Fruit Notes

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Fruit Notes

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Cover: Win Cowgill photo.

Comparison of the Effects of Ten Geneva Rootstocks and M.9 on Modi Apple Trees in New Jersey

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Rootstock is a critical component of any orchard system. Apple tree precocity, productivity, fruit quality, tree size, and tree architecture all are affected by rootstock. There are several currently available rootstocks that are very good, but new rootstocks are regularly released. One of the most prolific and exciting programs in the World is the Cornell-Geneva Apple Rootstock Breeding Program, a cooperative effort between USDA and Cornell University. To evaluate some of the new Cornell-Geneva rootstocks along with some of the earlier releases, a trial was established in Franklin Township, Hunterdon County, New Jersey, using the new disease-resistant variety Modi as the scion (http://www.modiapple.com). This trial was initially planted as part of the 2015 NC-140 Organic Apple Rootstock Trial, but was not maintained organically.

This trial, planted in April 2015, includes Modi on G.11, G.16, G.30, G.41, G.202, G.214, G.222, G.890, G.935, G.969, and M.9 NAKBT337. Please see the chart describing the characteristics of these rootstocks

General characteristics of Geneva® apple rootstocks.

Trait	G.11	G.16	G.41	G.214	G.935	G.222	G.202	G.969	G.30	G.890
Smallest to largest -- size category	M.9 NAKBT337	M.9 NAKBT337	M.9 NAKBT337	M.9 to M.26	M.26	M.26	M.26	M.7	M.7	M.7 to MM.106
Wooly apple aphid resistance	No	No	High	High	NO	High	High	High	No	High
Fire blight resistance	Resistant	Resistant	Very resistant	Very resistant	Very resistant	Very resistant	Very resistant	Very resistant	Very resistant	Very resistant
Replant disease resistance	Partial	Partial	Tolerant	Tolerant	Tolerant	No	Tolerant	Tolerant	Tolerant	Tolerant
Phytophthora resestance	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant
Cold hardiness	Yes	Partial good mid-winter, bad early cold	Yes	Yes	Yes	Yes	Yes good mid-winter	Yes	Yes	Yes
Yield efficiency better than M.9	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Low root suckering and burr knots	TBD	Yes	Yes	Yes	Yes	Medium	Yes	Yes	Yes	Yes
Susceptibility to latent viruses	No	Yes	No	No	Yes	No	No	No	No	No

Chart derived from *Geneva ® Apple Rootstocks Comparison Chart v.2* . Chart data valid as of July 22, 2016 from the Cornell University apple rootstock breeding team members: Genaro Fazio (USDA Breeder), Terence Robinson (Cornell Breeder), and Herb Aldwinckle (Professor Emeritus).

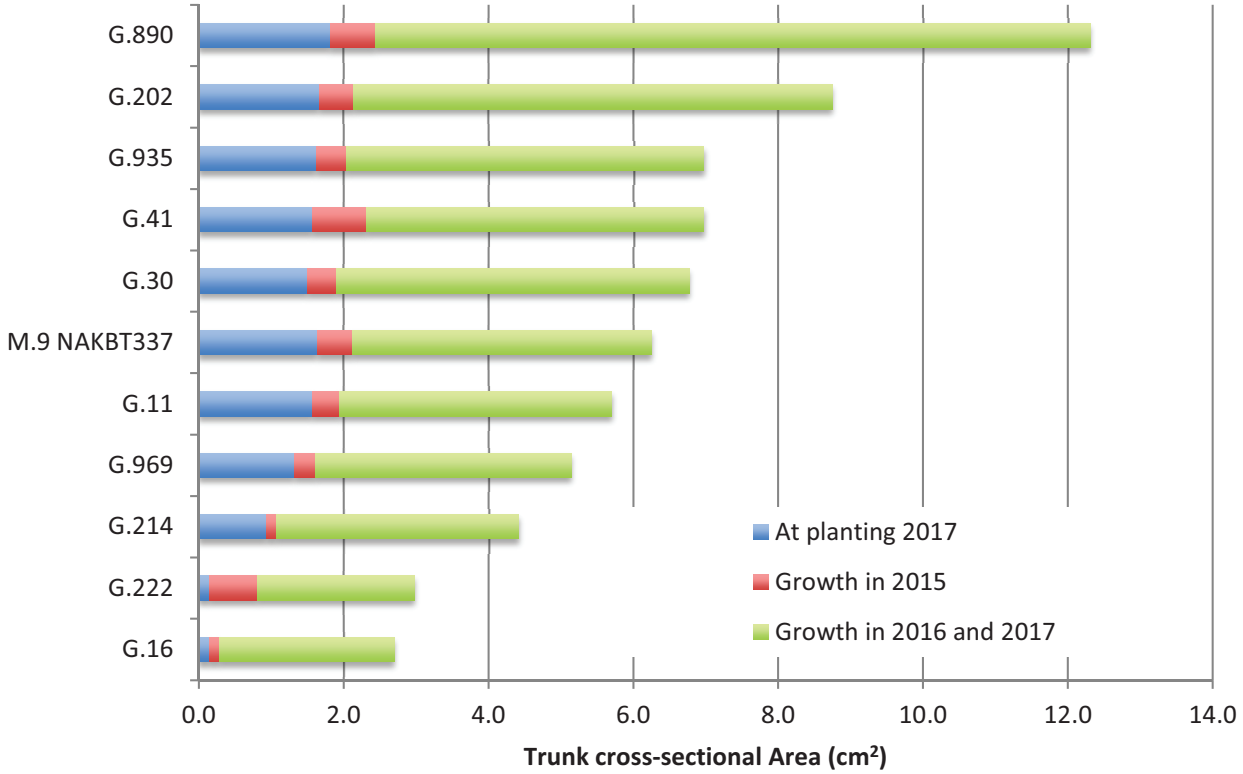


Figure 1. Trunk cross-sectional area on Modi apple trees on several Geneva rootstocks and M.9 NAKBT337 in New Jersey.

Table 1. Performance of Modi apple on several Geneva rootstocks in comparison to M.9 NAKBT337. Franklin Township, Hunterdon County, New Jersey.

Rootstock	Graft union height above the soil (cm)	Feathers (no. at planting)	Trunk cross-sectional area fall 2017 (cm^2)	Yield per tree 2017 (kg)	Yield efficiency 2017 (kg/cm^2 TCA)
G.11	14.6 a	6.3 a	5.7 cde	4.1 bc	0.72 a
G.16	20.3 a	0.5 d	2.8 f	1.1 d	0.57 abc
G.30	13.6 a	4.2 abc	6.8 c	4.6 ab	0.70 ab
G.41	13.4 a	5.2 ab	7.0 c	5.2 ab	0.75 a
G.202	14.3 a	6.1 a	8.7 b	1.2 d	0.13 c
G.214	13.9 a	1.6 d	4.4 ef	2.7 cd	0.65 ab
G.222	16.7 a	1.7 cd	3.0 f	0.7 d	0.26 bc
G.890	12.6 a	6.0 a	12.3 a	3.6 bc	0.31 bc
G.935	13.8 a	5.4 ab	7.0 c	6.4 a	0.91 a
G.969	14.3 a	3.0 bcd	5.2 de	4.8 ab	0.95 a
M.9 NAKBT337	14.3 a	4.8 abc	6.3 cd	4.8 ab	0.79 a

Means within columns are significantly different (at odds of 19 to1) if not followed by a common letter (Tukey's HSD, P = 0.05).

as defined by the Cornell-Geneva Breeding Program. Trees were spaced 3 by 12 feet and trained as tall spindles. Liberty trees were interplanted as pollenizers. The trial includes 12 replications with a single tree of each rootstock in each replication. Trunk cross-sectional area was assessed at planting and at the end of the 2015 and 2017 growing seasons. At planting, the number of usable feathers (4 inches or longer) were counted. Yield per tree was assessed at harvest in 2017.

At planting (Table 1, Figure 1), trees varied substantially in trunk cross-sectional area. Those on G.222 and G.16 were very small. After three growing seasons, tree size varied significantly by rootstock. Largest trees were on G.890. Next largest were on G.202, and the smallest were on G.222 and G.16. Trees generally were consistent with the expected sizes with a few exceptions. Trees on G.30 and G.969 were smaller than expected. Trees on G.222 and G.16 were much smaller than expected. Most trees were bench grafted in 2013 and kept in the nursery for two growing seasons. It appears, however, that those on G.222 and G.16 did not take well and were re-grafted in 2014 and thus were a year younger than the others, explaining the smaller tree size at planting and after two growing seasons in the orchard. This trial certainly confirms the suggestion that G.890 produces large trees, and these are clearly not suited for tall spindle production.

The number of feathers at planting (table 1) was directly related to trunk cross-sectional area at planting, with weak trees producing the fewest, and vigorous trees the most. Trees that came from the nursery with a trunk cross-sectional area of 1 cm^2 or less had virtually no feathers, but as the trunk cross-sectional area increased above 1 cm^2, there was a linear increase in the number of feathers up to an average of more than 6 per tree.

In this first harvest, the highest yielding trees were on G.935 and the lowest were on G.202, G.16, and G.222. The most yield efficient trees were on G.969, G.935, M.9 NAKBT337, and G.11. The least efficient trees were on G.202.

These early data in the life of this planting begin to paint a picture of these rootstocks, but that picture will not be perfectly clear for a few more years.

Megan Muehlbauer – New County Agent Joins Rutgers Cooperative Extension

Dr. Megan Muehlbauer, was hired August 1, 2017 as a County Agent III, Equivalent to Assistant Professor. Her focus is on commercial tree fruit production in northern New Jersey.

She obtained her Bachelors degree in biotechnology from Rutgers University, but as the daughter of a grain farmer had an interest in learning horticultural field work. This curiosity lead her to intern at the Rutgers University Snyder Research and Extension Farm. It was in this position that she learned small plot research and demonstration work in tree fruit and vegetables under the guidance of area fruit agent, Professor Win Cowgill. Win recently retired from Rutgers Cooperative Extension after 38 years of service (see Horticultural News Summer 2016) http://www.horticulturalnews.org/96-3/wxyzCover96-3.html.

Megan Muehlbauer in the hazelnut demonstration plot at the Rutgers University Snyder Research and Extension Farm in Pittstown, NJ.

Megan Muehlbauer cutting hop bines that are ready to be harvested from the hop demonstration trial at the Rutgers University Snyder Research Farm.

Subsequent to her undergraduate studies, under the advisement of Rutgers University Professor Thomas Molnar, Megan completed her dissertation titled 'The utilization of molecular and biochemical tools to assist in the breeding of hazelnuts (*Corylus* Spp.)'. Aside from helping to spark hazelnut production in the Northeast, Dr. Muehlbauer collaborated with

Megan Muehlbauer spraying pumpkin disease control research plots for Win Cowgill, 2011 Rutgers Sndyer Farm
Photo Credit: Win Cowgill

Rutgers University Professor Jim Simon, to obtain a SARE Partnership grant to establish a chemical quality analysis service at Rutgers University for hop growers.

As a Rutgers Cooperative Extension Agent, she will provide educational programming, and research support for the tree fruit growers in Northern New Jersey, while also providing assistance to the small fruit, and wine grape industries.

Horticultural tree fruit support will include:

- Demonstration of Tree Fruit Production systems
- Involvement, research support and outreach for the NC-140 rootstock trials
- Management of bitterpit disorder in Honeycrisp apples
- Testing and promotion of new, well adapted fresh market varieties

Dr. Muehlbauer will continue to explore the potential for the production of premium quality hops and hazelnuts in New Jersey as new high value crops. Both of which could be integrated into tree fruit production systems in New Jersey. In addition, she will pursue research on hard cider apples, in an effort to provide education and support for the burgeoning hard cider industry in New Jersey.

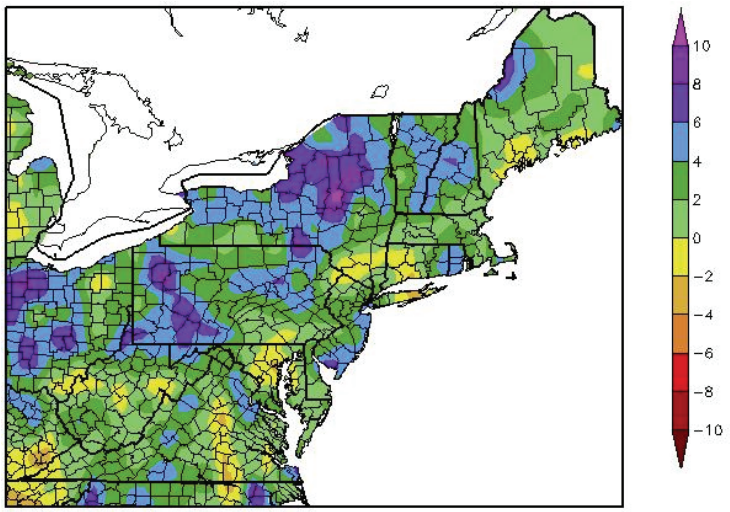
Dr. Muelbauer can be reached at the Rutgers Hunterdon County Extension Office at 908-788-1339 or email at muehlbauer@njaes.rutgers.edu.

University of Massachusetts Fruit IPM Report for 2017

Dan Cooley, Jon Clements, Elizabeth Garofalo, Sonia Schloemann, and Arthur Tuttle
University of Massachusetts Amherst

Weather

A winter low temperature of 2º F. in Belchertown was recorded on January 9, well above any temperature that would cause fruit bud damage. Otherwise, winter was fairly unremarkable with average snowfall. Spring came in fits, with a record cold temperature of 12º F. on March 23 followed just three weeks later by 84º F. on April 11. Because of the significant temperature fluctuations, there were some concerns about flower bud damage, however, both apple and peach bloom were profuse. Green tip of apple in Belchertown was April 10, bloom began approximately on May 1 and was quite protracted, lasting nearly 2 weeks. Weather during bloom was cool and wet, causing concern about potential pollination and fruit set. This lead to under-application and/or generally poor efficacy of chemical thinners in most cases and heavy fruit set. Wetter than normal weather in early to mid-season contributed to several disease problems, outlined below. The summer was generally benign, however, significant hail damage occurred in some orchards in central Massachusetts on June 27. The peach harvest was smooth and many peaches were picked. Late August into early September was cooler than average, and apples colored up nicely. However, mid-September turned warm to hot with the season's high temperature of 91º F on September 24. It was also dry fall which was favorable for harvest. Many, many apples were picked, likely one of the biggest apple crops in 10 years.



Map of the Northeast showing departure from normal precipitation in inches over the 90 days from April 26 to July 25, 2017 (Northeast Regional Climate Center).

Diseases

Apple scab was challenging for many growers this year. The wet spring made protective fungicides hard to apply, and sprays quickly washed off. There appeared to be more scab in commercial orchards this year than in any of the last four. Trap trees were set out at Cold Spring Orchard again this year, confirming seven infection events during the primary season.

Cool temperatures during a prolonged bloom period made **fire blight** blossom infection pretty much a non-issue. Some later season strikes were found in orchards where hail might have been the driving factor. Significant shoot blight was observed in one orchard in western Massachusetts where late bloom, pruning style (too many vigorous water sprouts) and a wet summer all contributed to infections.

There were some problems with **phytophthora crown and root rot** in new plantings. The wet weather

Phytophthora-afflicted apple trees in 1st-leaf apple orchard in eastern Massachusetts on August 31, 2017.

was ideal for the disease, and in a couple of cases led to significant tree death of trees planted this year, even on B.9, a relatively resistant rootstock. The problem may have originated with liners or nursery trees. In addition, there is some evidence that **southern rot** was also involved in one orchard.

Particularly nasty **fabraea leaf spot** (see photo) moved into Bosc pear at the UMass Orchard in late August. Wet summers are ideal for this disease to take hold. Season-long EBDC fungicides or Ziram, particularly during the summer and in wet seasons are need to control fabraea leaf spot.

In late August and September, a new leaf spot disease showed up on apples, identified as **Marssonina**

Fabraea Leaf Spot on Bosc pear in August at the UMass Orchard.

Marssonina Leaf Spot on Jonagold foliage, September 22.

Spotted-winged Drosophila in sweet cherries.

leaf spot. The disease has been an increasing problem in Europe and other parts of the world over the past 10-15 years. In these areas, premature defoliation is severe enough to cause premature fruit drop. While the disease was identified on leaves in Massachusetts, there was no significant defoliation or fruit loss, though some of this was reported in Connecticut and eastern New York.

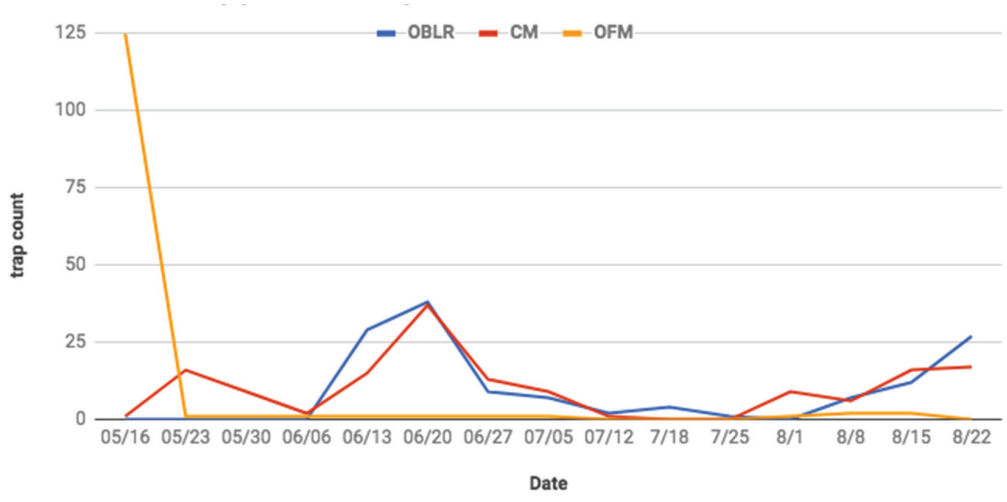
Insects

Spotted wing drosophila came in early and hard this year. One grower reported approximately an $8,000 loss in cherries due to adult egg laying and larval infestation of this pest. Traps placed at the UMass Orchard in a sweet cherry block caught SWD on July 3. See more on SWD in the small fruit section below.

Lepidopteran pests -- **Oriental fruit moth, codling moth, oblique-banded leafroller** -- despite high trap catches across the board, apparently caused very little fruit damage (or at least none in particular that we noted). We know targeted sprays were made for CM and OBLR in orchards where there is history of damage. Otherwise, it seems that the mandatory petal fall plum curculio sprays kept the majority of lepidopteran damage at least partially under control still (especially OFM).

Brown marmorated stink bug was monitored across the state by a group that included UMass Extension (EIP), iPiPE, Barnstable County Extension, Massachusetts Dept. of Agricultural Resources, and two independent crop consultants. Trap captures from 20 traps (mostly agricultural sites) and private home sightings were reported to MDAR. Trap catches were very low again in 2017 with a bit of an uptick in September and October. Thus far, no insecticide sprays have been reported to us that have specifically targeted this pest in Massachusetts orchards.

Brown Marmorated Stink Bug.



Lepidopteran pheromone trap captures in eastern Massachusetts orchard in 2017.

Horticulture

As previously noted, the apple bloom period was generally regarded as unfavorable. That turned out to be wrong. Chemical thinning was not aggressive enough, and apple fruit set was heavy. Not enough hand thinning occurred, and now there should be some concern about return bloom in 2018. Time will tell, fortunately the summer growing season when fruit buds are formed was favorable, so that will help. Remember, how many times have we over-thinned apples with chemicals? You are advised to be more aggressive when applying chemical thinners, going down the road. High crop loads do not create quality fruit on some varieties, particularly Honeycrisp, Jonagold, Golden Delicious, etc.

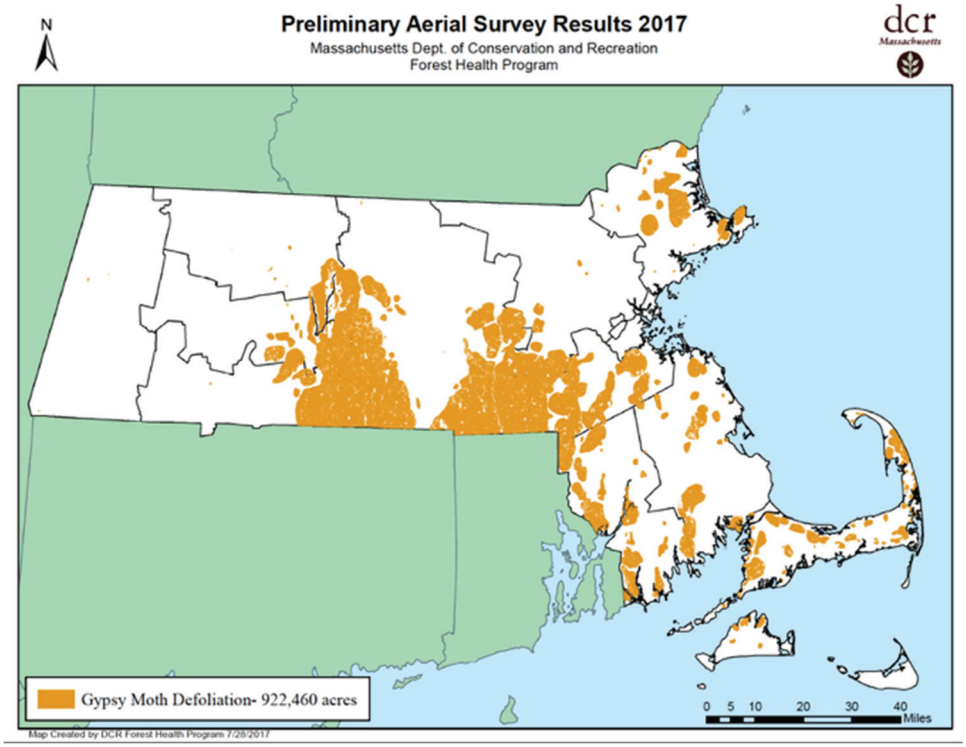
Also previously mentioned was phytophthora observed in newly planted trees. First off, if you even begin to wonder if a site is too wet to plant fruit trees, it is! Second, consider planting on mild berms -- particularly on wetter sites with heavier soils -- to get those roots into a more favorable (warmer and drier) situation, which will result in better young tree growth and earlier yields.

Gypsy Moth feeding on blueberry flowers.

Small Fruit

Winter moth egg hatch occurred during the second week of April in 2017; approximately 1 week later than in 2016. Blueberry growers reported very low levels of winter moth damage in 2017 achieving good control with timely oil/insecticide applications. One explanation could be that the biological control agent, *Cyzenis albicans*, a tachinid fly, that has been released by Dr. Joe Elkinton in 41 sites across Massachusetts (and has become established in 17 of these sites), may be having a measurable impact. However, this continues to be a difficult pest to manage. We published five *Massachusetts IPM Berry Blasts* (often in collaboration with Heather Faubert in RI) with information about winter moth.

Gypsy moth populations were extremely high in several regions of Massachusetts in 2017. This was



Extent of gypsy moth defoliation in Massachusetts in 2017.

thought to be largely due to the drought conditions in 2016 whereby the natural control agent *Entomophaga maimaiga* was suppressed by the dry conditions. The Massachusetts Department of Conservation & Recreation (DCR) estimated that over 362,000 acres were defoliated by gypsy Moth in 2016. DCR estimates over 922,000 acres were defoliated in 2017. Several blueberry growers reported significant crop loss due to Gypsy Moth feeding on flowers. A return to more typical precipitation helped to reactivate the *E. maimaiga* fungus and increased gypsy moth mortality later in the season; however, sufficient numbers survived to lay eggs for next year so this may be a problem again in 2018. Timely insecticide applications (e.g., B.t.) would likely control this pest.

Spotted Wing Drosophila (SWD) – Massachusetts maintained a 10-trap network for monitoring the onset of SWD activity for 2017. Scentinel or Pherocon traps and lures were used in most cases and traps were monitored on a weekly basis starting in mid June. SWD trap captures and fruit infestation occurred early in 2017 as compared to previous years. First capture coincided with sustained capture dates beginning at approximately June 27, 2017. This was at least 2 weeks earlier than in previous years and put some crops at risk that had not been considered vulnerable to SWD in the past; late ripening varieties of June bearing strawberries and sweet cherries. Growers of these crops suffered damage due to this unexpected population build up so early in the season. Weather conditions in mid through late summer with consistent rain and high humidity allowed for continuous buildup of SWD populations through the late growing season. Grape growers reported significantly high populations in vineyards during harvest. Some table grape growers suspended harvest early due to concerns about SWD infestation of their fruit. One twilight meeting, held at Nourse Farms in Whately, MA on June 15, 2017 and attended by 45, focused on SWD management recommendations for 2017. Four issues of Massachusetts IPM Berry Blast contained information on SWD pest status and management recommendations. Trap capture results from the ten site network were reported on iPipe.

Spotted-winged Drosophila trap.

Special Projects, Research, and Publications

The UMass RIMpro Advisory Service was formed thanks to financial support from the New England Tree Fruit Research Committee. Twenty-one RIMpro grower sites -- one in CT, ten in MA, five in ME, one in RI, three in VT, and one in NH -- were set up using either NEWA weather station or virtual/Meteoblue weather data, and participants received disease and pest management advice from UMass as well as individual visits. We are in the process of evaluating how the growers used RIMpro and how much uptake there will be going forward using this IPM decision aid tool.

A UMass team including extension educators, a graduate student, and two undergraduate students ran a pheromone trap network across Massachusetts orchards as part of the eIP and iPiPE Northeast Apple Crop Pest Program. Traps were checked weekly and pest incidence/counts were entered into the iPiPE portal. iPiPE is a collaborative effort between researchers, extension specialists, and growers that utilizes near real-time data to provide pest status, education, and outreach on a national scale.

Lead and hosted by UMass, the New England Tree Fruit specialists team contributed to the up-start on-line edition of the New England Tree Fruit Management Guide. In addition, UMass received a Northeast IPM Center grant to lead the team in developing a full-fledged on-line New England Tree Fruit Management Guide to be launched in time for the 2018 growing season.

An Eco Apple App was developed, the target audience being Eco Apple growers, the objective to make Eco-Apple-approved spray chemical information available by bud stage and pest. The app is free (thanks to some leftover Northeast SARE money) and can be

Ambrosia apple at UMass Cold Spring Orchard, October 2, 2017.

used by any apple grower wishing to restrict their spray chemical use to Eco Apple approved chemicals. The app is available on both the Google Play and Apple App Stores.

In collaboration with researchers at Cornell's Hudson Valley Lab, an Asian pear variety block at the UMass Orchard in Belchertown was inoculated with fire blight on June 26 to study the progress of canker development and viability into the following winter. Inoculation was a success, as shoot blight and canker development was significant by the end of the summer in most varieties. These trees will be removed before bud break in 2018.

Funded by Northeast SARE, and in cooperation with Quan Zeng at the Connecticut Experiment Station, a block of Jonagold apples at the UMass Orchard in Belchertown was first inoculated with fire blight during bloom on May 6 and then treated with several biological fire blight control/suppression sprays. Unfortunately, although we understand there was better "luck" in CT, absolutely no fire blight appeared, including in the control trees. Cool conditions during bloom were probably the reason no fire blight was seen. The experiment will be repeated again in 2018.

We participated in the weekly Northeast Regional Berry Call-in organized by Cornell University that brought together Extension and Industry and Growers from the Northeast (PA to Ontario) to discuss current observations and timely topics together. These calls are extremely useful for problem solving and general awareness of growing conditions and challenges. Calls started in mid-April and ran through July.

A UMass team including a research associate, graduate student, undergraduate Extension CAFE Scholar, and extension educator conducted a 6-week trial in an one acre block of Polana raspberries to test efficacy and placement of attracticidal spheres for management of spotted-wing *Drosophila.* This was part of a multi-state SARE grant project directed by Tracy Leskey (Appalachian Fruit Research Station, USDA).

The UMass Fruit Team received funding from NIFA to conduct extension and research activities in fruit IPM (Multi-Level Extension Delivery to Support IPM for MA Vegetable and Fruit Growers; Hilary Sandler, project director). In 2017, there were seven growers at the "Mentor" level, receiving extensive IPM training throughout the growing season in tree fruit and small fruit IPM issues that they identified as major problems. Five other growers also participated in single issue "Partner Projects" in apples, raspberries, and cranberries. The project also supported weather station maintenance, our connection with NEWA, and grower training in use of decision support systems.

Five new UMass IPM fact sheets were published in FY17. *Blueberry IPM–Mummy Berry*, *Blueberry IPM–Witches' Broom*, *Raspberry IPM –Anthracnose*, *Raspberry IPM–Cane Blight*, and *Raspberry IPM – Spur Blight*.

Delicious Still Dominates Indian Apple Industry

Kunaal Singh Chauhan
Apple Grower, Shimla, Himachal Pradesh, India

Delicious was introduced to the Shimla hills of Himachal Pradesh, India, by an American in 1916. Most local farmers in the region took to planting apples in the 1940s, and it was not until the 60s that the Indian Delicious made a name for itself in the markets. Now in 2017, on the occasion of the centenary celebrations, when Delicious seems to be on the decline across the globe, sales of Delicious in India look as good as ever.

Himachal is a mountainous state, and apples grow from elevations of 4,500 feet to as high as 12,000 feet, with the best quality coming in the higher mountains. India, on average, produces 3 million metric tons of apples and is in the top six apple producing countries of the world. Apples are packed in boxes with the majority sold in wholesale markets and a small amount sold retail.

Delicious was the favorite apple of the US for a long time but saw its demise due to the adoption of apple cultivars that had better taste and texture. Focus on growing redder skin sports of Delicious, which had more cosmetic value than taste and flavor, greatly contributed to the demise of Delicious as the favorite American apple. Sales of US Delicious gave way to Fuji, Gala, Granny Smith, and Honeycrisp, and overall production declined.

But in India, Delicious is still the favorite apple. Close to 80 percent of the Delicious grown in Himachal are still the same old Stark strain from the Stark Brothers Nursery, Louisiana, Missouri, which is still popular because of its taste. This good flavor is one of reasons why Delicious is still the predominant variety grown here. Another reason is the less vulnerability to bruising

Photo 1. A typical Delicious orchard, Mashobra Research Station, Himachal Pradesh, located 7000 feet above sea level.

Photo 2. A Box of the Stark strain of Delicious, from an orchard in Kotkhai, India.

as compared to the other varieties; it is a much easier apple to send to the far corners of India by truck. India is big country with a vast market with farmers getting good prices even for small sized fruits. Larger fruit size and high color, however, demand a premium price. On average, Indian fruit growers have a 70 percent profit margin on every box of apples sold.

Higher colored apples fetch better prices in the market, which has led to the entry of the newer high coloring strains of Delicious being planted by growers. These strains planted in Himachal over the past few years are now being sold for as high for $50 per box in the early season, i.e. July and early August. The average price for the same 27 kg box of the older strain is about $22. The new ones do not taste as good as the original reds, and as such, consumers in India may soon start foraging for a better tasting apple, as the production of the new strains increases. Indian growers should heed the history lesson of the US Delicious grower chasing the red strains with no taste!

It is hard to compare apples that are imported from US to those grown in India. The apples coming in from Washington State have excellent cosmetic appeal and define what a table apple should look like for our Indian consumer. However, the Indian consumer has the impression that the locally grown produce tastes better, is fresher, and has no artificial wax. While our Indian Delicious may taste better for the short term, our lack of modern postharvest tools like precooling, 1-MCP, refrigerated storage, and transportation makes our season a short one. As a result, most of our Delicious apples have a short shelf life and must reach the market very quickly. However, India is a big country with 1.4 billion mouths to feed. Eighty percent of our 3 million tons of fruit ends up as fruit for fresh market consumption. These Indian Delicious apples never go out of demand!

Note that the amount of apples

Photo 3. A Box of Scarlet Spur Delicious, one of the newer strains of Delicious being grown in India now.

Photo 4. Kunaal Singh Chauhan in a Delicious orchard in Yakima, WA. Kunaal Chauhan is general secretary of the Progressive Growers Association in India, a group of more than 130 farmers who have left other careers to pursue the life of an apple grower. His orchard is in the Kotkhai region of Shimla district, where he mainly grows apples and pears. Photo credit Win Cowgill.

produced by the state of Himachal Pradesh, which constitutes 40 Percent of the Indian production, is equal to the amount apples imported into the country from various countries.

For now, it is clear that good flavor and our early timing of Delicious entry into Indian markets are ensuring that apple growing is a profitable business for Himachal Pradesh growers. As growers adopt the redder strains of Delicious and they start taking market share of local apples sold, we need to be cautious that our Indian consumers may demand better flavor and texture.

Many Himachal Pradesh apple growers have established small trial plantings of newer cultivars which might work for the Indian markets. These include strains if Fuji, Gala, and Honeycrisp.

Chester "Chick" Forshey: March 21, 1925 – May 9, 2017

Steve Reiners, David Rosenberger, and George Lowery
Cornell University

It is with great sadness that the Horticulture section in the School of Integrative Plant Science at Cornell announces the passing of a respected friend and colleague, Professor Chester "Chick" Forshey. Dr. Forshey passed away in Venice, Florida on May 9, 2017. He was 92. Former colleagues remember him as the ultimate practical fruit researcher, with an unusually deep interest in the underlying physiological principles that control tree responses to weather and cultural practices. His enduring contributions have been in the area of applied physiology of apples that support a deeper understanding of how trees work.

Dr. Forshey was born on March 21, 1925 in Lower Salem, Ohio, to James and Opal Forshey. Graduating high school in 1943, he enlisted in the US Navy and saw action during World War II in the South Pacific as a Quartermaster on the high-speed transport ship, the John Q. Roberts. The ship escorted convoys and took part in maneuvers in preparation for the anticipated invasion of Japan in 1945. After being honorably discharged from the Navy in 1946, Dr. Forshey, like many in the "greatest generation," used the GI Bill to enroll at Ohio State University in Columbus. There he earned his Bachelors degree in Horticulture and his PhD in Pomology. Soon after graduating with his PhD, he joined Cornell University in 1954 as an Assistant Professor of Pomology assigned to support fruit research and extension programs in the Hudson Valley. He was promoted to Associate Professor of Pomology in 1958 and to full professor in 1966. He became superintendent of Cornell's Hudson Valley Laboratory in Highland, NY in 1968; the position he held until his retirement in 1989.

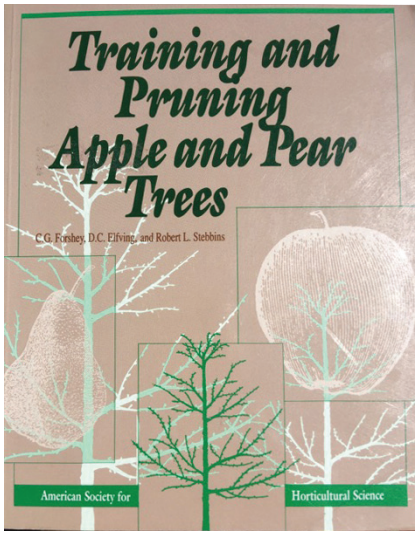
At the Hudson Valley Lab, Dr. Forshey was responsible for setting up an analytical laboratory on fruit investigations that continues to this day. His own research dealt with studying the nutritional needs of tree fruits, irrigation requirements, and chemical thinning of the apple crop. Towards the end of his career, his research emphasized the relationship between vegetative growth and fruiting in apple trees. This included studying the effects of such factors as variety and rootstock, nutritional status, pruning, crop load and growth regulators on the overall quality of finished fruit and productive capacity of the tree.

"During Dr. Forshey's tenure in the Hudson Valley, new facilities were constructed in Highland [New York] in 1963-64 and a large addition was completed in 1974. Dr. Forshey effectively mentored younger scientists and fruit extension staff during the 1970s and 1980s while conducting his own detailed research on nutrition, fruit thinning, pruning and young tree training," said Professor Emeritus David Rosenberger.

Rosenberger continued, "He is remembered for his sharp wit and for his attention to detail in both his research and in the precise wording that he used in his extension talks. Without his dedication to the

fruit industry, the Hudson Valley Lab would not exist today and the eastern New York fruit industry might not have maintained the vitality that it still exhibits today."

Although Dr. Forshey was a world-class researcher, he considered the interaction with tree fruit growers as the best part of his job. He maintained a close relationship with fruit growers in the Hudson and Champlain Valleys. Although retired for almost 30 years, "his growers" still speak of him and his work in glowing terms. Alan Grout, a grower in eastern NY talked with him just a few days before he passed away. In Alan's words, Chick was "direct, candid, sharp, witty, and spot-on as usual." Alan added that Chick would be proud of the apple crop he was harvesting this fall, as it was the "direct result of Chick's constant input and devotion for more than fifty years."



Win Cowgill, Rutgers Professor Emeritus, commented on the impact Chick continues to have beyond New York. "Dr. Forshey was a force to be reckoned with in northeast pomology circles. His efforts established the Cornell Hudson Valley Lab. The lab and the scientists and extension personnel stationed there, past and present, have been vital to the tree fruit industry in NY, New England and New Jersey. As the extension fruit faculty and researcher stationed in Northern New Jersey for 38 years, I counted on the lab and Dr. Forshey during his tenure for science based information on apple production."

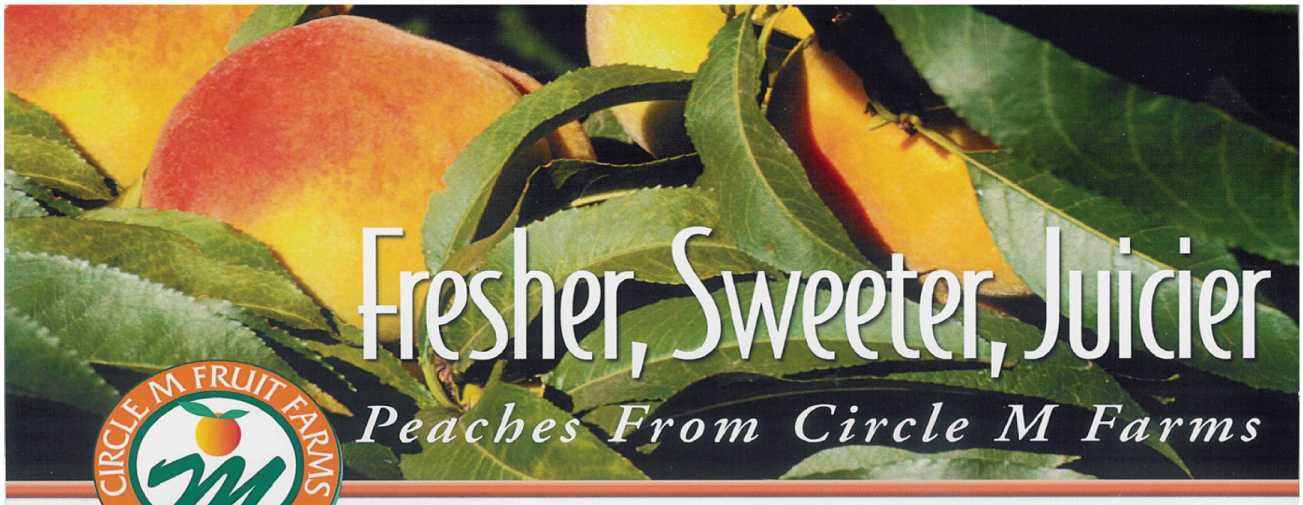
In 1963, Dr. Forshey took his family to South America where he spent one year as a temporary member of the Rockefeller Foundation staff with its Chilean Agricultural Program. At the request of the Faculty of Agronomy of the University of Chile, the Ministry of Agriculture, and the School of Agronomy of the Catholic University he assisted with the development of research and teaching programs in these different institutions. At the end of his year in Chile, he was named honorary professor at the Schools of Agronomy of both the University of Chile and the Catholic University.

Dr. Forshey was a member of Sigma Xi, American Society for Horticultural Science, American Chemical Society and the Soil Science Society of America. He published over 140 articles and co-authored the book, "Training and Pruning Apple and Pear Trees". He also wrote the article on "Apples" in the World Book Encyclopedia. He was a popular speaker at annual meetings of the Horticultural Society where he was noted for his writing style and terse form of commentary, both written and verbal.

He met his future wife, the former Lorraine Sweetland at a sandwich shop in Pleasant Valley, NY, soon after coming to the Hudson Valley region and they were married in 1956. They celebrated their 60th anniversary this past November. He and Lorraine were the proud parents of four children Douglas (Manakin-Sabot, Virginia), Gregory (deceased), Patricia (deceased) and Debra (Palmyra, Virginia). He also had five grandchildren: Meghann and Stephanie Forshey, and Kate, Jilian, and Logan Stutz.

Dr. Forshey was a dedicated family man who enjoyed spending time with his growing family. They spent many happy hours fishing at their camp on Indian Lake near Millerton, NY. He was also a renowned woodcarver and celebrated for the many lifelike woodcarvings he made of birds and ducks. He was an active member of the Hyde Park United Methodist Church for many years. Upon his retirement, he and Lorraine moved to Venice, Florida where they built their retirement home on the edge of a lake with a beautiful view of the sunset. When he wasn't chatting with Northern fruit growers, he spent his time tending to his own plants and vegetation, wood carving and cooking.

Although Dr. Forshey had been retired for many years, his book, Training and Pruning Apple and Pear Trees, first published in 1992, lives on. The book, written with Don Elfving from the Horticulture Research Institute of Ontario and Robert Stebbins from Oregon State University, remains a go to text for students around the world. As described in the introduction, the book was an "effort to provide guidance to the practical pomologist through the collection, organization, and summarization of current information on the principles and practices of pruning apple and pear trees." For a man who so valued his relationships with growers, the fact that his words and advice lives on is perhaps the most meaningful professional tribute Dr. Forshey could receive.



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