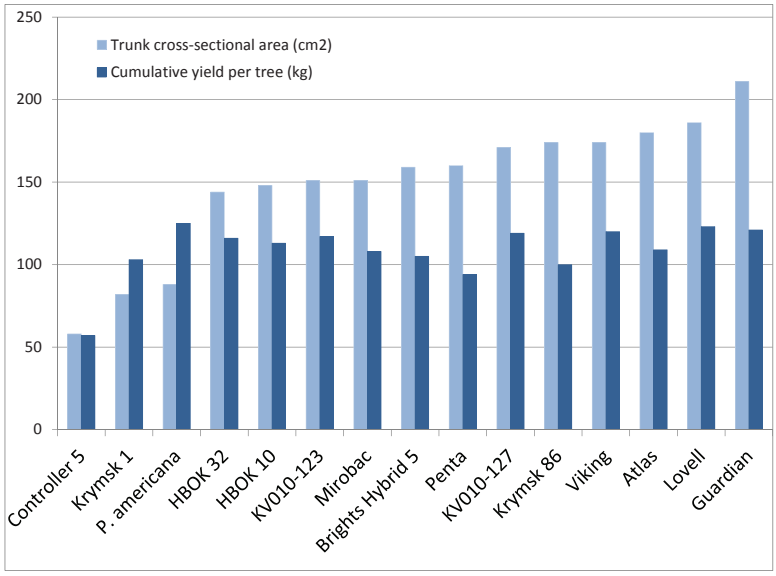


Figure 1. Trunk cross-sectional area (2015) and cumulative yield per tree (2011-15) of Red Haven trees in the Massachusetts planting of the 2009 NC-140 Peach Rootstock Trial.

occurred. Where possible, scaffolds were pulled back and bolted into place. All of these trees have grown and performed normally. The planting includes eight replications in a randomized-complete-block design. Means from 2015 (seventh growing season) are included in Tables 1 and 2 and Figure 1.

At the end of the 2015 season, largest trees were on Guardian, Lovell, Atlas, Viking, Krymsk 86, and KV010-127, and smallest trees were on Controller 5, Krymsk 1, and *Prunus americana* (Table 1, Figure 1). Trees on Penta, Bright's Hybrid 5, KV010-123, Mirobac, HBOK 10, and HBOK 32 were intermediate to

Table 2. Cumulative yield, cumulative yield efficiency, and average fruit size of Redhaven peach trees in the 2009 NC-140 Peach Rootstock Trial at the UMass Cold Spring Orchard Research & Education Center, Belchertown, MA. All values are least-squares means, adjusted for missing subclasses.[z]

Rootstock	Cumulative yield per tree (2011-15, kg)	Cumulative yield efficiency (2011-15, kg/cm^2)	Average fruit weight (2011-15, g)
Atlas	109 a	0.62 d	188 a
Brights Hybrid 5	105 a	0.66 d	181 a
Controller 5	57 b	1.02 bc	172 a
Guardian	121 a	0.59 d	190 a
HBOK 10	113 a	0.83 cd	182 a
HBOK 32	116 a	0.81 cd	179 a
KV010-123	117 a	0.78 cd	181 a
KV010-127	119 a	0.71 cd	184 a
Krymsk 1	103 a	1.32 ab	186 a
Krymsk 86	100 a	0.59 d	180 a
Lovell	123 a	0.67 d	186 a
Mirobac	108 a	0.74 cd	176 a
Prunus americana	125 a	1.50 a	188 a
Penta	94 a	0.60 d	186 a
Viking	120 a	0.72 cd	184 a

[z] Means were separated within columns by Tukey's HSD (P = 0.05).

the two groups (Table 1, Figure 1). Substantially more suckering occurred from trees on *P. americana* than from any other rootstock (Table 1).

Greatest yields in 2015 were harvested from trees on Lovell, and the lowest yields were harvested from those on Controller 5 and Krymsk 1, with all others intermediate in yield (Table 1). On a cumulative basis (2011-15), yield was similar among most trees, except that yield from trees on Controller 5 was significantly lower than all others (Table 2, Figure 1). The most yield efficient trees in 2015 were on *P. americana* and Controller 5, and the least efficient trees were on Guardian (Table 1). Cumulatively (2011-15), yield efficiency was greatest for trees on *P. americana* and lowest for trees on Bright's Hybrid 5, Lovell, Atlas, Krymsk 86, Penta, and Guardian (Table 2). Fruit size in 2015 and on average (2011-15) was not different among rootstocks (Tables 1 and 2).

Under Northeastern conditions in this trial, most peach rootstocks performed similarly. It is interesting, however, to look more closely at the dwarfing rootstocks. In this trial, trees on Controller 5, Krimsk 1, and *P. americana* were all substantially smaller than trees on all other rootstocks. Yield per tree was significantly lower in 2015 for those on Controller 5 and Krymsk 1 than trees on Lovell, but trees on *P. americana* yielded similarly to those on Lovell. Cumulatively (2011-15), trees on Krymsk 1 and *P. americana* yielded similarly to trees on Lovell, but trees on Controller 5 yielded less. Yield efficiency (yield per trunk size) in 2015 and cumulatively was high for all three dwarf peach trees. Overall, Controller 5 results in trees of very low vigor which appear weak in the field. Yield per tree is low, but because of the small size, efficiency is good. Trees on Krymsk 1 and *P. americana*, however, are dwarf but produce a comparable levels per tree to the much more vigorous rootstocks. *P. americana* is a prolific producer of root suckers, which may limit its commercial value.

Black Stem Borer
Xylosandrus germanus

Deborah Breth[1], Art Agnello[2], Kerik Cox[2], and Elizabeth Tee[1]
[1]Cornell Cooperative Extension – Lake Ontario Fruit Program
[2]Cornell University – NYSAES, Geneva, NY

Figure 1. Black stem borer adult is only 1 mm wide and 2 mm long. Photo by E. Tee

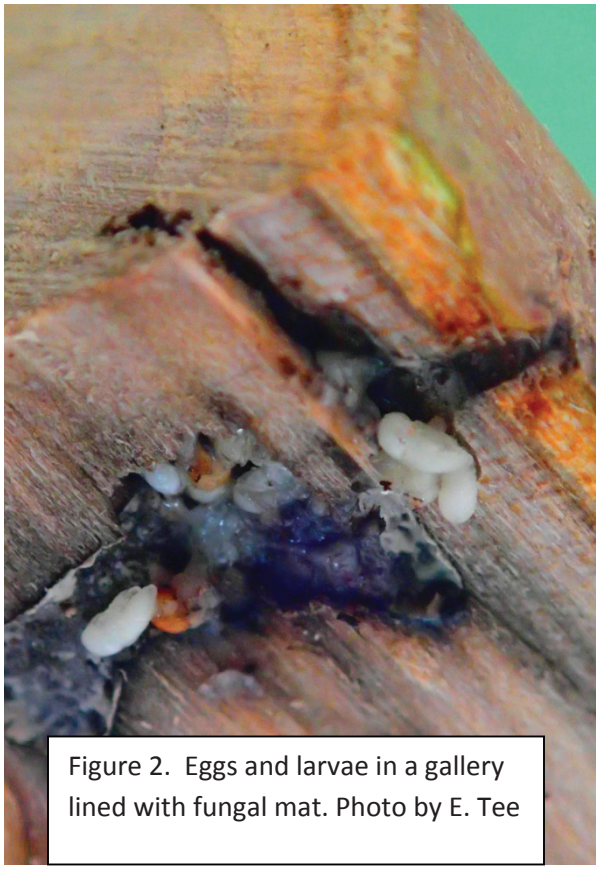


Figure 2. Eggs and larvae in a gallery lined with fungal mat. Photo by E. Tee

The black stem borer was introduced from eastern Asia and first detected in NY in 1932. It has since been detected in most parts of the US. It is a general wood boring insect, in the group called Ambrosia beetles, with a huge list of suitable hosts including American beech, maple, dogwood, black walnut, oak, magnolia, and several other ornamental and forest species. It continues to spread by flight (about 2 km) until it finds a suitable host. Long distance spread to Oregon and the West has likely occurred through intracontinental movement of untreated domestic solid wood packing material and other raw timber. It has also been documented in apple and sweet cherry in 1982. We first detected black stem borer in 2013 in 6 apple sites in the Lake Ontario Fruit Region of NY, and have identified more than 30 farms with this pest.

The tiny black beetles overwinter in galleries at the base of infested trees. The first beetles emerge from overwintering sites to infest new sites after 2-3 days with maximum temperatures $\geq 68^{o}$F. This means they can first become active in early-late April. In 2015, the first trap capture of adults was May 4. Most flight activity occurs during warm evenings. Based on literature from Ohio, the second flight is expected to start in late July or early August. However, in 2014, our traps continued to capture adult beetles in early July.

Figure 3. Black stem borer pupa. Photo by E. Tee

Only females fly and emerge in spring to colonize new trees. The adult female drills a hole ~1mm in diameter, and hollows out

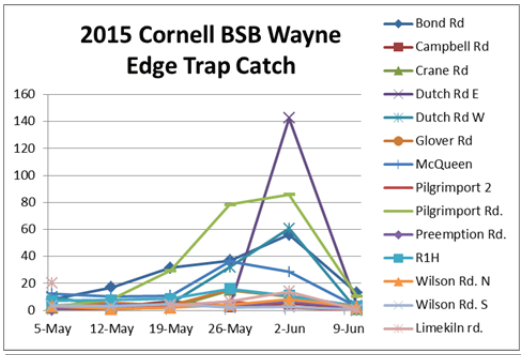
This trap has 15 black stem borers in the bottle trap.

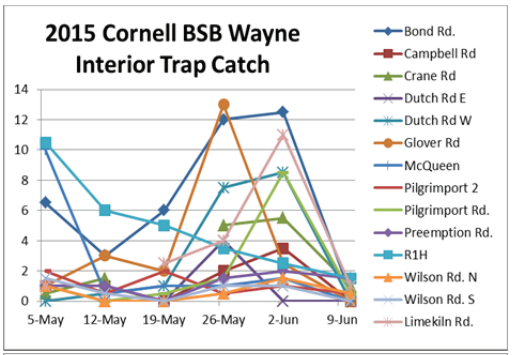
a channel into the sapwood of a small tree (2-50 cm diameter) and starts to culture a fungal food source, *Ambrosiella hartigii*. She lays her eggs (tiny, ~1mm white, football shaped) in the chamber. She lines the chambers with the Ambrosia fungus for the larvae, (also white with 3 instars) to feed on before they pupate to develop as an adult. It is this fungus that the larvae will feed on in the brood chambers, not the tree. It takes about 30 days for development from egg to adult in optimal temperatures. But in the field it can take 55-60 days. The ratio of females to males is about 10:1. The females can lay 2-54 eggs, but they average about 18 per brood. After the female is finished nurturing her larvae, she backs into the entrance, plugging the hole, and dies there. The males that develop in the first brood stay generally in the brood chamber and mate with their sisters. The mated females disperse from that brood chamber to make another chamber or reclaim an old one. The males do not fly. Infestations of only a few females can result in a significant problem under the right conditions.

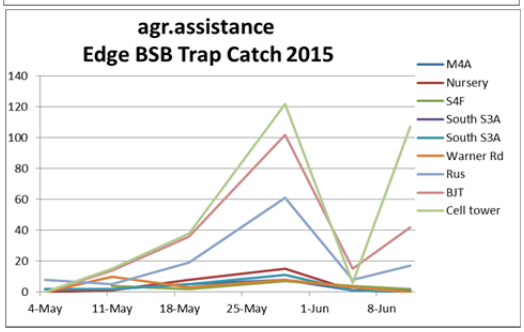
This insect has 2 generations per year in NY. Late in the summer the beetles from the second brood will migrate to a hole lower in the trunk to overwinter where researchers have found as many as 100 in a chamber. These beetles go into diapause in the late summer and will not be active again until the next spring.

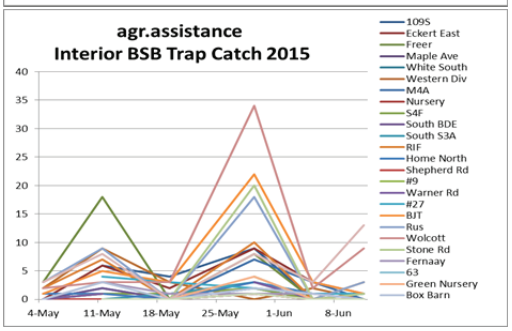
Trap Network for 2015

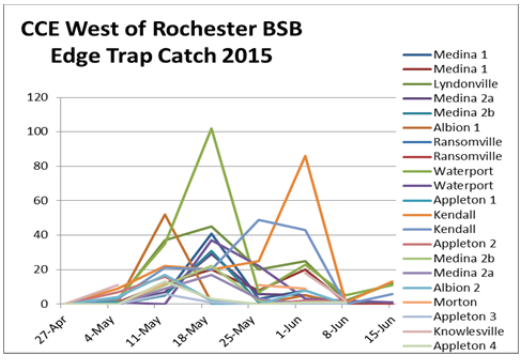
There is a collaborative effort among CCE, Cornell faculty and fruit consultants to monitor flight activity in and adjacent to orchards. Although trap capture does not generally correlate with damage in orchards, it is an indicator of their presence, and if there are stressed trees in the orchard, we expect to see BSB. Thanks to agr.assistance, Paddock Ag Services, and Eve Farm Services for collaborations and running traps. Traps are

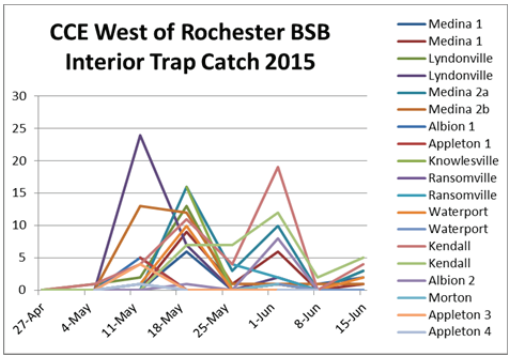












composed of a fruit juice bottle with side openings cut with an ethanol lure (http://www.agbio-inc.com/) hung from the bottom of the bottle, enviro-safe antifreeze is in the cap. The bottle is inverted and hung about 2-3 feet off the ground. We always catch more on the edges near woods or brush. We have caught an average of 30-40 BSB per site, ranging from 0 – 288 per site so far in 2015.

Tree Symptoms

Although these borers have a reputation of attacking stressed trees that are giving off ethanol volatiles, they also have been reported to attack "apparently healthy trees." The trees in the spring look like they are weaker than non-infested trees, with some flaky or blistered bark, but some look perfectly healthy. Some are oozing sap or fire blight ooze from the entry holes. If the weather is calm and dry, growers might be lucky enough to see the "toothpick" of compressed sawdust pushed out of the holes. Upon close inspection, growers might find small pinpricks (1 mm diameter), and the tiny black beetle in the hole. Using loppers or a pruning saw, growers can cut ¼–½ inch away from the hole to see the galleries that extend perpendicular to the trunk of the tree and are hollowed out a bit vertically to accommodate the brood of eggs; additional channels may be cut into the pith of the tree.

Toothpick "frass" photo by E. Tee

The fungus the beetles carry with them does not generally kill the tree, but sometimes the tree response is to wall off the fungus in the transport vessels, thus, starving the tree. Dr. Kerik Cox has been isolating microbes from infested tissue related to BSB. In 2014, he primarily found *Nectria haematococca* (anamorph *Fusarium solani*) in the beetles and apple tissues. In 2015, his lab is finding a *Nectria haematococca* and bacteria (non-fire blight) in beetles. In apple galleries, we're finding a lot of *Botryosphaeria dothidea* and a little *Nectria haematococca*. With summer rain and BSB infestation, *Botryosphaeria* canker may show up later in the season or next fall/winter in infested orchards. It may look a lot like the *Nectria cinnabarina* of the last season, except that it will have black stroma instead of the salmon-colored stroma of *Nectria cinnabarina*.

The blistered tissue in apples associated with BSB-infested shoots remains a mystery that has baffled microbiologists, entomologists, and applied anatomy specialists. Tissue under the blistered epidermis is filled with clear white cells that are too large to be fungal. From blistered tissue, we routinely isolate fluorescent *Pseudomonas syringae*, which is associated with blister bark of apples in Europe.

So far, orchards where BSB has been detected are tall spindle or super spindle plantings in areas of wet soil conditions, where no irrigation is available, or in areas with frost or winter injury. Rootstocks most commonly are Bud9, followed by M9 clones and M26. One site reported infested trees on MM106 and MM111 rootstocks. The infested tree age ranges from planting year in 2000 to 2014, and also nursery plantings. The most common variety is Gala, followed by Fuji, Honeycrisp, and Paulared, followed by NY-2, Pazazz, Pink Lady, Gingergold, Macoun, and Empire.

Control

If growers identify black stem borer in their high density orchards, the recommendation (taken from ornamental nursery situations) is to remove and destroy the infested trees. Remove the rootstock as well, since it will continue to attract and harbor BSB. Take infested trees to a location where they can be burned immediately. The grower should start a trapping program using ethanol-baited traps, as in the photo, checking them weekly to time insecticide applications for when the beetles emerge from the galleries to find a new place.

The key to controlling this pest is maintaining tree vigor and eliminating whatever is causing the stress.

Repair drainage issues, install irrigation on droughty soils, and prevent fire blight infection. Select sites with low risk of winter injury and frost. Do not use any cultural practices that disturb the roots.

Although several chemical and biological controls have been tested, researchers have not yet identified anything that will stop these beetles. But with very wet spring or fall weather and poor soil drainage, you might see more damage the following season. The fungus carried by the beetle does not seem to be dependent on any particular weather conditions.

The ornamental nursery industry, where this is a serious, pest relies on pyrethroid trunk sprays on a 2-week schedule, which would certainly be a challenge in apples, given concerns of how it would impact mite control efforts. The nursery industry has also tested neonicotinoids, anthranilic diamides (cyazypyr, acelepryn), and tolfenpyrad, and has not found them to be effective in controlling BSB. There are currently no systemic insecticides effective for this pest. We have nothing registered specifically for control of this pest except for Lorsban, Warrior II or Grizzly (lambda-cyhalothrin), which are labeled for "tree borer species", but we have no data yet on efficacy to support any recommendations at this time. It is expected that chlorpyrifos trunk sprays for borers may be effective, but these will not prevent higher points of entry, which have been seen as high as 4 feet in the tree. Chemical control trials are under way.

For more information on trapping for this pest or identifying the problem, call or email Debbie (dib1@cornell.edu), or Art Agnello (ama4@cornell.edu).

Acknowledgements

These efforts funded by Federal Formula Funds (Hatch), Apple Research and Development Program, New York Farm Viability Institute, Cornell University, and Cornell Cooperative Extension.

Stressed High Density Apples are Subject to Collapse

Peter Jentsch
Cornell University, Hudson Valley Laboratory

Editor's note: *All new high density apple plantings, especially tall spindle should be planned with trickle irrigation. The water needs to go on the day the trees are planted. Stressed trees are predisposed to insect damage. I have seen several blocks of trees in both PA and NJ that are in the same situation as Peter describes below, Collapse and tree death. Peter and I had several conversations as he was developing the article below, both before and after it was published. Please take all the suggestions to heart. This article was reprinted with permission from Peter Jentsch's blog from October 16, 2015:* https://blogs.cornell.edu/jentsch/ *with the title,* Fuji & Zestar Collapse: The 'Perfect Storm' for Tree Stress at Harvest.

In the world of fruit growing there are few sights more disheartening for a grower then the loss of fruit just days before harvest. Whether its hurricane winds and flooding, hail storms, tall spindle trees upended in a failed support structure from a heavy crop load or herbicide injury during drought years leading to tree decline. Without a doubt, late season fruit damage is costly.

Only a few of these scenarios might be prevented by careful planning and continued critical assessments of each block through the season. Prevention will often be needed years before these events occur. In the case we describe here, it may be a 'perfect storm' of multiple causes, interacting together within specific varieties and rootstock to cause severe decline.

During the past few seasons we've seen both early and late season environmental stress affecting newly planted and young well established trees. Stress can be caused by both sever rain (Hurricanes Irene and Sandy in 2011-12) and this seasons drought (2015).

In eastern and western NY, growers are seeing an increasing infestation from black stem borer (BSB), *Xylosandrus germanus* that are attracted to stress induced trees. To date, we have not seen BSB infestation of 'healthy trees' exhibiting 1mm holes in the trunk or tell tale 'tooth pick' frass. However, in stressed trees, we are increasing seeing the presence of BSB infested trees with trap captures of BSB from Essex to Orange Counties.

This week we observed two Hudson Valley orchards with severe tree decline leading to tree loss. The first, a block of Fuji on M.9 rootstock in Ulster County with varying degrees of rootstock, union and scion injury just above ground level up to the graft union and well into the scion wood. The second, a block of Zestar, also on M.9 rootstock in Columbia County had near identical injury. Both blocks showed yellowing foliage of weakened trees with near perfect crop load, standing

Evidence of black stem borer near graft union.

Adult black stem borer.

in contrast to the dark green of neighboring trees. Both blocks had the same herbicide active ingredient in weed management programs over the past two years.

In Fuji we assessed 121 trees, inspecting three rows in the block and finding over 58% of the trees with varying degrees of yellowing. As we dug into the rootstock and base of the scion we found 30% of the trees had lost 100% of their bark just below and above the rootstock graft union. Only 9% of the trees in the block had complete or undamaged bark, the majority without burr knots. Evidence of dogwood borer feeding, frass and or live larva were found in 52% of the trees while 1mm holes, galleries and sawdust frass indicated BSB in 26% of Fuji trees.

A very confusing aspect of this sampling showed many of these severely damaged trees had little to no live bark around the perimeter of the trunk, yet they were still completely green, and with a full crop. Over the past weeks many of these trees had transitioned from a 'completely healthy appearance' to yellow, then brown, in just a matter of a few days. To date the grower had removed 73 trees in these Fuji rows with increasing numbers of trees showing severe symptoms of decline over time.

Adjacent rows with Cameo, Golden Delicious and HoneyCrisp, also on M.9, and on the same herbicide schedule, showed no yellowing or decline. However, in Cameo there is flaking bark and cracking but no signs of cambium decline or bark separation from the wood. The Golden Delicious and Honeycrisp were without any signs of damage to the trunk save the 'normal' growth cracking and healing that comes with age.

In the Columbia County Zestar block we observed pockets of decline, initially thought to be only from black stem borer. Similar herbicide schedules and active ingredients were used over the past two years, identical to the Ulster County Fuji block. Dogwood borer has also been a perennial problem with live larva present and significant DWB feeding injury found throughout the block. Bark separation from the trunk near the base of the tree of


Black Stem Borer entry hole and frass, Dogwood Borer Frass and bark flaking.

Canker and peeling bark on Fuji / M.9.

both rootstock and scion was also present.

We know that rootstocks, which produce a high number of rooting initials that appear above ground when the graft union is up, such as the M.9 rootstock, are very prone to dogwood borer infestations in the Northeast. The loss of vascular cambium tissue restricts the flow of nutrients and water to the tree causing tree stress as nutrient flow slows within the tree.

On dwarfing rootstock orchard planting systems with considerably smaller trunk diameter and shallow rooting systems, trees are at greater risk to the impact of disease and insect pests and environmental stresses.

The underlying causes appear to be **a complex of factors**:

- the presence of **dogwood borer**, predominately along the southern side of the rootstock in rooting initials or burr knots below the graft union. The rootstock above ground peeled off, revealing dead wood, fresh frass from DWB feeding, and a high percentage of regions of dying trees with live larva present.
- the appearance of 1mm holds into the dead wood, believed to be that of **black stem borer** with fresh frass, tunneling and galleries within the heart wood.
- a defined region of **canker** radiating upward from the graft union on the north side of the tree. Beneath the bark of the canker was dead wood walled off by live tissue (see images below). We noted the Northwest band of bark to still be wet from the morning dew at noon. It may be that this area of moisture from dew in very dry years would have slower drying time post application of a spray AND act to 're-wet' the region for additional uptake of herbicide with long residual. The canker on a number of the dead trees had split open.
- herbicide strips in the two farms were impeccably clean, free of weed plants. There may be the possibility of residual herbicide injury causing cankers where overlap of high rates of spray and slow dry time causes re-wetting and re-absorption of the active ingredient. Was this exacerbated by the wounding by DWB and subsequent absorption and uptake of herbicide into these freshly wounded sites? In years of drought, super spindle trees without adequate irrigation will undergo increasing stress that may increase the risk of herbicide injury. This appeared to be the case in the use of Rely.

Brad Majek, weed scientist in New Jersey, recently published a warning about potential phytotoxicity to tree fruits from glufosinate herbicide (Rely and generics).

His short article appeared in the Rutgers Cooperative Extension Plant and Pest Advisory. One of the photos in Brad's article looks very similar to the damage seen in many Hudson Valley apple orchards. Desiccation from herbicide exposure combined with normal water stress during hot dry periods may predispose the trunks to invasion by *Botryosphaeria dothidea*, a canker pathogen that is incapable killing the cambium in healthy functioning trees, but which becomes very pathogenic in drought-stressed trees. Gramoxone can also contribute to similar trunk damage, especially on young trees (Observations from Dr. David Rosenberger).

Minimizing the use of herbicides that might injure the bark and cambium layer is yet another important factor in reducing tree stress. If injury from herbicide causes restriction in the cambium layer, reducing movement in phloem and xylem cells, the tree will be unable to transport nutrients and water. This in and of itself

may lead to BSB infestations.

The importance of **Dogwood borer management** played a role in the collapse of these trees and cannot be overstated. In new planting systems consider the Geneva rootstock series with the best match between rootstock and scion. They tend to throw fewer rooting initials above ground and will dramatically reduce the population of DWB.

Irrigation, especially in soils that drain quickly such as sandy loam, shale or alluvial till, is essential as the trees go into the ground. New plantings of high density fruit on well drained soils should be under regimented irrigation shortly after planting as root systems are developing. Establishing the rooting zone, pushing the extension leader and developing fruiting wood is critical to the productivity and longevity of a high density block.

A topic for future research will need to include the influence of DWB on the stress of young trees to produce ETOH leading to BSB infestation. Subsequently, do the fungal pathogens that are introduced to the tree by the adult to feed its young, give rise to cambium decline at the base of the tree? Secondarily, does the influence of herbicide on the trunk of trees play a role in cambium decline leading to bark death and separation. We hope to begin the process of answering these questions in small plots studies beginning in 2016.

Farming is Hard! The first eight to ten years in the life of a tall spindle system is one that requires unending attention to detail. Highly dwarfing rootstock, especially M.9, will hound even the stoutest of growers with a ruthless and unending barrage of tree stresses that are unforgiving in rehabilitation, leading to failure if left unattended. A single weak link in these systems can lead to rapid decline of entire blocks. As we commit to growing more fruit per acre, one's tenacity and commitment to effective diligence and detail in all areas of production also needs to flourish.

***Editor's note**: I have also observed numerous cankers and bark injury on apple in both PA and NJ that appear to be caused by glufosinate herbicide (Rely and generics).*

Cankers as the result of repeated applications of glufosinate herbicide (Rely and generics) on a block of Fuji/M.9. Win Cowgill photo.

Damage to Macoun trees from the herbicide Liberty(glufosinate) drift. Win Cowgill photo.

Enhancing Return Bloom of Apple

Winfred P. Cowgill, Jr.
Win Enterprises International, Baptistown, NJ

Wesley R. Autio
Stockbridge School of Agriculture, University of Massachusetts

Apple flower buds are formed in June and July for most varieties. Roughly 25-30 days after full bloom is the rule of thumb for the end of the thinning window and the beginning of the flower bud development stage. Though this is a rough guideline, actual physiological responses are a result of degree-day accumulations.

In addition to utilizing the hormonal type chemical thinners (NAA, NAD, 6-Ba, ethephon) during the normal thinning windows, research has shown that both NAA and ethephon can be also be applied in supplemental applications to enhance flower bud formation for the following season.

Beginning when king fruit are 30-35mm in diameter (roughly 4-6 weeks after bloom, depending on temperature), growers can begin using ethephon or NAA applications to stimulate return bloom.

However, if the crop load is not reduced to the correct levels with chemical thinning in the normal thinning window, no amount of supplemental NAA and ethephon applied will ensure return bloom!

Research has shown that beginning thinning at bloom with PGR's increases return bloom.

Ethephon

Ethephon is a synthetic compound that is broken down in plant tissue to form ethylene. When applied during flower bud development on apples (June-early Jul), ethephon can be highly effective at influencing return bloom. We suggest using ethephon at 150 ppm (0.5pints/100 gallons).

Ethephon treatments should begin when fruit are 35 mm (1.2-1.4 inches) in diameter (about 6 weeks after full bloom). See Table 1 for the number of weekly applications recommended per variety.

Ethephon on non-bearing apples can be used at 300-450 ppm (1-1.5 pts/100 gallons) beginning 2-4 weeks after full bloom. However, these trees should have filled their space and be ready to bear the following year. This might be a 3 year old tall spindle planting or a new 3-4 year old semi dwarf orchard. Note that ethephon will reduce tree growth and before Apogee, was used for that purpose.

NAA

NAA can also be used for return bloom. One approach to is to use NAA when fruit reach 30-35mm in

Table 1. Varietal recommendations for ethephon applications to enhance return bloom.

Variety	Number of weekly, 150ppm ethephon applications starting at 30-35 mm (1.2-1.4 in)
Paulared	1
Gingergold	1-2
Honeycrisp	4
Gala	2
Macoun	2
Empire	2-3
Jonagold	2-3
Golden Delicious	2-3
Mutsu	2-3
Fuji	4
Suncrisp	4
Goldrush	4

diameter (about 4-6 weeks after bloom, depending on temperature) at 5 ppm and make repeat applications at 7-day intervals. There is very little risk of late thinning with NAA as compared to ethephon. One approach is to make the first application of NAA at 30mm and then switch to ethephon for subsequent applications.

The various NAA product labels call for applications every 7-14 days. Growers have experimented with up to 5 applications. If these applications extend through August, they may also reduce pre-harvest fruit drop in certain varieties of apples (see the label for additional information).

Maximum annual application for apples and pears is 150 grams of NAA (161 fl oz of Fruitone L or 0.33 lbs NAA equivalent) per acre per year or per crop cycle.

Concentration- the concentration rates listed in this article are based on spraying tree row volume dilute. If you apply less than the dilute rate of water per acre, concentrate the PGR appropriately.

Cautions

Ethephon applications at high temperatures and high rates can defruit trees, make sure you are past June drop and observe the temperature for the day of application + 2 days. NAA applied for return bloom can reduce fruit quality of certain early ripening varieties (see the label for details).

Conclusion

There are no silver bullets! Crop load must be adjusted during the normal chemical thinning windows for summer PGR applications to be effective. Growers considering the use of PGR's for return bloom need to be in tune with their orchard conditions before making any application. Application of summer PGR's can be very beneficial to a grower's operation by breaking a biennial cycle, but their use requires a careful understanding of all the parameters that their application can influence. *Begin slowly and follow all label rates, guidelines and precautions. The label is the law.*

Note: The above information was developed from research and observations in New Jersey, other portions of the Mid Atlantic and Massachusetts fruit growing regions.

Win Cowgill Retires After Thirty-eight Years at Rutgers University

Wesley R. Autio
Stockbridge School of Agriculture, University of Massachusetts

Win Cowgill, one of the country's best known extension pomologists, retired from Rutgers University on April 1, 2016. Everyone who knows Win realizes that he cannot truly retire, so it is no surprise that he has begun a fruit consulting business, Win Enterprises International, LLC.

Win grew up in the suburban community of Metuchen, New Jersey, but very early on, was exposed to agriculture through his grandfather, Paul Drummond, a dairy farmer in Middletown, Delaware. Because of his grandfather's influence, Win fell in love with agriculture. He attended Delaware Valley College and received a Bachelor of Science degree in Horticulture in 1974. After a bit of time landscaping and farming, Win enrolled in a summer course in systematic pomology taught on Saturdays by Drs. Fred Hough and Catherine Bailey, of Rutgers University. He was hooked and began an M.S. program in the Department of Horticulture at Rutgers the next fall studying cold hardiness of apricots with Drs. Hough and Bailey. To help get through the program, Win received a part-time Gerber Baby Food assistantship and later worked full time as the strawberry and blueberry technician for the breeder Dr. Gojko Jelenkovic.

In February 1978, Win began what would become his career, taking the job of general agricultural extension agent in Warren County, New Jersey. A year later he became the North Jersey Area Fruit Agent. To obtain tenure and promotion within the New Jersey extension system, individuals are required to conduct research and publish results regularly. Because of this requirement, Win began an active applied research program that was focused on enhancing the sustainability of New Jersey farms. He conducted vegetable, nursery, strawberry, and grape research but focused mostly tree fruits. The results of this large body of work were published widely and were the focus of many educational programs for farmers.

Win was fortunate to work with and be mentored by some of the greats during his early career, including Fred Hough, Ernie Christ, Norm Childers, Gojko Jelenkovic, Rich Marini, Jack Springer, Steve Johnston.

In his very first year on the job, Win attended an International Fruit Tree Association (IFTA) summer meeting, which began a lifelong association. Through IFTA, Win met North America's best research and extension pomologists (including Dave Ferree, Bob Carlson, Steve Blizzard, Charlie Embree, Bruce Barritt,

Ron Perry, Pierre Fillon, Raymon Granger, and Gary Couvillion) and growers (including Ron Metzler, Don May, Evan Milburn, Gary Mount, Bob Petch, Dennis Courtier). Win, with Jon Clements, oversaw the IFTA website for many years, and they were recognized for that contribution with the 2006 Outstanding Service to the Industry and Organization Award. In 2013, Win was recognized by IFTA with their Outstanding Extension Award.

Win's involvement with the Multi-State project NC-140 has spanned the last 25 years. He has represented New Jersey on this important committee focused on tree-fruit rootstocks. He has been involved in 14 of the multi-location NC-140 trials, each requiring about 10 years of study. Win and Jon Clements have given tremendous service to NC-140 through the development and maintenance of its website and email listserve. Win's participation in NC-140 brought a great deal of information back to New Jersey growers, but through it, he also contributed significantly to the knowledge of the committee. The committee's influence extended throughout North America and throughout the World.

In 1993, Win spent three months on sabbatical at the University of Vermont. Win collaborated with Joe Costante and Jon Clements to initiate an email discussion group called Apple Crop. This discussion group, 23 years later, is still active and serves an important function to allow tree fruit researchers and growers to exchange information and ideas worldwide. They also developed one of the first apple-related websites, the Virtual Orchard. This forward thinking created one of the first 500 websites on the World Wide Web!

Win addressed his job with dedication, enthusiasm, and a great deal of work. He managed the 14-acre orchard at Rutgers Snyder Farm with the same goals, concerns, and constraints that any commercial grower has, and he credits this activity as one of the most important accomplishments of his career. It allowed him to understand the grower needs and relate new approaches with a background of true experience.

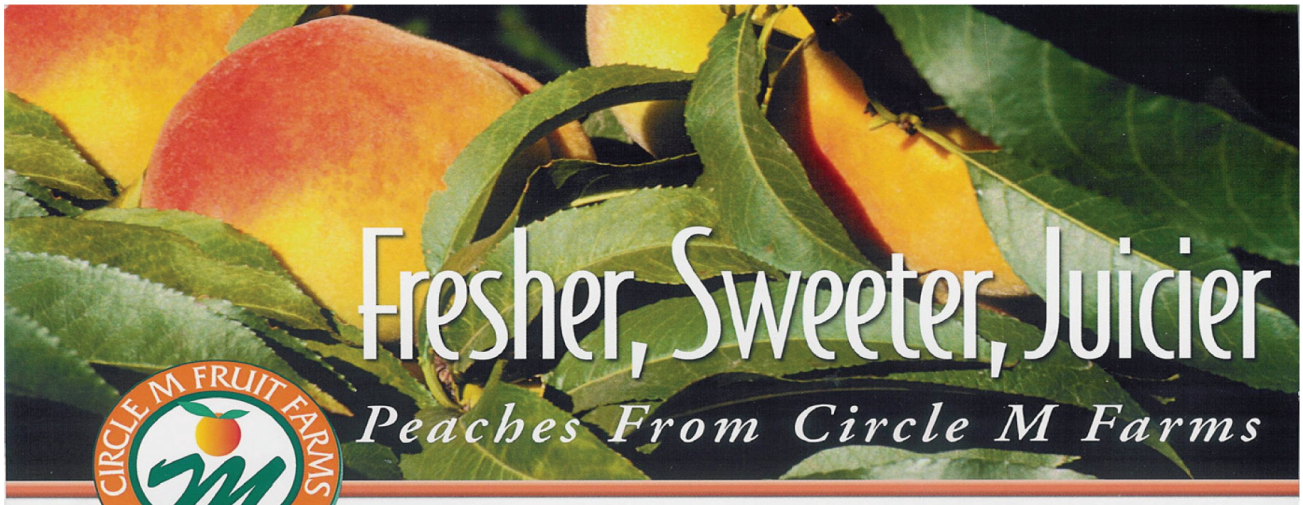
Win will be sorely missed, but he will still be active consulting commercial growers and industries, conducting research, editing *Horticultural News*, and giving talks internationally.

Vegetable and Fruit Twilight Meeting, June 3, 2016, Brookdale Fruit Farm, Hollis, NH: The Why's and How's of Drip Irrigation

Bill Lamont, Vegetable and Irrigation Specialist, Penn State University, discusses pond filter systems for Drip and Trickle Irrigation. Photo Credit Win Cowgill.

Trevor Hardy, Irrigation specialist with Brookdale Fruit Farm, discusses all aspects of planning and installing a drip system for tall spindle apples. Photo Credit Win Cowgill.

Win Cowgill, owner Win Enterprises International, LLC consulting, discusses handling new Premier Honeycrisp trees on B.9/MM.111, stripping leaders, applying MaxCel for branch development, and herbicide programs.



CIRCLE M FRUIT FARMS

Exceptional quality and flavor at attractive prices
Brought to you from the 4th generation family farm of Santo John Maccherone

- PLU Stickers Available Upon Request
- Low in Calories
- Nutritious and Delicious
- Exceptional Flavor

SANTO SAYS...

"Peaches from Circle M Farms just plain taste better. Their size and color are what your customers want, and their flavor is the icing on the cake.

That's because our orchards are tended with care and attention, and their fruit is left on the tree to ripen naturally until they reach their optimum sweetess. Then they are picked by hand, taste-tested by me to ensure quality, and packed gently into 25 lb. volume boxes for shipping. Single layer cartons are available upon request.

Circle M's 30 varieties of peaches and nectarines are known for their sweetness and their luscious color. They look as good as they taste.

Discriminating customers appreciate our white flesh peaches because of their lower acid levels and supremely sweet taste.

Add it all up: Peaches from Circle M Farms are fresher and sweeter, picked by hand when their time has come, and packed with care for a longer shelf life.

Yellow, white and donut peaches and yellow and white nectarines are available early July to late September."

Call us at 856 856 207-4542 or 609 381-6465. Fax your order to 856 878-0404

JERSEY FRESH
FROM THE GARDEN STATE

Available in 16 oz. and 64 oz. sizes

Made from fresh New Jersey Peaches
"Peach Cider Drink, Peach Salsa, Peach Preserves"

Santo John Maccherone
circlemfarmsllc@gmail.com
Circle M Farms
88 Sandy Ridge Road
Salem, N.J. 08079

Fruit Notes
University of Massachusetts Amherst
Stockbridge School of Agriculture
205 Bowditch Hall
Amherst, MA 01003-9294

104911