

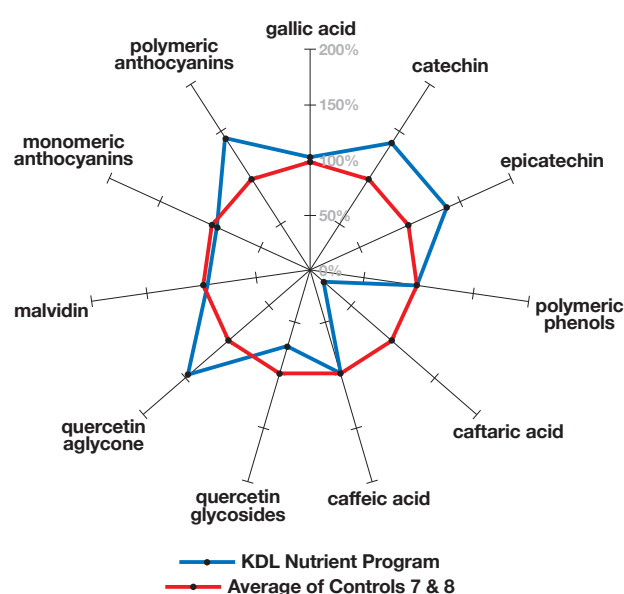
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The International Fruit Tree Association held a study tour in New York in July, which included this stop at Wafler Farms. Find out more about the tour and what growers shared beginning on page 28.

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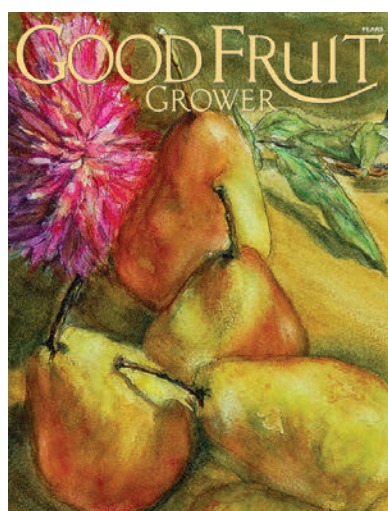
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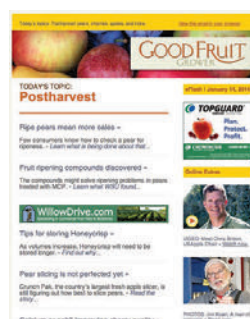
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GOOD POINT

Amit Dhingra, Washington State University

The Age of the Pear

The pear has been a staple food in Europe for centuries — often the subject of paintings by Van Gogh and highly revered by fables and foodies alike. Unlike in the U.S., pears in Europe are often enjoyed with a fork and a knife, on a plate, like one might eat a mango or other soft, ripe fruit.

In America, fruit mobility is a prized commodity and one that greatly affects the breeding choices made by growers. It's easy for the highly mobile American market to grab an apple to go, and it's a fairly reliable assumption that the apple you choose will be sweet and ripe. However, pears when ripened properly are juicy and can be slightly messy and cumbersome. It's also a much greater challenge to predict and pick a pear at the peak of ripeness from a shelf. This makes it hard to expand per capita consumption of this delightful fruit as growers struggle to deliver a consistent product.

These challenges help set the stage for an industry that's been stagnant for the past several decades, with pear varieties that have remained unchanged for nearly 250 years. The problem is more than just lackluster varieties and lack of innovation. It's a deeper educational and cultural challenge. With slow pear consumption growth, there is no real incentive to increase planting or change methods. Pears are viewed as the "old steady"

option for growers. With a less volatile growing season and relatively stable profits, pears are often consistent and unchanging. Introduction of new varieties in the past brought about a range of issues, including fire blight, so most growers are content to keep their pear production the same as it has been for generations.

The pear industry has unlimited potential and is ripe for a revolution. The pear itself has superior health benefits compared to apples, including higher fiber content and a lower glycemic index.

Studies have shown they're better tolerated by people with food allergies and they don't have the same flavor issues as other "healthy" crops, like kale. In essence, the pear mostly has a perception problem and has yet to receive the proper attention as have other fruits and vegetables.

If the industry could address the main issues with pears, namely providing a convenient and easy way to consume them while on the go and producing a more consistent flavor profile, why couldn't they have the same revolution that other, less appealing crops have had?

One potential way to address both issues is in the sliced fruit market. Sliced apples have dominated the sliced produce sector with a market of over \$500 million, while the total pear market across all forms currently is just \$350 million. There are several different ways to address the challenges of delivering a consistent and convenient product. At Washington State University, we are working with a set of ripening compounds meant to consistently ripen pear fruit and enable the production of sliced pears with long shelf life. This project has received support from the pear industry as well as the Washington State Department of Agriculture. If sliced pears tasted great consistently, were readily available and had a superior nutrition profile to that of other fruit, who is to say they couldn't be the rulers of the sliced fruit market?

In addition to facilitating the production of sliced pears, we, and our colleagues, are using improved and faster protocols that allow us to breed dwarfing pear rootstocks and even better varieties. The hope is to develop solutions across the entire pear value chain in response to the feedback of growers and addressing their top concerns. By first generating revenue for the industry with sliced pears, we expect to spur innovation and develop a repertoire of varieties that are ready to eat straight off the tree, revolutionizing the pear industry and addressing many of the remaining concerns. In an area where progress has been slow, there is a lot of opportunity, and in collaboration with the industry, we have laid a foundation for rapid advances. *The age of the pears cometh.* ●

Amit Dhingra, Ph.D., is an associate professor in WSU's Department of Horticulture and founder and CSO of Phytelligence, an agricultural biotechnology company.



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PHOTO BY LORI PARLO

Todd Parlo, a Walden, Vermont, organic grower is evaluating 84 pear varieties as cold-hardy rootstock candidates. These David pears are one of the varieties he's earmarked as a good possibility.

In the hunt

A Vermont organic grower is evaluating 84 pear varieties as cold-hardy rootstock candidates.

by Dave Weinstock

Todd Parlo has been growing organic fruit and operating a nursery at his Vermont farm for the past 20 years. At 1,750-plus feet above sea level, his farm lies in a region where the average annual extreme low temperature reaches between minus 30 and minus 35 degrees Fahrenheit.

However, the majority of fruit tree rootstocks — pears included — are only cold-hardy above zero, which falls short of requirements for growers like Parlo.

“The Achilles’ heel of growing pears in northern climates is parent rootstock,” Parlo said. “Most people tend to put scions on European rootstock, but there is a limit to their cold-hardiness.”

Four years ago, he applied for and received a \$14,000 U.S. Department of Agriculture Sustainable Agriculture Research and Education grant to evaluate the cold-hardiness of 600 apple varieties and almost 85 pear varieties within organic systems. “We had an opportunity, with the SARE grant, to get a large pot of cultivars and to do a little more rigorous recordkeeping,” Parlo said.

He did his own grafting, but nearly all his test varieties came from commercial nurseries, many of which are located in the northern United States and Canada. “What I couldn’t find commercially, I was able to get from the

national germplasm collections,” he said.

His research is ongoing, but so far Parlo has identified eight possible pear candidates that could serve as rootstock in colder regions.

Cold’s advantages

There are some positives associated with growing in colder regions, including an absence of fire blight, virtually no plant diseases and fewer pests. In Parlo’s region, growers deal with only two pests: blister mites and tarnished plant bugs.

Another advantage is the region’s snow cover, which acts like an insulating blanket during frigid weather. In Parlo’s case, temperatures periodically fall to 40 degrees below zero, but Parlo doesn’t fear a severe low temperature as much as a rapid change in temperature that shocks the tree, leaving it no time to gradually adjust.

In either case, roots are the critical concern because they are the least hardy part of the tree. “While trees can be cold-hardy up top, the roots are not because they are insulated by the soil throughout the year,” he said.

The cold-hardiness of most temperate fruit roots is actually above zero. There are rootstock selections compatible with cold-hardy European varieties and available for growers located in regions with negative temperatures, but not extreme cold like Parlo’s region.

Seedling rootstock tends to come from Bartlett seeds, which Parlo said, “are not terribly cold-hardy.” Clonal rootstock isn’t an answer, either, because its plant hardiness seems to be closer to minus 30 degrees than minus 40 degrees.

Parlo’s best rootstock options are Old Home by

“The Achilles’ heel of growing pears in northern climates is parent rootstock.”

—Todd Parlo

Farmingdale 97, 513 and 333. “OHxF.97 is the most vigorous one and it’s pretty hardy, but not that hardy,” he said.

OHxF.513 and 333 are slow growing, which is a separate problem. “A late ripening pear can still have leaves when we begin to see freezing weather,” he said. “If it freezes and it’s succulent, it’s done.”

He also uses *Pyrus communis*, the European pear or common pear, but generally uses his own seed. “It comes from hardier genetics than commercially available, canery-generated strains,” he said.

P. ussuriensis is the most cold-hardy stock, but when European scions are put on top of them, pear decline becomes an issue. “Asian varieties are not very cold-hardy at all,” said Parlo.

Some growers use quince as rootstock, but it isn’t hardy enough for Parlo’s region.

Early picks

Most of Parlo’s varieties are bitter tasting and not suitable for use as a scion. Parlo is quick to point out his trials are ongoing; still, he’s identified eight probable candidates for rootstock:

—**Stacey** is an early bearer with an acceptable form. Blister mite was less a problem with this variety than others in his test.

—**Summercrisp** displays good form and is vigorous without being excessive. It’s susceptible to blister mite

—**Luscious** has moderate vigor and good cold tolerance. It seems to have a pollen issue, requiring it to be grouped with other pears. Its foliage tends to be less lush than others.

—**Hardy** has a very vigorous tree that grows straight up like a poplar. It suffers from some cold damage. It has



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Developed in 1933 by the South Dakota Experiment Station, the female parent of Krylov pears hails from eastern Siberia. The variety is fire blight resistant.



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The Stacey pear mother tree is believed to be nearly 300 years old and measured 108 inches in circumference in 2006. It produces a small, sweet fruit that should be picked in mid-August before it ripens and placed in cool storage.



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Summercrisp pears have good resistance to fire blight, ripen early and store for six weeks in refrigeration. Flesh is crisp, juicy and has a mild flavor, but browns internally when allowed to ripen before storage.

dieback issues on the new shoots, but they do grow back. "We've had no fire blight strikes on this one," he said.

—A **David** pear tree shows good form, has spreading and well-angled branches. It also shows some resistance to blister mite.

—**Krylov** produces a vigorous and healthy tree with fair form. It shows no cold damage. No pear decline has been evident and it shows signs of blister mite resistance.

—Two of his own local varieties also show promise: **Hill** and **Walden Large**. They both exhibit excessive vigor with upright growth and form, making them hard to manage. They are moderately susceptible to blister mites.

Having reviewed Parlo's list of varieties, Joseph Postman, curator of USDA's National Clonal Germplasm Repository Collection in Corvallis, Oregon, agreed about the varieties' astringency. "But a number of these could make some good rootstocks," he said. ●

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Persistent conditions

Pear industry continuing to push for more pear conditioning.

by Ross Courtney

Conditioning pears is nothing new, but industry officials are still asking shippers and retailers to do more of it.

"It's been an ongoing process," said Kevin Moffitt, president and CEO of Pear Bureau Northwest, which promotes fresh pears from Washington and Oregon under a federal marketing order and the brand USA Pears.

For 15 years or so, the Pear Bureau has encouraged both retailers and packing houses to build controlled atmosphere rooms in which to condition pears, kick-starting their natural ripening process with ethylene gas treatments.

The theory is that shoppers will buy more pears if the fruit is closer to ripeness at the time of purchase. And it's true: In 2012, conditioned pears sold nearly 20 percent better than unconditioned pears in a study by the Pear Bureau and Nielsen Perishables.

"If people understand you have ripe pears or ripe fruit, you're going to distinguish yourself from your competition," Moffitt said.

Chalk it up to the obvious. Impatient shoppers don't want to either wait for their fruit to ripen or help it by, say, placing it in a bowl next to a banana. (Bananas release a lot of ethylene that will hasten ripening of any other nearby fruit.) A total of 71 percent of pear shoppers eat their fruit within three days of purchase, according to Pear Bureau statistics.



PHOTOS BY ROSS COURTNEY/GOOD FRUIT GROWER

Above, the pear on the left — note the blush hue — has been ethylene treated. The pear on the right is untreated. In the photo at right, ethylene treated pears are shown inside a controlled atmosphere room at Blue Star Growers in Cashmere, Washington. Though the process is nothing new, industry officials still urge both shippers and retailers to condition pears so they are riper when a shopper picks one up. The device in the foreground emits the ethylene gas that permeates the vented boxes.



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PHOTOS BY ROSS COURTNEY/GOOD FRUIT GROWER

Blue Star Growers has four controlled atmosphere rooms, each large enough to condition two tractor-trailer loads at once. Josh Dailey, assistant shipping manager, closes the doors.

"If people understand you have ripe pears or ripe fruit, you're going to distinguish yourself from your competition."

— Kevin Moffitt

"Today's consumer doesn't want to work that hard," said Kathy Means, vice president of industry relations for the Produce Marketing Association based in Newark, Delaware.

Asking shoppers to wait two weeks after purchase before eating? "It's the stupidest thing you've ever seen in your life," said Roger Pepperl, vice president of marketing for Stemilt Growers in Wenatchee, Washington, which conditions some of its pears.

Conditioning is getting more prevalent. Nationwide, 47 retailers offer treated pears, up from 35 five years ago. But only about 35 percent to 40 of green d'Anjou pears receive ethylene treatments before they reach store shelves and even less of other varieties — 15 to 20 percent of Bartletts and only 5 percent of Bosc, said Moffitt, who hopes the food service industry adds red d'Anjous to the list next.

D'Anjous, both red and green, are the easiest variety to treat. After an ethylene treatment, their ripening slows again in cold storage. Bartletts, on the other hand, continue to ripen after conditioning and need to be sold within two weeks or so, but they are extremely firm right after harvest, so most Bartlett conditioning happens early in the season. Other varieties simply ripen better on their own or don't respond as well to ethylene.

The Pear Bureau publishes a manual for conditioning of different varieties and contracts with a consultant to

help both shippers and retailers start a condition program or fine-tune one already in place.

Part of the reluctance is deciding whether the retailer or the shipper bears the responsibility for conditioning.

Many shippers would rather retailers handle it, preferring folks further down the line risk damaging ripe fruit by shipping it to their stores. Meanwhile, ethylene chambers with generators, vented boxes and forced air temperature control require a sizeable capital investment and space.

Of the 54 Northwest pear shippers, 32 have conditioning capability, according to Pear Bureau Northwest's roster.

"You also need to have a significant enough volume to justify the expenditure," said Dan Kenoyer, general manager for Blue Star Growers in Cashmere, Washington. However, the service adds value. Blue Star custom conditions for many of its buyers and charges a premium for conditioned fruit, Kenoyer said.

In the past, many packing companies like Blue Star relied on roaming ethylene trailers. The company built four conditioning rooms in 2005. The chambers, each with a bright yellow door and resembling a fire station bay, each can hold two tractor-trailer loads full of pears. Inside each chamber is an ethylene generator the size of an office printer and probes that track the internal temperature of the fruit.



Blue Star Growers marks all ethylene conditioned pears in cold storage with a "TR" for treated.

To condition pears, shippers warm the fruit to roughly 65 degrees, gas for roughly 24 hours and then cool to 32 degrees or so. The process takes three to four days.

However, the fruit still is not ready to eat. It has another three or four days to ripen, allowing time for shipment. The ethylene treatment "is like we kick-start the process to a certain point," said Josh Dailey, assistant shipping manager for Blue Star.

Retailers routinely condition bananas in ethylene chambers in their distribution centers, but not as often for pears, avocados, mangoes and tomatoes. They often don't have the space and prefer to use their limited

capacity for bananas. Some also fear it will increase their shrink due to pears going bad before purchase.

Only five — Raley's, Thrifty Foods, United Supermarkets, Wal-Mart and Wegmans — treat pears in their own facilities, according to a roster from the Northwest Pear Bureau.

Wal-Mart was one of the first, said Gary Campisi, senior director of quality control for Wal-Mart's fresh grocery division.

The retail giant started conditioning bananas in 1993 as soon as it began building its own distributions centers. The company started with pears around 2000 to prep the fruit for in-store samples and customers loved it.

"It doesn't take a whole lot of leap of logic to figure that one out," he said.

Today, Wal-Mart conditions Bartletts and d'Anjous in all 44 of its distribution centers, using the same 600 ethylene rooms as bananas, Campisi said. They do not condition Bosc pears because they don't sell as many, and customers have a wider variety of preference for the ripeness level of Bosc pears than d'Anjous and Bartletts.

Wal-Mart also buys pears conditioned by the shipper but will run them through the chambers again if the pressure of the fruit is above 12 psi.

"My personal opinion is the retailer who is closer to the customer" bears the responsibility for conditioning, Campisi said, arguing he would rather control the quality of his customer's eating experience than someone else.

"If you're focused on sales, on top line sales, then you are going to want to have a good ripening program," he said. "Not just the one-time sale but the repeat sale." ●

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Grab and go

Fresh pear industry pushes for stand-up “pouch” bags for consumer convenience

by Ross Courtney

Pear marketing officials are encouraging more shippers to consider packing in “pouch” style bags that stand up straight on store shelves, allow for logos and feature handles for quick-grab shoppers.

“Pouch bags have been gaining momentum,” said Kevin Moffitt, president of Pear Bureau Northwest, which markets fresh pears from Washington and Oregon under the brand USA Pears.

Moffitt has been singing the praises of the pouch bags, which range in sizes up to 5 pounds, something already used by other commodity groups, at industry meetings the past year.

Retailers have been asking for them, too, said Moffitt. Wal-Mart started pushing the pouch bags about two years ago, while stores long have had good luck selling apples and table grapes in pouch

bags, sometimes called gusset bags.

Ed Weathers, vice president of sales for Duckwall Fruit in Hood River, Oregon, noticed the same retailer demand.

“They understand it because other commodities are using it as well,” he said.

This year, Duckwall Fruit plans to pack 2-pound gusset bags. The company does not plan to upgrade any equipment to accommodate the new packaging, but Weathers was unsure if it would change labor needs. “It’s an unknown for us,” Weathers said.

Though less common in pears, bags work well in the produce industry because they offer a “canvas,” said Kathy Means, vice president of industry relations for the Produce Marketing Association. On them, marketers can print logos, recipes, instructions for ripening and nutritional facts. “This is a tried and true marketing option,” Means said.

Also, retailers sometimes don’t like small pears next to big pears in bulk displays, Moffitt said. The pouch bags offer the opportunity to sell smaller fruit.

“It’s a way for us to merchandise small pears,” Steve Smith, general manager for Yakima Fresh, a sales company in Yakima, Washington.

How many Northwest packers already use pouch bags is unclear, Moffitt said. About 10 sales companies represent 90 percent of the Northwest volume shipped each year, and a majority of those sales teams promote the bags with clients.

Of the 54 pear shippers on the bureau’s roster, 43 offer some form of bagged pears, but many are sold in 5-pound sacks that lay down, much like a bag of onions or potatoes.

Moffitt called the pouch sacks a “better, clean, more upscale look.” ●

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The big push for a dwarfing rootstock



Amelanchier rootstock continues to exceed expectations, while cold-hardy quince candidates have been narrowed to 14 accessions.

by Dave Weinstock



Todd Einhorn

Optimal performance of pears on trellises will continue to be elusive without a full dwarfing rootstock. Existing varieties can cut tree size by 30 percent, but to deliver the kind of light penetration necessary for successful production on a trellis, tree size needs to be reduced by an additional 20 percent.

European growers and southern U.S. growers get all the dwarfing they need from quince rootstock. Unfortunately, quince lacks the cold-hardiness necessary to withstand Pacific Northwest winters, to say nothing of those of the Northeast.

There are two rootstock prospects undergoing late-stage testing that continue to outperform the rootstocks colder-climate growers are forced to use. Developed in Germany, Amelanchier continues to do well in field trials in Oregon, and a quince rootstock research project is poised to enter a North American testing phase.

Amelanchier

Amelanchier trials in Oregon continue to show the rootstock's superiority to Old Home by Farmingdale 87, significantly outdistancing the industry standard's near-barren limbs with good fruit and flower production.

A superior dwarfing rootstock, Amelanchier should shed more light on pears in trellises, especially in lower canopies, which is an ongoing problem with OHxF.87. (See "Let there be light" on Page 16.) It tests hardy to minus 40 degrees Fahrenheit, and, though there is still a ways to go, its precocity promises heavier production for the life of the tree.

The plant is a genus of the Rosaceae family, consisting of about 25 species of deciduous shrubs and small trees, many of which are native to North America. Its bark is smooth, gray or, less commonly, brown. It has a five-petaled white flower and produces red to purple edible fruit.

"Grafted with Anjou scions, (Amelanchier) yielded 20 to 30 bins per acre in its third and fourth leaf, while OHxF.87 had few flowers and no fruit."

—Todd Einhorn

There are 32 Amelanchier ornamental cultivars and 25 Amelanchier cultivars grown for fruit.

According to documents filed by the University of Saskatchewan Plant Science Department with the International Cultivar Registration Authority, the word "Amelanchier" is derived from a French word meaning "small apple." The plant has an uncommonly large list of common names with some interesting folklore attached to them. (See "By any other name" on opposite page.)

Early returns

Michael Neumüller, a horticulture researcher at the Bavarian Fruit Center in Hallbergmoos, Germany, has developed inter-specific and intra-specific Amelanchier hybrids. His goal was to produce a cold-hardy rootstock for pears, which he succeeded in doing.

"He produced an extraordinarily cold-hardy plant, hardy to minus 40 degrees Celsius in midwinter, which showed relatively little damage at that temperature," said Todd Einhorn, a Michigan State University horticulture associate professor. (Minus 40 degrees Celsius happens to be equal to minus 40 degrees Fahrenheit.)

In trials Einhorn conducted at Oregon State University prior to his moving to MSU in August, the rootstock was



A telling comparison: A fourth-leaf d'Anjou on Amelanchier rootstock bearing fruit (left) easily outproduced the barren fourth-leaf d'Anjou on OHxF.87 on the right.

PHOTO BY TODD EINHORN

By any other name...

Amelanchier is one of those plants blessed with a lot of common names. Plant registry databases and academic literature are peppered with references to them and the attached folklore.

The common name boasting the best traditions is the serviceberry. There are at least three fanciful stories about the root of that moniker.

One says early American settlers often didn't bury the dead until the weather warmed and the ground thawed. Travel was easier, too, so memorial services were delayed until the serviceberry bloomed.

Another version is also related to winter travel. It says serviceberry blooms at the same time Appalachian roads became passable enough for circuit preachers in the region to travel to remote communities to lead church services.

A third bit of folklore claims its name is a corrupted form of sarvisberry, the name Romans gave to the European mountain ash. Apparently, early American settlers thought the plant's berries resembled sarvisberries.

Also named juneberry, it earned that label because its fruit ripens in June. Saskatoon, the largest city in Saskatchewan, is named for the Cree word for the Canadian variety of the plant.

It is also known as shadbush, so named because it blooms about the same time a fish species called shad runs in northeastern U.S. rivers.

Whatever it is called, an Amelanchier, by any other name, is still an Amelanchier. —*D. Weinstock*



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GOOD FRUIT GROWER

The essential resource

Let there be light

When the industry standard rootstock isn't dwarfing enough, light penetration to lower canopies becomes a problem. That's one of the big reasons why growers are not rushing to put up 50-acre blocks of pears on Y-trellises.

And yet, *Good Fruit Grower* found two hardy souls giving the system a try. Despite setbacks, both are still evaluating its possibilities and both agreed rootstock was a significant obstacle to the venture.

Two Washington pear growers try to bring light to lower canopies with trees on Y-trellises.

by Dave Weinstock

The pear industry standard, Old Home by Farmingdale 87, is the most precocious commercial pear rootstock available, but it is not dwarfing enough.

Aaron Clark, vice president of Price Cold Storage in Yakima, Washington, planted a block of Taylor's Gold pears on a Y-trellis 10 years ago. After five years, with "no more than a cardboard box of them" to show for his efforts, he cut them down and top-worked them to Golden Russet Bosc.

In the block's third year, he harvested 30 tons per acre and thought he was on to something. "I thought the heavens had opened and I dreamed I could yield 40 tons an acre consistently," he said. "Turns out, I can't, or at least I haven't so far."

He tried replicating his early success with a 3-by-11 foot organic block of Bosc, planting 1,300 trees per acre, using OHxF.87 and 97 rootstocks. Success hasn't come, and one of the problems he cited was light penetration.

With 2-foot open tops, his trees bloomed but didn't set as well as he would have liked, especially in the lower parts of the tree. He opened his tops to 4 to 5 feet, which he said gave him his best results, but his yields still fell short of his 40-ton goal.

Currently, his orchard is averaging 25 tons per acre, maxing out at 35 tons per acre, and his mature blocks are making just the average.

Clark is unhappy with his rootstock choices. "Since we don't have consistently productive rootstock for pears, we've been trying to build more budwood," he said. "I'm not sure that is a long-term answer."

Consumer desire for new varieties is huge, he said. "But with no rootstock, we're stuck. So we grow the same pears my grandfather grew."

Don Gibson, CEO of Mount Adams Orchards of White Salmon, Washington, put up a 14-acre block of Y-trellised pears, hoping to get into production faster. He achieved his goal, getting to the levels he wanted in five years.

What makes him unhappy are the system's costs, some of which are related to vigor. Like Clark, he has experienced problems maintaining light interception to the bottom of the trees.

Training costs are another concern. "We were spending more time on training in the first years," he said. "It also took multiple wires to tie limbs into position because limbs can have weaker calipers."

Then, too, denser trees bring on higher fire blight risk. "If you get it, it would spread quickly," Gibson said.

His bottom line: "We don't have a good, dwarfing rootstock conducive to a trellis." ●



Don Gibson

precocious in the second leaf. "It was incomparable to OHxF.87. Grafted with Anjou scions, it yielded 20 to 30 bins per acre in its third and fourth leaf, while OHxF.87 had few flowers and no fruit," he said.

For plantings done with no interstems, Einhorn described its dwarfing as extraordinary. "On Anjou, it exhibited the degree of dwarfing within the range of what you'd expect to see on M.9 and M.27 apple rootstock," he said.

Einhorn also saw 50 to 60 flower clusters per tree in the second and third leaves. "In the fourth and fifth leaf, we saw up to 200 flower clusters per tree," he said.

Quince trials

For the past several years, Einhorn also has investigated the use of quince as a rootstock in northern climates, looking for many of the same rootstock qualities Neumüller discovered in Amelanchier. Used extensively in Europe and in warmer climates in North America, quince isn't hardy enough to survive locations where temperatures drop below zero and snow cover persists through the winter.

Good Fruit Grower has been tracking the progress of Einhorn's quince rootstock trials. (See "Quince evaluated for hardiness," *Good Fruit Grower*, September 2011). His work began in 2009 when he and Joseph Postman, the curator of the U.S. Department of Agriculture's National Clonal Germplasm Repository Collection in Corvallis, Oregon, evaluated a subset of the quince collection for cold-hardiness, selecting 60 varieties for initial review.

From that group, 22 varieties were as hardy or harder than OHxF varieties. Along the way, they sent a portion of them to Richard Bell at the Appalachian Fruit Research Station in Kearneysville, West Virginia, to determine fire blight sensitivity.

Over the next five years, they winnowed the candidate list down to 14 accessions, always comparing candidate performance to that of OHxF.87. Einhorn will begin testing these trees with and without Comice interstems and putting Bartlett and Bosc buds on top. This trial begins in 2017. In 2018 and 2019, he will expand the trial to four states and one Canadian province: Michigan, Pennsylvania, New York, Washington and Nova Scotia.

He also plans to continue as chair of the pear rootstock committee of USDA's NC-140 project, a multistate project aimed at boosting peach, cherry, pear and apple production through improved rootstocks.

Cornell trials

Before Terence Robinson, a Cornell University tree fruit physiologist, left for a three-year sabbatical, he set up a combined pear rootstock and training system trial at the New York Agricultural Experiment Station. He also hired two postdoctoral research associates to oversee them in his absence.

Now into their fourth leaf, the trees are starting to fill out with few differences in growth due to spacing, one of the research associates, Jaume Lordan, reported during the International Fruit Tree Association study tour in New York state. He cautioned that the study was still in its early stage.

Robinson planted the fruit in three tree spacings: 3 feet between trees and 12 feet between rows at 1,210 trees per acre, 4.5-by-12 feet at 807 trees per acre and 6-by-12 feet at 605 trees per acre.

The three training systems they are evaluating are the tall spindle, V-trellis and biaxis. They are also evaluating three rootstocks within these systems — OHxF.69, 87 and Pyro 2-33 — and chose Bosc scions because of their cold hardiness and propensity for being sold as fresh fruit.

At this point, trees on a biaxis are smaller than the others because they spread their tree vigor over two axes. The smallest rootstock is the Pyro 2-33.

The greatest yields occurred on OHxF.69, followed by OHxF.87 and Pyro 2-33 "As expected, yield per acre was highest on the 3-foot spacing and lowest on the 6-foot spacing," Lordan said.

Highest yields were observed on tall spindle, followed by V-trellis and biaxis. ●

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Prey's way

Central Washington pear grower innovates, adapts.

by Ross Courtney

Rudy Prey of Leavenworth, Washington, does things with his pear trees that not all, or even most growers, do.

He ties the top branches together to pull them into an archway to maximize light exposure. He plants them close together to create high density block and starts cropping them two or three years earlier than most normally would.

"He's wholeheartedly taken on the high density, which is difficult everywhere on earth," said Tim Smith,

the semi-retired Washington State University extension educator for Chelan County.

Prey carves his blocks from the side of a steep hill and protects them from wildfire by clearing the undergrowth of his wooded property that abuts the Wenatchee National Forest. The chore helps keep his 12 full-time employees busy all year.

He even has to shoo away a few bears occasionally, though when they visit, they usually snack on his fruit at night and are long gone by the time his workers arrive.



ROSS COURTNEY/GOOD FRUIT GROWER

Rudy Prey bucks the trend among pear growers by training his fruit trees to form arched canopies between rows, as he shows in his Leavenworth, Washington, orchard in June.

"He's adapted to his circumstances," Smith said.

Prey borrowed many of his ideas from the apple industry and applied them to pears, which, unlike apples, lack the true dwarfing rootstocks that allow growers to keep orchards compact. Researchers are trying to develop such rootstocks with little luck so far.

Prey didn't want to wait. "I've been doing this for 30 years, and that hasn't happened yet. I doubt it will in my lifetime," said Prey, 51. "These are the rootstocks we have, and I just make them work."

He and his father first planted in 1975 with 20-by-10-foot spacing, which raised a few eyebrows among their neighbors used to 20-by-20 or 24-by-24. With each new block, they tightened more and more, getting earlier production and higher yields. His father went as tight as 14-by-6.

Prey continued the trend when he took over management in 1996, maxing out at 14-by-1.5 feet, about 2,000 trees per acre. Since then, he has settled on 14-by-2 or 14-by-2.5 because he noticed little improvement any tighter than that. The steep topography of the Wenatchee



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PHOTOS BY ROSS COURTNEY/GOOD FRUIT GROWER

High above Washington's Wenatchee River Valley in the Cascade foothills, Prey must contend with heavy snows in the winter and forest fire threats in the summer. Firewising — clearing underbrush to reduce wildfire risk — on his property adjacent to the blocks is a never-ending chore and keeps his 12 full-time employees busy all year.

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A Red d'Anjou pear ripens in a make-shift fruiting wall created by Prey's training system that will eventually lend itself to mechanization, he said. At left, Prey uses only twine to stretch his pear canopies into an archway to maximize sun exposure. He gave up on trellises a few years ago, reasoning that pear trees have strong enough roots to stand on their own.

River Valley between Leavenworth and Cashmere, where roughly 85 percent of the Wenatchee district's pears are grown, prevents him from narrowing his rows any more.

Planting trees close together forces them to compete for nutrients, water and sunlight, holding back vigor and prompting more fruit. To even out sun exposure to the entire tree, he trains limbs by tying the tops together, creating a shaded archway over each alley.

"Any sunlight that hits the ground is wasted sunlight," he said.

The leaders wind up being about the same angle as his orchard ladders come harvest time. They might even lend themselves to platforms or other mechanical equipment if he chooses to try it. He's hoping for a platform

with tracks, again because his hills might be too steep for conventional wheels.

He tried trellising in the past but abandoned it. Pear trees have deep and strong enough roots on their own, especially in his clumpy soil. One tree gets pulled left, the other right. He tried planting at angles but snow crushed his baby trees. At 1,700 feet in the Cascades, Leavenworth averages 22 inches a year.

"We do a lot of things up here differently because of snow," he said.

He ran a test not too long ago, pruning his new orchard systems twice as fast as his traditional trees, some 50 years old. He estimates his newer blocks cut his costs by \$50 per bin.

Most of his employees live year-round at the farm, though he does hire some seasonal harvesters.

He grows only pears on his 75-acre orchard now, two-thirds of them organic, and delivers to Peshastin Hi-Up, a few miles down the valley. He's removed all his apples, which thrive on the flatlands of the Columbia Basin where pears can't.

He's happy with his conversions and innovation, discussing them openly at winter workshops. But he warned other growers to think hard before they try it.

"High density is not for everybody," he said. Growers must commit to many changes in habits and equipment and be willing to do it over a large area to see any results. "You got to have a different mindset," he said. ●

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Swapping wheat

The dry, rolling wheat fields in north-central Oregon have a new neighbor: a vineyard of Pinot Noir grapes that will be planted to 400 acres in the coming years.

The crop isn't a departure for the people who've launched this venture. James Martin and his wife, Molli, represented the fifth generation when they took over her family's cherry orchards outside Hood River, Oregon. Over time, they gradually sold the orchards, the last one in 2006, to pursue dreams of entering the wine business. They started the Quenett wine label in 2003 and patented wine-by-the-glass technology sold under the brand name Copa di Vino. Today, they are among the largest wine producers in Oregon, bottling just shy of 126,000 cases annually out of their Sunshine Mill Winery in The Dalles, Oregon.

Now, they're converting wheat fields south of town into Pinot Noir. The Sunshine Estate Vineyards sit in an area with high summer temperatures — their particular spot is averaging about 3,200 degree days a year — and irrigation water comes from deep wells. The wind blows hard, but the Walla Walla loam shows potential for wine grapes. Already, 100 acres have been planted on their own roots, not grafted as is often the case with this variety, with plans to plant the other 300 acres within the next few years.

"We bought this land from a longtime wheat farmer who had a vision of wanting to do a vineyard, and we took that vision on for him," Martin said, adding that the combination of higher degree days and heat, along with aspects of the soil and expressions of the self-rooted clones, could prove interesting. "We expect different elements than you get typically with Oregon Pinot Noir, but we think when it's combined together it's going to be special and unique."

Mapping the soil

To gain a better understanding of the soil, Martin and viticulturist Mark Roser turned to a soil mapping system, called the Soil Information System, to create a 3-D profile of the physical and chemical characteristics of the soil, including texture, moisture-holding capacity, macro- and micro-nutrient levels and root zone depth, among other things.

Sunshine Estate Vineyards in The Dalles, Oregon, has 100 acres of Pinot Noir (as seen on opposite page) planted on a former wheat farm, with plans to plant 300 more acres in the coming years.

One of the largest wineries in Oregon is planting 400 acres of Pinot Noir in what were wheat fields with the help of some new technologies.

by Shannon Dininny with photos by TJ Mullinax

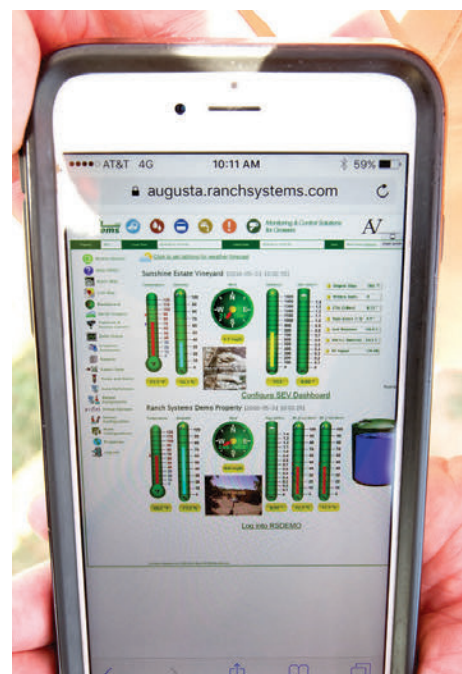


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"We bought this land from a longtime wheat farmer who had a vision of wanting to do a vineyard, and we took that vision on for him."
—James Martin



A misting system installed at Sunshine Estate Vineyards.



A mobile application allows vineyardist Mark Roser to monitor the vineyard's weather and irrigation systems.



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James Martin, owner of Oregon Mountain Estates, and viticulturist Mark Roser at their Sunshine Estate Vineyards in The Dalles, Oregon, which has a magnificent view of Mount Hood.



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Martin tours the company's estate vineyard in late May with Dan Rooney.

Even though the soil itself seems consistent, any changes to the topography can change the soil characteristics, said Dan Rooney of Trimble Agriculture, the owner of the system. "We do a lot of mapping of crops where it's flat, and I can tell you, there's no such thing as a flat field," Rooney told growers at an Oregon State University Extension field day at the vineyard in June. Even a tilt a half-percent or 1 percent in one direction makes "a huge difference over time in terms of organic matter and nutrient buildup, and it changes the soils as a function of that topography."

The models serve as a sort of MRI of the soil, Roser said, and with it they were

able to determine vineyard spacing — 7 feet between rows, 5 feet between vines — irrigation blocks and clone selections.

"Even with soil so uniform, we did find some variations, but we added some different clones based on slope and aspect, thinking we could get some different expressions of the fruit," he said.

So far, five different clones have been planted — clones 113, 459 and 828, Wädenswil UCD 2A and Pommard — on a vertical shoot positioning system. "If you get the right growth spacing, based on your sunlight models, you're getting good shading for the fruit and getting it good protection," Roser said of the trellis choice.

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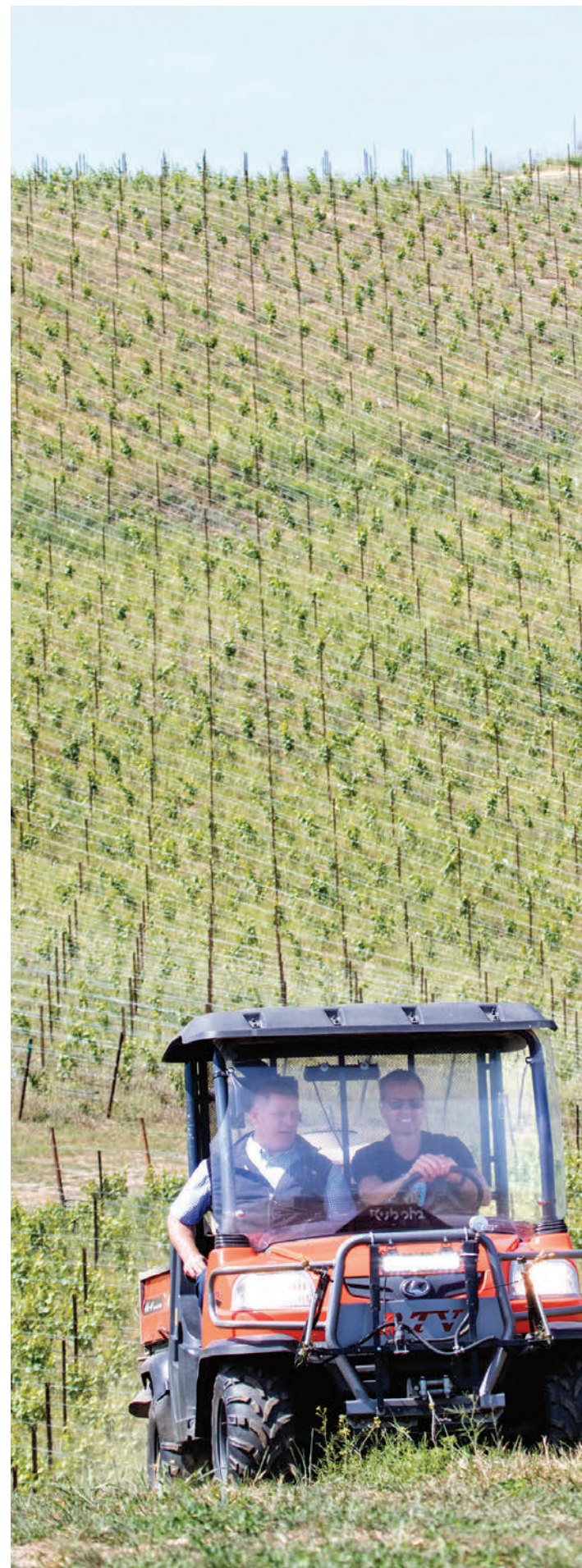
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Last year's harvest came in at 7 tons. "From our first harvest, the wines are all tasting like \$50 to \$70 Pinot," Martin said. At left, Roser assesses post-bloom quality of this season's crop in late May.

"It will take a few years, and a little bit of winemaking to figure this out, to see which ones are giving us what we want," he said.

Testing new methods

Before planting, Martin and Roser elected to rip the soil underground with a wing-tine ripper to establish the root zone, set at a depth of 28 inches. That meant they fought weeds heavily the first year, so a cover crop of sweet peas and Yamhill wheat has been planted between rows for weed control.

The vineyard also makes use of a hydrocooling system, an idea employed in some areas of California. One line affixed to the trellis supplies irrigation water from two wells on the property, as

well as fertigation, while another line supplies water for misting under the same pressure.

Roser, who has worked previously with wineries in California, said he had tried misters there on a couple of projects to help cool fruit on the hottest days. The same tactic can be employed in Oregon, he said, noting that the misters played a huge role last year with the high temperatures.

"I find I can drop the temperature of the vineyard down to the low 50s, and just mirror that coastal influence they get down in California," he said.

Martin agreed. "Last year, it was crazy heat. The crop came on early. We showed no signs of sunburn. We saw really robust berries. No dehydrations," he said.

"Usually young plants are not going to be able to produce fruit of that kind of quality."

Last year, they harvested their first crop, 7 tons. They plan to plant the remaining 300 acres over the next 10 years — roughly 75 percent of it is already staked — which will increase production by another 135,000 cases, Martin said.

It's slow going, after the "last painful two years of trying to get large enough production to cover your overhead," he said. "But from our first harvest, the wines are all tasting like \$50 to \$70 Pinot. It's more extracted, has a darker, richer color. Overall, we think we will have a great addition to the Oregon story of Pinot Noir." ●



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Mechanization is rolling along

Innovative New York growers find success with platforms and more.

by Dave Weinstock

The International Fruit Tree Association's three-day study tour in drought-ridden upstate New York featured plenty of horticultural tips and research updates for the roughly 275 growers who attended. But amid the dust and dry fields, a shiny, bright spot emerged: the power and potential of mechanization.

Several growers shared their own experiences with mechanical pruning, hedging and platform technologies. Here, *Good Fruit Grower* highlights three of these efforts:

The Wafers

Paul Wafler farms 1,100 acres in Wayne County, New York, including 450 acres of apples — producing 400,000 bushels annually — with one-third of their acreage nonbearing.

Paul and brother Walter, president of their Huron Fruit System firm, design and build orchard equipment — something that's been a lifelong obsession for Paul. He tinkered with machines as a youngster and, in his early teens, began fixing lawn mowers. He became so enthralled with machines and how they worked, he filled the family's basement with his projects.

These days, the Wafers build and sell machines that are designed to improve orchard worker efficiency, including a two-row hedger that cuts time spent at the task by half, significantly reducing costs.

The crown jewel of their company is a two-piece package consisting of a self-propelled, mobile platform and an automated bin loader. Paul Wafler said it provides a 30 to 50 percent efficiency boost in clean picks and doubles efficiency in spot picking.

Workers generally fill five bins in about 45 minutes to an hour, depending on picking quality and fruit size, and the farm has eliminated the use of ladders.

The platforms are assembled from pre-cut steel, sent out for painting and returned to be equipped with motors and hydraulics. Finished platforms feature an inclined central track with rollers on both sides, where the bins are situated. Six worker platforms, three on either side at three different heights, extend upward alongside the bin rack, enabling crews to pick fruit, prune, thin or tie trees.

Clif Walters, left, and Clovis Bair work on a Huron Fruit Systems mechanical platform thinning apples at Wafler Farms in Wayne County, New York, in early July.

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PLAY

See the Wafler Farms machine at work during thinning at goodfruit.com/media



TJ MULLINAX/GOOD FRUIT GROWER

Paul Wafler, right, adjusts the speed on a Huron Fruit Systems mechanical platform as crews thin tree rows at Wafler Farms.



Paul Wafler



Walter Wafler

Metal hoops, four on each side, extend just beyond the worker platforms to hold inverted traffic cones. The cones can be used to hold gear during nonharvest tasks or, during harvest, to hold culls and bruised fruit.

“We pay our workers the same rate for quality fruit and culls,” Walter Wafler said. “That way they won’t game the system, putting culls in the quality bins. By not throwing them on the ground, they increase revenue.”

When the cones fill, they are emptied into a single wooden or plastic bin in the middle of the platform. Workers fill the two bins below and above the cull bin with quality fruit.

When the bins are ready to be replaced, a tractor-hitched bin trailer, another Wafler innovation, raises five empty bins off the ground and places them on an elevated trailing rack behind the platform.

The platform rack with the full bins tips downward, allowing those bins to exit to the ground under the storage trailer. The empty bins on the elevated rack then load onto the platform rack and are raised to the pick position.

One bin loader can serve up to four platforms at a time, and platform workers keep picking throughout the bin exchange.

The self-propelled platform can be controlled from seven positions — a control panel located at the rear as well from six posts, three on each side, equipped with toggles for steering and speed adjustments.

A \$3,000 video-monitoring system tracks the platform progress, location, yields and worker performance, allowing for pickers to review their efforts and improve efficiency (See “The tech advantage” on Page 32).

Continued on Page 34



DAVE WEINSTOCK/GOOD FRUIT GROWER

A two-row hedger, designed and built by Paul and Walter Wafler to run down their 7-foot rows between their tall spindle tipped trees, is able to hedge two rows at a time. The machine cuts labor time and costs in half for this task.

Orchard innovators

A number of growers hosting the 2016 IFTA New York Study Tour said that to get the benefits of new machinery, you have to adjust orchard practices.

For example, Wafler Farms' mechanical platforms are designed with their own tall spindle tipped system in mind, with 12-foot poles, set 3 feet in the ground and tipped inward 1.5 feet from the base of the pole.

Trees are planted 3 feet apart, alternating 13 feet and 7 feet between rows, with 1,400 trees per acre. However, they are trained to be narrower at the top — about 18 inches between trees. They also lean into the 13-foot row. The arrangement tightens the space between the trees and the platform and brings the workers closer to the trees.

Just as in any relationship, the closer you are, the better, Paul Wafler said. "The tall spindle tipped system places our workers as close to the trees and the fruit as we can get them. If it's not right in front of them, they can easily reach around the tree to get to it."

Any variety changes occur in the 7-foot rows. The only traffic the narrower rows get is from mowers and sprayers.

Trees are supported on a two-wire system with a vertical stabilizer wire for each tree. A cross-wire to the opposite 7-foot row from posts and from every seventh

tree helps trees and the trellis structure withstand heavy winds or crop loads.

Wafler favors whips over feathers because he believes they provide superior production in years seven through 25. "I know they are susceptible to transplant shock. But in those first three years, they'll grow aggressively and catch up by year five."

They train their trees in an unconventional manner. "We wrap wires to the trees and then wrap trees to the wires," he said.

In a tree's first year, they'll attach and fold a 12-foot stabilizer wire for each tree over the trellis wires, attaching it at the top with two clips to keep it from sliding down. Then they'll wrap the stabilizer wire around the tree loosely, so that it doesn't girdle it, while still providing support.

At year three, when the central leader grows above the first wire and is below the second, they'll wrap it around the stabilizer wire three or four times, to provide the upward structure for it to grow toward the second wire. Secured below the lower wire, with its central



TJ MULLINAX/GOOD FRUIT GROWER

Wafler Farms uses a stabilizer wire on young trees, part of an unconventional training technique. "We wrap wires to the trees and then wrap trees to the wires," explains Paul Wafler.

leader wrapped around the top wire, the tree begins to fix branches.

When pruning, they'll lazy cut three to four branches at their extreme ends. "We'll leave a stub an inch to 3 inches long. We're looking for a 20-branch equivalent per tree, with stubs counting as branches," he said.

If crews can put their hands on a tree and touch four to five branches, there are too many in the zone. "We want to be able to touch no more than three," he said.

Each branch should be singulated: between the trunk and the end of the branch, there should be no forks, Y's or T's. The goal is to hang four to six apples per branch to produce about 100 apples per tree.

From late bloom to early June, workers engage in a task Wafler refers to as "stepping back." His crews cut branches, leaving lower branches longer and narrowing the tree upward to create a 3-foot width at the bottom and an 18-inch width at the top.

The result is fruit readily visible on the trees throughout the orchard, and with the trees cut and trained as they are, workers can reach all the way around the rows for all tasks, including harvest.

The Wafers measure productivity not only on bins per acre, but also on acres covered. "What we want is for our crews to be able to flow through our orchards, covering as many acres as possible," Paul Wafler said.

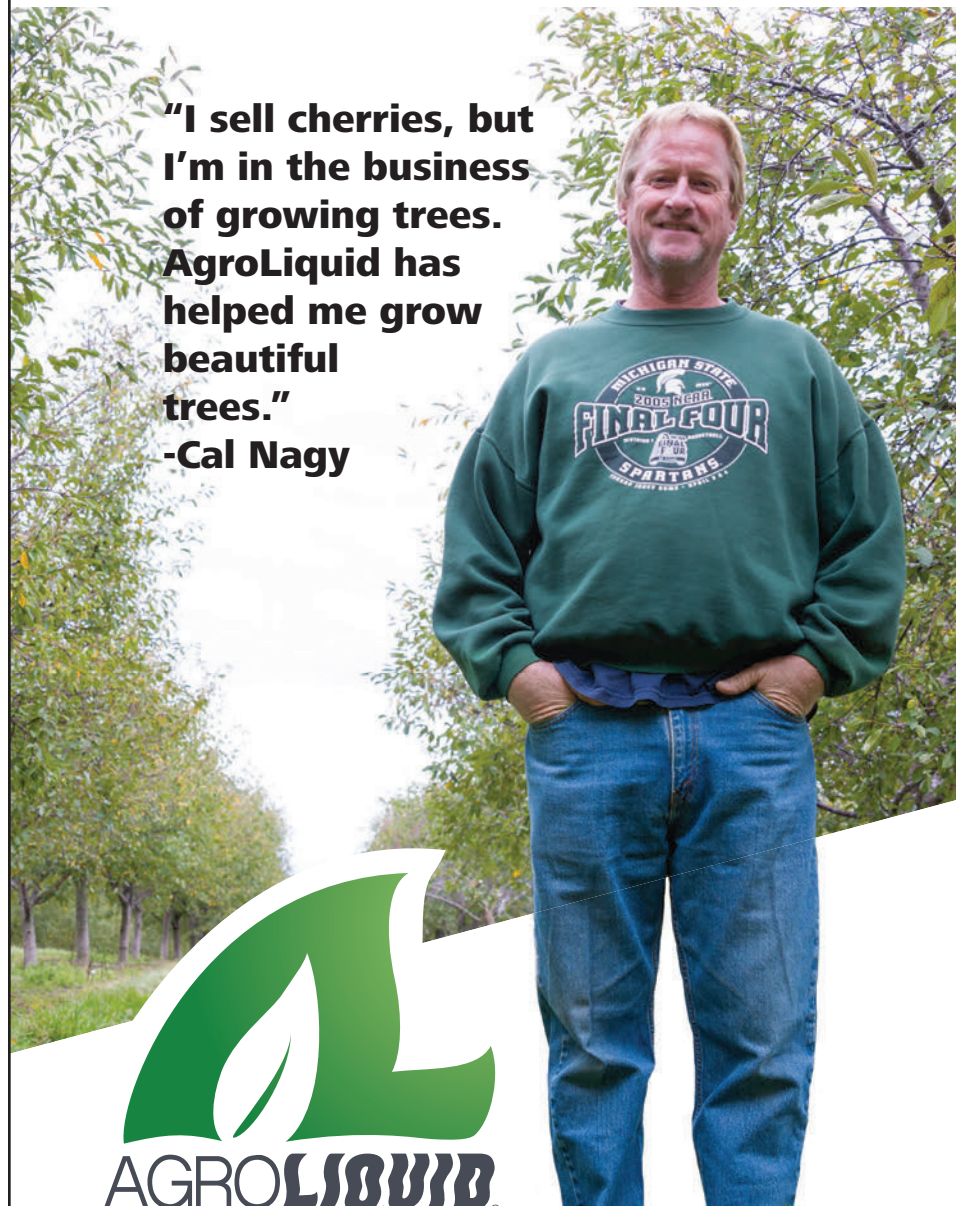
They can do that because they don't always clean pick their apples. "We'll come back to the same block and pick it several times before we're done," he said. "We spot pick almost 100 percent of our blocks now — not because we need to, but because we can." —D. Weinstock

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The tech advantage

Digital add-on uses a combination of GPS and video data to track performance of man and machine.

by Dave Weinstock



Rick Howitt

Wafler Farms wanted to do more than just mechanize tasks on the farm. Paul Wafler also wanted to be able to monitor the progress and location of the farm's own Huron Fruit Systems platform in the orchard, as well as track yields and worker performance.

He wants the orchards running like a production line; wherever there is a problem, he wants to be able to see it and correct it as quickly as possible.

A \$3,000 add-on monitoring system, built to Wafler's specifications by Agrinetix of Henrietta, New York, makes that possible. "It's not a surveillance system as much as it is a tool to improve worker performance and reduce culls and bruised apples," said Rick Howitt, Agrinetix' director of information systems.

For Wafler, it's a system that allows him to both control and track costs. "At any given time, I know where my workers are, what they are doing. It is all about maintaining a flow," he said.

How it works

Cameras mounted on the front and back of the platform and positioned to record activity on the entire platform shoot 20 seconds of video roughly every hour

(the time intervals are configurable). The recorded video is transmitted to USB storage, via power over Ethernet cables, which carry both data and electrical power.

The system's brain is a Raspberry Pi microprocessor, which is about the size of a cigarette pack and costs about \$35. It has one gigabyte of memory, can save data via any size USB thumb drive and uses the Linux operating system. The whole system is housed in a weatherproof box.

Another Wafler modification uses one of the video cameras to take a picture of the bins at unload as a quality control tool. "We added a switch that trips when the bins are full, taking one picture of all five before unloading as a check against quality," Howitt said.

At the end of the day, supervisors deliver the video data on USB drives to the office, where a software program compiles those video snippets into a 6-minute video.

Wafler set up 10 kiosks, one per mobile platform, in the area where workers gather in the mornings and evenings to review the previous day's videos. The video rendering software splits the kiosk television screens into three panels: The left panel shows the front platform view, the right panel shows the rear platform view and a third provides a list of the day's unloads as well as photos of each unload.



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PHOTOS BY TJ MULLINAX/GOOD FRUIT GROWER

Above, Rick Howitt monitors a small computer that records data collected from a Huron Fruit Systems platform during apple thinning, part of a monitoring system that also includes Wi-fi cameras and video monitors, as shown in the two photos at left.

Based on the videos, workers and supervisors determine ways in which individuals or crews might improve their efficiency. In addition, the review also addresses overall pick quality, including the consistency of fruit color and quality.

Extras

What if you were able to determine exactly where the best and worst yields were within any given block or row?

To that end, Howitt's team mounted four load cells — electronic devices that measure weight — to the platform, one on each corner. As weight is added, the metal in the device is stressed. It responds to the stress

by sending out an electrical current that is interpreted by the processor to determine the increase in bin weights.

This data will enable them to create a yield map of an orchard.

Next, Wafler asked if they could determine where each of the platforms was, at any given time, on his farms. That solution was a relatively easy one: They added a GPS system.

It's still a work in progress, with the current challenge being communication. Since Wafler Farms consists of a number of locations over several miles of northwestern New York countryside, they need to devise a means of transmitting that data continuously to the

communication hub. The very low speed at which the mobile platform moves — 7 feet per minute — made accurate GPS tracking difficult. They solved that by adding a computer to work off the wheels, tracking both speed and distance.

Now the Waflers can graph its movement for every minute it is in motion based on computer reports sent to the processor once a second. The downside is that data is stored on the platform with the video data and can't be analyzed until the end of the day.

That's why the Agrinetix technical staff is currently looking at building a wireless network for real-time reporting. ●

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SHANNON DININNY/GOOD FRUIT GROWER

Scott VanDeWalle (right) designed a multirow pruning platform that runs almost every day, except during harvest, for a wide array of orchard tasks, including winter pruning, summer suckering, hand-thinning and tying trees.

Continued from Page 30

VanDeWalle

Another mechanical innovation comes from Scott VanDeWalle of Alton, New York. He designed a multirow pruning platform that runs almost every day, except during harvest, for a wide array of orchard tasks, including winter pruning, summer suckering, hand-thinning and tying trees.

The structure is mounted atop a tractor with an inner platform and two outer platforms hung on metal arms from the center of the machine in a gull-wing arrangement. The outer platforms hold one worker each while the central platform holds one worker on each side, plus a driver in the front. The driver raises, lowers and extends the outer platforms and steers the vehicle with a self-centering joystick.

"We tried using a radar- or sonar-based steering system, but we could never get it to work," VanDeWalle said.

Next to steering, maintaining proper speed is the key to efficient platform use. "Speed has to vary, depending on how heavy the canopies are and whether crews are pruning or thinning," he said. "Proper speed is necessary so the guys aren't standing around looking at each other."

Trees are 10.5 to 11 feet tall. VanDeWalle uses a five-wire system and supports it with 12-foot poles. The lowest wire is 2 feet above ground and the highest is at 9.5 feet.



Scott VanDeWalle

"Speed has to vary, depending on how heavy the canopies are and whether crews are pruning or thinning."

The outer platforms can be raised from 12 to 13 feet above ground level and extended outward 12 feet from the central platform. Central platform workers focus efforts from the second wire to the tops. Those on the outside handle the rest. "Our workers can cut four rows at a time as long as they can reach through," he said.

Woodworth

Another grower using mechanical innovations is Patrick Woodworth of Sandy Knoll Farms near Lyndonville, New York. He began transitioning his old-style, central leader Gala blocks into a tall spindle system

in 2015. The trees are planted on Malling 9 rootstocks with 3.5 feet between trees and 14 feet between rows.

Woodworth is looking for more sunlight interception and greater labor efficiency as he moves to adopt the tall spindle system. "We want to push production closer to the trunk. Our transition sets the stage for mechanical aid in orchard maintenance and harvesting," he said.

To get those improvements, Woodworth uses a mechanical hedger and an automated platform built by J.J. Dagorett's Automated Ag Systems of Moses Lake, Washington. "I can't say enough about how necessary this platform is to our operation," he said.

It's a popular piece of equipment in the region. Dagorett sold the same platform to Rod Farrow of Lamont Farms of Waterport, New York, and two more New York growers are getting the same machine before the Gala and Honeycrisp harvest, said Mario Miranda Sazo, a Cornell Cooperative Extension Service Lake Ontario Fruit Program fruit specialist.

Woodworth's farm previously had 888 trees per acre. That has increased to 1,980 trees per acre in 2-by-11 spacing for new plantings. New plantings also are going in on five- and six-wire systems, compared with the single-wire system in existing blocks, where a pole supports each tree.

Existing tree growth ranges from 12 to 14 feet high, with branches at 20 to 24 inches and bearing fruit within 18 inches of the tops. Ultimately, his trees will be square-shaped; they will "set the box" with a 44-inch width.



TJ MULLINAX/GOOD FRUIT GROWER

Patrick Woodworth shows a 13-foot-tall vertical axis system that took about four to five years grow into a fruiting wall to better accommodate mechanization at Sandy Knoll Farms near Lyndonville, New York. Each tree uses a single piece of steel to help it remain self-supporting, which makes a trellis system unnecessary.

“With that dimension, our workers — who pick from platforms — can get to tree centers without the hindrance of dominant branches,” Woodworth said.

In the first three years, his crews perform dormant pruning to remove dominant branches. He limits renewal cuts to three per tree.



Patrick Woodworth

“Three cuts is a rule of thumb,” Woodworth said. “It’s a stopgap for the pruners, which, if we do it this way consistently, allows us to keep the tree calm and helps to equalize its crop load every year.”

Hedging makes the point of regrowth at the same spot, away from the trunk. “We are limiting the opportunity for the tree to grow out and creating more opportunity for it to fill in empty spaces at our

desired dimension,” he said.

They do the same hand-pruning in the fourth year but follow with mechanical pruning at dormancy, to set the box at 20 to 22 inches from the trunk. New shoots grow the following season and are hedged 22 to 24 inches from the trunk in late summer. ●



TJ MULLINAX/GOOD FRUIT GROWER

Steel angle iron supports for Woodworth’s Sandy Knoll Farm fruiting wall.

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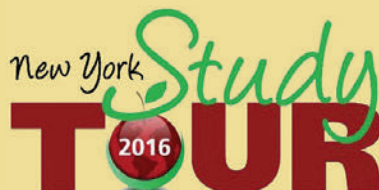
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Several growers who hosted the 2016 IFTA New York Study Tour at their orchards graciously allowed Good Fruit Grower to capture photos and videos of their machines at work several weeks before the tour. Visit our website at goodfruit.com to see more from those stops and stay tuned for more from the tour in future issues.





Blight & bugs

Matt Boucher hand collects bees from blossoms in an orchard infested with fire blight. Boucher is capturing bees and other insects in an effort to

A Cornell University doctoral student seeks to identify which insects transmit fire blight bacteria.

by Dave Weinstock

Matt Boucher, a doctoral student at Cornell University, thinks insect transmission is one way fruit trees contract fire blight. So, he's working to identify which bugs are responsible and, ultimately, to develop preventive management strategies to disrupt the process.

His work is a continuation of research started in the early 1900s, then unaccountably abandoned in the 1930s, prior to World War II. Early researchers believed insects had a passive role in fire blight transmission. They posited a process of disease spread from infected to healthy surfaces by means of bug movement from one to the other.

It's not a long reach, considering the ease with which bees track viral and bacterial disease into their hives. They do so by picking up infected pollen and bringing it home.

However, Boucher said, some research suggests insects might play a more active role: carrying the bacteria inside their guts, incubating it for a period of time, before carrying it to and infecting new hosts, such as fruit trees.

Understanding the pathogen

Boucher's interest stemmed from a conversation with George Sundin, a Michigan State University plant pathologist, about the possible interaction of pathogens in insect guts and hosts. The discussion centered on novel type III

secretion systems (T3SS), which are hollow needlelike structures that bacteria use to transmit disease-causing proteins into hosts.

Plant pathogens can have multiple T3SSes, and they can be active at different times during the disease cycle, Boucher said. For example, one may be active during plant infection, while others are active during insect vectoring.

Fire blight bacteria have three T3SSes. Sundin's group successfully knocked out the one responsible for plant infection, and no fire blight symptoms appeared on fruit. They have hypothesized that the remaining two are active in the insect when it transmits the disease.

So why not just use genetic engineering to disrupt T3SS function, much like an Ohio State University horticulture research group did a few years ago?

There are two reasons, said Boucher. First, the chances of the federal government allowing an altered bacteria to be released into the environment are very low. Secondly, an altered bacteria is a weakened bacteria and would not survive competition in a world populated by unaltered bacteria.

So Boucher is working to identify which insects are transmitting fire blight and, in addition, to determine if the T3SSes are active once the insect is infected. "Do they allow the pathogen to persist in the insect's gut for a longer time? Do they change the insects' behaviors?" he said

"When flies land on the margins of the canker's ooze, they could be picking up bacteria for possible transmission."

—Matt Boucher

Which bug?

Boucher will be capturing insects from yellow sticky cards in a fire blight-infected orchard through September for his research. Each tree has two cards, one in the canopy and the other down on the trunk at knee level. Boucher places the cards on 20 trees, collecting a total of 40 cards each week. Then he takes the cards back to the lab, removes the bugs and grinds them up. "We run DNA tests to see if they are carrying the pathogen," he said.

He's also catching bees on flowers using collection vials. Can fire blight persist in hives? The answer is no. "But we have no information about what's inside their guts," he said.

Anecdotal suspects

Early in his research, Boucher implicated potato leafhopper as a fire blight vector but has not yet confirmed it. Already, he has collected 400 potato



PHOTOS BY HEATHER GRAB/CORNELL UNIVERSITY

find if they are transmitting fire blight bacteria.



The fly sitting on the apple on the right (seen between the two apples) may be there for the sugar produced by the fire blight bacteria. Based on his observations of flies on cankered fruit, Boucher wonders if they're a vector for the disease.

leafhopper samples, with more expected throughout the season.

Leafhoppers are of interest because of their eating style. They are a piercing-sucking insect that uses a stylet to puncture plants and probe around for nutrients within the phloem and the xylem.

They leave a telltale of their passing: toxic saliva associated with something called hopperburn, a browning around the edge of the leaves caused by the insects' siphoning. "It is also caused by the plant's physiological response to hopper feeding," he said.

He also has a number of other suspects for which he has no proof, but based on personal observations they represent possibilities.

Bees have been implicated in past research, and Boucher captured 500 bees during bloom. The majority were honeybees along with one native bee species.

Flies and aphids are other possibilities.

The ooze that comes out of cankers on a fire blight-infected tree is a mixture of plant sap, fire blight bacteria and a sugar produced by the bacteria. Boucher thinks the sugar may be an attractant to flies. In June, when ooze comes out of the fruitlets, Boucher has seen flies land and remain on the ooze for up to a minute. "When flies land on the margins of the canker's ooze, they could be picking up bacteria for possible transmission," he said.

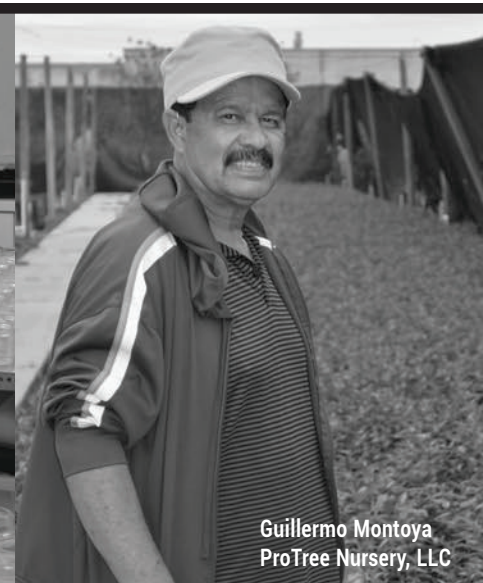
He's caught "lots" of flies on the yellow cards, adding credence to his belief they may be involved, but he hasn't identified the specific culprit yet.

Aphids excrete honeydew, which may contain fire blight, and ants eat the honeydew because it is nutrient-rich. "If the ants carry infected honeydew away, they could inadvertently transport the pathogen along with it," Boucher said.

That said, he thinks this is a less likely scenario, compared to either bee or hopper transmission. But as long as aphids continue to appear on the sticky cards, he'll be testing aphids to see if they are involved. ●



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The clean

Workshops go on-site to warehouses to show workers where those pesky pathogens could be hiding.

by Ross Courtney

Sanitize gloves again after employee breaks if they were set on an unwashed table. Hang tools with bristles down in a closet when not in use. Turn up water pressure high enough to move dirt, but not so high it splashes it around.

More than anything, though, approach all packing facility duties with a mindset of food safety, industry officials and sanitation supervisors say. Don't just clean to mark a box on a checklist. Think like a pathogen.

Ask yourself, "If I was a germ, where would I be hiding," said Laura Grunenfelder, technical issues manager for the Northwest Horticultural Council.

In the era of food safety pressure, the potential for contamination may seem endless, but industry officials and food safety supervisors have just as many tips and ideas for how to combat foodborne illnesses. Washington's tree fruit industry has been staging hands-on workshops inside warehouses to help packers learn best practices to keep pathogens such as *Listeria monocytogenes* (*Listeria*), *Escherichia coli* 0157:H7 (*E. coli*) or salmonella off their apples, cherries and pears.

Listeria is the pathogen of highest concern to the fruit

industry because it's the most serious; as many as 30 percent of *Listeriosis* cases result in death. The bacteria lives and grows in temperatures ranging from freezing to 113 degrees Fahrenheit, at a wide array of pH levels and inside controlled-atmosphere rooms.

The Washington State Tree Fruit Association started the cleaning and sanitation workshops a year ago after a *Listeria* outbreak traced to caramel apples that were packed at Bidart Brothers in Bakersfield, California, killed seven people and hospitalized 34.

"An outbreak like that can cause significant losses for the whole industry," said Jacqui Gordon, director of education and member services for the Tree Fruit Association. If one shipper causes an outbreak, the whole industry gets a black eye. Sales drop for everyone.

In late July, the organization finished its third round of the workshops, which feature both classroom presentations and facility demonstrations in both Spanish and English. Already, they've attracted more than 250 people so far. The association spends about \$800 on each workshop, which costs \$45 per person. More are planned for next year.



Elis Owens, director of Birko Corp. technical services, speaks to workshop attendees during a sanitation workshop offered by the Washington State Tree Fruit Association in Zillah, Washington. Owens recommends packing houses have a team of sanitation workers on each production shift to keep areas free of debris and push away standing water. "Their job during production is just to go out and just pick up stuff off the floor," Owens said. At top, Julian Vasquez sprays chlorine foam as one of the steps operation crews employ to sanitize a cherry processing dump tank.

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Cleaning and sanitizing tips

Not all packing facilities, some of them decades old, were designed with cleaning in mind, but sanitation workshops hosted by the Washington State Tree Fruit Association offer numerous tips warehouse operators can follow to keep their facilities as clean as possible.

People

- Adopt a mindset of actively seeking out contamination.
- Create incentive programs, such as gift cards or pizza parties, for meeting cleanliness standards.
- Give sanitation employees strong, water-resistant flashlights.
- Hire roaming sanitation workers to remove standing water and pick up debris, such as cardboard scraps, during production shifts.

Water and chemicals

- Clean hidden areas and cavities, such as hollow legs or the undersides of surfaces.
- Lift out drain gates to clean both drains and gates more thoroughly.
- Calibrate water pressure to wash dirt but not spread it through excessive splashing.
- Use correct chemical concentrations. More does not always equal more effective.
- Restrict access to cleaning chemicals.
- Apply antimicrobial powders or foams to the floor at entry points.

Machinery

- Sanitize floor-scrubbing machines periodically.
- Clean forklifts periodically. Designate them for certain areas.
- Test rubber flaps often.
- Remove parts, such as belt cutter blade caps, for periodic cleaning.
- Take out wax brush rolls and soak them in cleaner. Use two sets to clean on a rotation.
- Use silicone rubber padding instead of foam.
- Line wooden orchard bins with a plastic bags to use them as soak tanks.
- Consider installing automatic belt cleaners that can be retrofitted to existing lines.

Work spaces

- Place floor mats only in areas for standing, not in transition traffic areas.
- Soak floor mats in solution while cleaning the floors beneath them.
- Remove or replace peeling grip tape from floors and stairs. It can harbor pests, as well as trip people.

Tools

- Designate cleaning tools, such as brushes and brooms, for certain areas. Color code them.
- Store brushes, brooms and mops head down to prevent dripping onto the handle.
- Use “captive” tools and personal protective gear that never leave the facility to prevent cross-contamination.
- Gloves protect surfaces and fruit, not the worker. Wash or replace gloves every time they touch something unrelated to the job, such as handrails or catwalks.
- Use disposable green scrubbers.
- Haul brooms and mops on a tool caddy with castors to prevent them from touching the floor when not in use.
- Whenever possible, clean with ladders and long-handled brushes to avoid climbing on equipment.
- Establish a schedule for disinfecting maintenance tools, such as wrenches and screwdrivers.



Building or upgrading a packing facility? Here are some design tips:

- Locate drains centrally for cleaning access.
- Use continuous smooth belts instead of segmented belts.
- Use stainless steel whenever possible and avoid soft metals, such as aluminum.
- Avoid wood.
- Keep welds smooth for easier cleaning.
- Set up equipment so sanitation workers can reach it with ladders instead of climbing.
- Consider a water treatment system to prevent rust and buildup of soap scum.
- Install good lighting.
- Provide adequate hand-washing facilities.
- Provide access to hot water for cleaning hoses.
- Drain condensation from coolers outdoors, not to the floor of the building.
- Build solid walkways over water or food contact areas to prevent debris from falling.

— R. Courtney

The workshops primarily cover good manufacturing practices in the wake of outbreaks. However, they include brief updates about the Food Safety Modernization Act, or FSMA. The Tree Fruit Association also holds educational events intended to help growers understand and implement FSMA requirements in their orchards, and future workshops specific to FSMA compliance are planned for warehouses.

Collaborators are the Northwest Horticultural Council and the Washington State Tree Fruit Research Commission, as well as the host packing companies.

A major message is that all packers should constantly improve their cleaning and sanitation techniques for the good of the entire industry.

“Food safety should not be a competitive advantage,” said Ines Hanrahan, a project manager for the Washington Tree Free Research Commission during the most recent workshop in Washington’s Yakima Valley.

Still, food safety is a tough conversation. Workshop organizers struggle to find packers willing to host the tours for fear they will be singled out for minor flaws.

“While there are certain things we cannot control, we can certainly improve as people how we react to everything, and we can improve what we do on a daily basis,” Hanrahan said.

Challenges

Not all packing facilities are designed with cleaning in mind.

For example, Elis Owens, director of technical services for Henderson, Colorado, sanitation company Birko, warned during the recent workshop against climbing on top of packing equipment to clean it to avoid contamination from boots that may have just been on an unsanitized floor. However, that may be the only way to reach it.

Meanwhile, older lines often contain exposed electronics, wooden surfaces and hidden nooks and crannies that may be hard to clean. Owens also has found packing line pipes, discarded after a renovation, coated with biofilm, a generic term to denote a sometimes invisible buildup of organic or material dirt that can harbor pathogens. Packers should consider flushing pipes and flumes



Cleaning in tight areas and around parts and mechanisms is a sometimes tricky — but necessary — step.



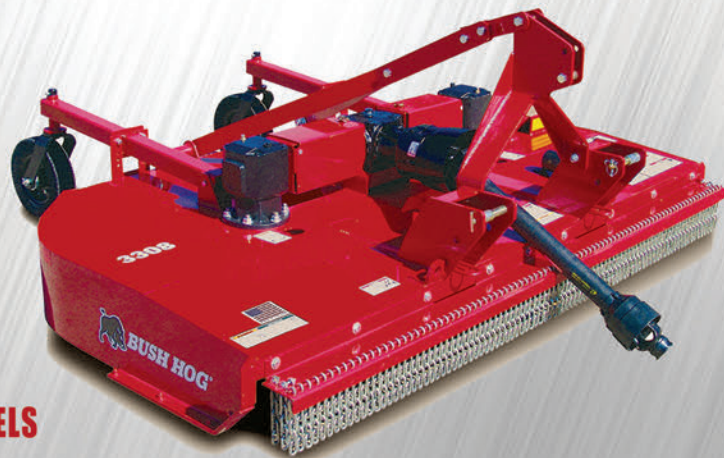
André Harrell evenly coats floor drains with chlorine foam before scrubbing debris off surfaces during the workshop.

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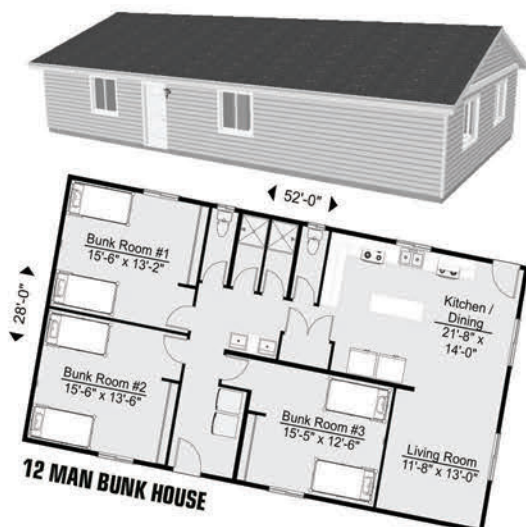
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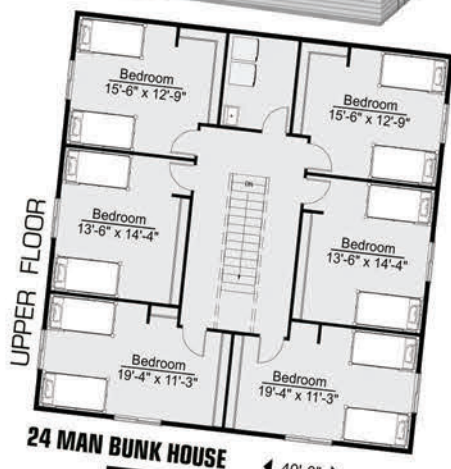
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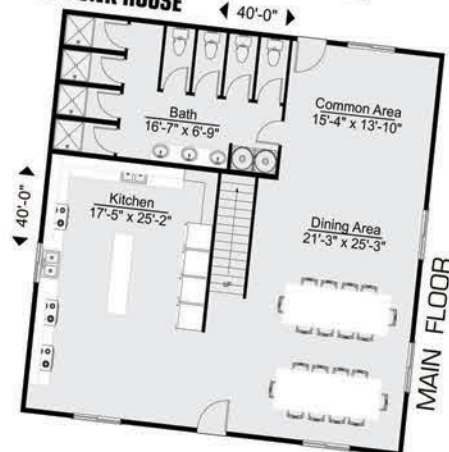
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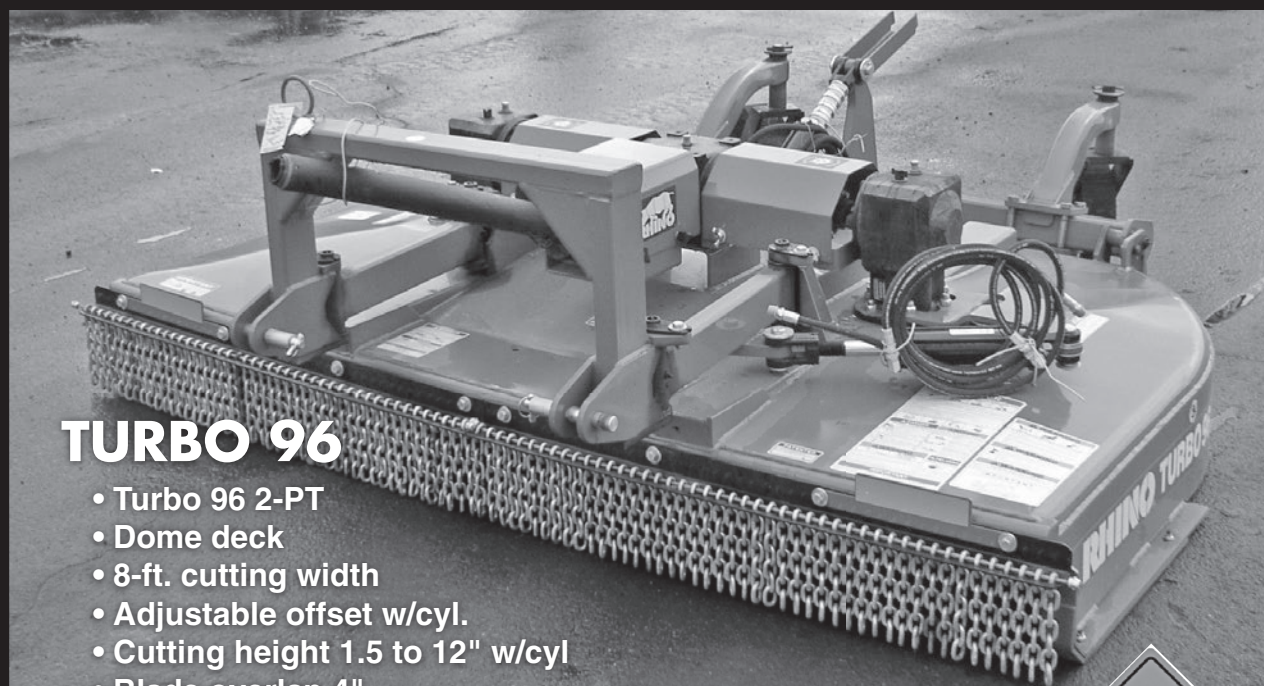
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Another suggestion was placing sanitation workers on each production shift to keep areas free of debris and push away standing water. "Their job during production is just to go out and just pick up stuff off the floor," Owens said.

The workshop featured both classroom presentations from Hanrahan and Owens as well as live demonstrations by sanitation workers inside packing facilities. At each packing house rotation, employees donned nylon protective "banana suits" to spray chlorine foam, scrub with green abrasive sponges and pressure rinse drains, dump tanks, belts, sorters and stem cutters on a cherry line.

One of the bigger lessons from the workshops: Seek dirt and grime in places where it's not easily visible, such as inside hollow table legs.

At Washington Fruit and Produce, workers even clean the tops of ceiling beams, said Jeff Nordstrom, the company's food safety administrator, leading a group during one of the facility rotations. Crews also take apart pieces of equipment to clean inside and around them.

He said food safety managers will have to adjust to the peculiarities of their own lines. For example, his crews rinse debris down into the bottom of the dump tank and hose it out a side hatch. Another facility turns on the elevator belt to bring it up where workers can more easily reach it.

Borton and Sons and other plants teach sanitation workers to swab for Adenosine Triphosphate, usually called ATP tests, which reveal proteins — not actual pathogens — after cleaning but before sanitizing each area. "Sanitizers are not your end-all," said Jeremy Leavitt food safety and compliance manager for Borton and Sons. "It's your insurance policy." The company also tests periodically for specific pathogens — *Listeria* once a week and *E. coli* and salmonella once a month.

Borton and Sons gives incentives for cleanliness standards, another oft-repeated suggestion, granting a \$25 gift card for each week with no positive ATP results, and offers pizza parties for teams that reach longer milestones. ●

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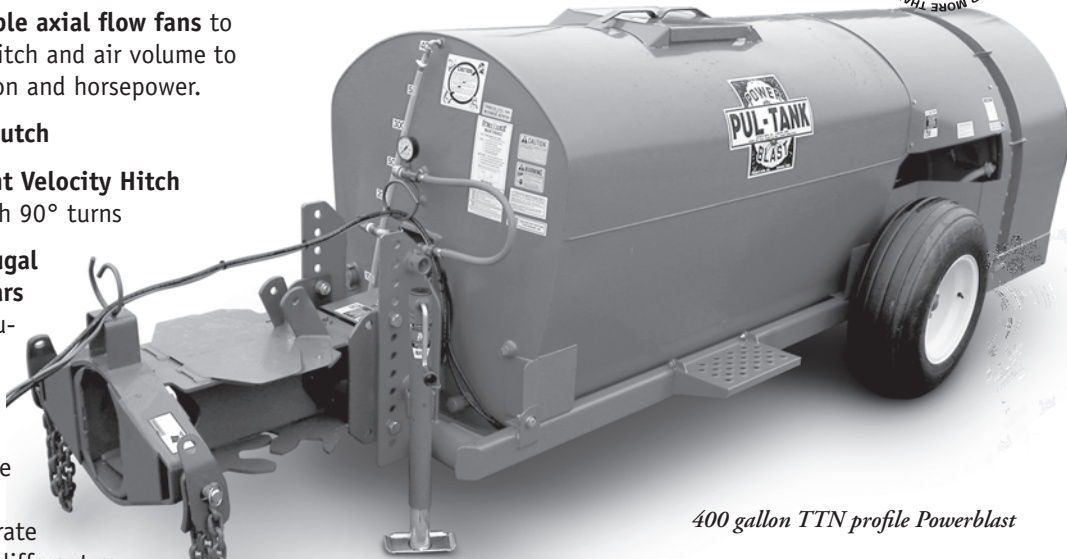
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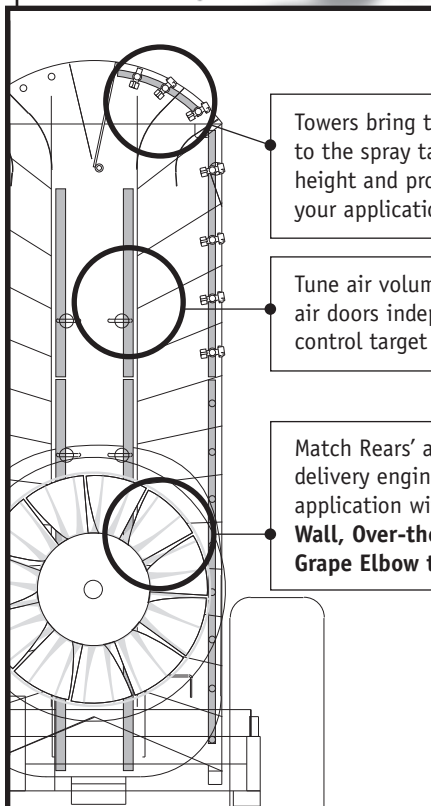
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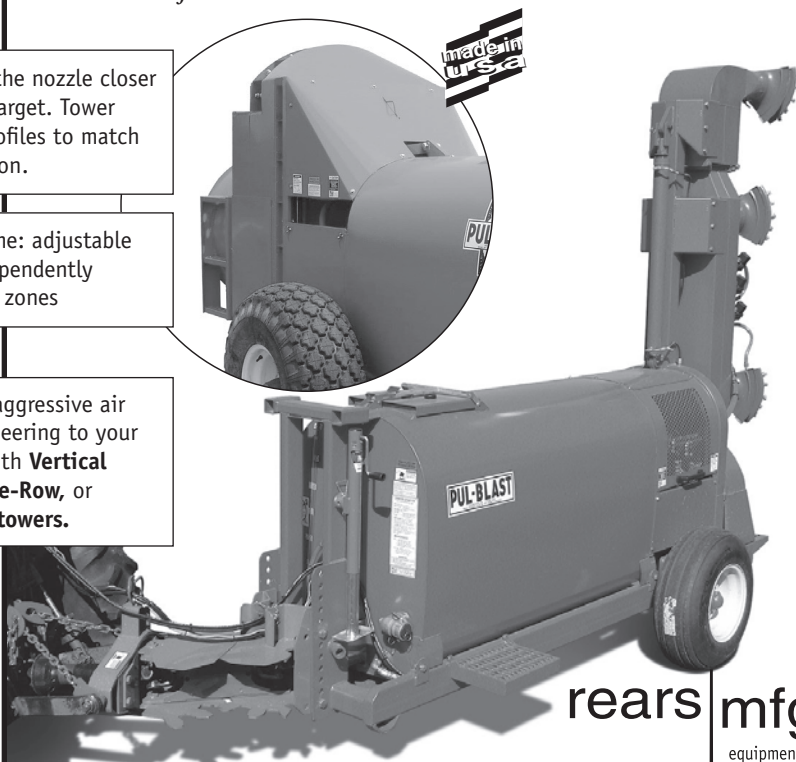
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Aftermath of an outbreak

Researchers share what they learned from 2014 *Listeria* contamination of caramel apples.

by Shannon Dininny

Many in the tree fruit industry have moved on from the 2014 *Listeria monocytogenes* illness outbreak associated with caramel apples. They haven't forgotten it, certainly, but they've turned their focus to other issues.

Even so, the outbreak was the lead session of the Center for Produce Safety's annual conference this summer in Seattle, as researchers shared lessons learned and information gleaned from the case with food safety professionals from across the world.

Seven people died and about 35 were sickened in the outbreak that investigators tied to a specific supplier of Granny Smith and Gala apples in California, marking the first direct tie of fresh whole apples to a serious food safety outbreak.

When such outbreaks occur, the first thought is to the victims, and the second thought is to the products involved, said Bob Whitaker of the Produce Marketing Association, who moderated the session. "Another tragedy is when we fail

to recognize the outbreak for what it is, and what it is basically is a failure in our business operations."

That breakdown in processes that are designed to deliver healthy products to consumers requires that adjustments be made, he said, to minimize the chance an outbreak will happen again. In the case of the outbreak tied to caramel apples, "there are critical lessons to be learned from this."

Here's a rundown of key points:

—Apples weren't previously considered a likely source for *Listeria*, and intact, undamaged apples remain an unlikely cause of listeriosis. However, problem spots remain.

Research has shown that the stem end or calyx area is problematic for cleaning and sanitation, as are deep depressions in the fruit that could harbor bacteria, said Kathleen Glass, associate director of the University of Wisconsin-Madison Food Research Institute. When the stick was inserted into the apple, in this case, it translocated the *Listeria* from the surface of the apple to the interior flesh.

These points provide an explanation

for the *Listeria* in the caramel apple and highlight the potential for another outbreak "unless we look at other intervention strategies," she said.

—The industry can only have a better understanding of the prevalence of *Listeria* in packing houses by adequately monitoring for it. And know that *Listeria* can hang around longer than you think.

Oct. 31 was the last day of operations at the California packing house where the apples in this case were packed. That packer, Bidart Brothers, opened its doors to researchers to help determine the cause of the bacteria, and researchers were able to detect *Listeria* on different surfaces all the way up to the end of March, said Trevor Suslow, extension research specialist for the University of California-Davis.

"*Listeria* was widely distributed and highly persistent, even under dry conditions weeks later," he said.

—Packers must consider the end use of their products.

In the case of the caramel apples, storage temperature was also an issue, with

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the apples stored at room temperature, enabling *Listeria* growth.

"We need to ask the question: What can happen to our product to convert it into food that now poses a high risk for *Listeriosis*?" said, Martin Wiedmann, a food safety professor at Cornell University. "You cannot rely on the consumer. You need to understand what the consumer can do with your product. I challenge all of you in the industry to start to think that way, because I think it's very important."

—*Awareness and training are vital.*

Growers and packing houses can't simply wait for the next outbreak. They must raise awareness, communicate with employees and offer training workshops now to prevent future outbreaks, said Ines Hanrahan, project manager for the Washington Tree Fruit Research Commission.

"You can change human behavior, and if you change that, you have won half the battle," she said.

These efforts require management buy-in, bigger cleaning crews with a motivated crew leader — all of whom love what they're doing and recognize it's not just a job — and more time devoted to cleaning and sanitation with a master schedule, she said. A reward system, monetary or otherwise, such as pizza parties for work crews, can also boost performance.

"It's really about trying to understand what it is we're trying to accomplish, what is personally at stake for them," she said. "If a worker understands how it relates to his family, how an outbreak could affect his family and their health, it makes a difference. And it makes them feel appreciated and like they're not forgotten."

—*Communicate. Communicate. Communicate.*

The 2015 outbreak resulted in lost industry sales of \$15 million, canceled promotional events and a sea change in thinking about export risk, said Mark Powers, executive vice president of the Northwest Horticultural Council.

Seven countries took actions related to the outbreak, and two, Indonesia and Sri Lanka, stopped trade altogether. Many of the actions fell on products that were not a safety concern, largely due to misunderstanding of the facts, Powers said.

Federal regulators, foreign embassy personnel and industry associations need to be on the same page in the event of an outbreak, sharing the same message, he said, to avoid a crisis.

Bidart Brothers shipped its apples months before packers in the Pacific Northwest shipped theirs, Powers said, yet the effects were felt by everyone.

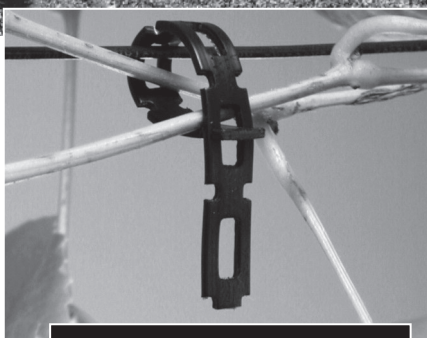
"The product was out of the market. The response was off the charts, out of reality, but it was real, and the concerns were real," Powers said. ●



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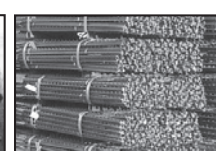
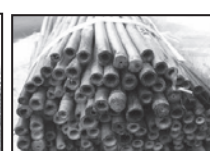
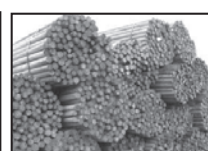
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New tools to determine fruit quality parameters



Ines Hanrahan



Stefan Röder

Several devices and methods to measure fruit quality have been introduced to the market — here's a look at what they do.

by Ines Hanrahan and Stefan Röder, Washington Tree Fruit Research Commission

Growers and packers require accurate information about fruit maturity over the course of a season — on the tree prior to harvest, at receiving in the storage facility and throughout storage — to ensure a year-round supply of high-quality fruit. At the same time, postharvest losses must be minimized to ensure financially sustainable packouts and returns for growers.

Recently, several devices to assist in determining some of the commonly used fruit quality parameters, such as firmness, soluble solids content (SSC), titratable acidity (TA), dry matter content (DMC) and skin color, have been introduced to the market. The Washington Tree Fruit Research Commission (WTFRC), under the leadership of project manager Ines Hanrahan, has tested several such devices. The following summarizes those findings without endorsing any one product over another.



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How they compare

Here's an overview of several devices and methods used to measure fruit quality parameters, including firmness, soluble solids content (SSC), titratable acidity (TA), dry matter content (DMC) and skin color. Find summaries of each method here and on the next page. (Images courtesy of the Washington Tree Fruit Research Commission.)

	DA Meter	Metrohm Titrator	Accuvin Titratable Acidity Test Kit	BSG wine acid test	Atago PAL-BX ACID5	Felix F-750
Parameter	Chlorophyll quantity	Titratable acidity	Titratable acidity	Titratable acidity	Soluble solid content, titratable acidity	Chlorophyll quantity, dry matter content, (soluble solid content)
Price for device (\$)	\$ 3,000	\$ 30,000	-	-	\$ 1,260	\$ 6,950
Price per sample (\$)	-	-	from \$1.82 (\$52 for 20 test/kit) (\$103 for 50 test/kit) (\$182 for 100 test/kit)	\$ 0.25 (\$10 for test kit - approx. 40 tests)	-	-
Time requirement per sample	3 sec.	3 min.	1 min.	3 min.	3 min.	5 sec.
Accuracy	100%	100%	73%	87%	69 - 88%	-
Training	Easy-intermediate	Difficult	Easy	Intermediate	Intermediate	Difficult
Advantages	-Quick calibration -For field use -Easy to use -Hand-held device	-Exact value -High reliability -Auto sampler for high sample throughput	-For field use -Fast & easy to use -No training needed	-Cheap method -Good accuracy	-SSC & TA estimation from the same sample	-Measures up to 3 parameters at the same time -Hand-held device -High future potential
Disadvantages	-Low correlation between DA value and other fruit quality parameter -Difficult to download data with software provided by company	-Acquisition and maintenance cost -Training required -Requires lab conditions	-No exact value -Less accurate	-Not comfortable for field use -Additional tools (electric pipette and glass beaker) are useful when analyzing larger sample set (>15)	-Error susceptibility when making the 1:50 dilution -Low accuracy for TA reading	-Models have to be developed -Many open research questions regarding the specifics for models -Not ready for field application

SOURCE: WASHINGTON TREE FRUIT RESEARCH COMMISSION

TR Turoni DA-Meter

The DA-meter nondestructively measures the difference of absorbance (as I_{AD}) of two wavebands of light between 670 and 720 nm, which is used to calculate relative chlorophyll content, an indicator for the maturity progression of the fruit. However, while the parameter correlates closely with the SSC, TA and firmness for some varieties and regions, no major correlations have been found in the Pacific Northwest for Honeycrisp. When using the DA-meter in orchards, direct sunlight can interfere with the readings, so the WTFRC team has retrofitted a visor to the instrument to eliminate fluctuations in readings caused by light (see inset photo at right). The DA-meter alone cannot replace the most common destructive maturity indicators (SSC, starch, firmness), but it can be used as an additional parameter to track the speed of maturity progression, the spread of maturity within a tree or a block, and to separate lots for storage. Currently scientists are using the DA-meter to study the ripening behavior of pears.



Summaries continue on the next page.

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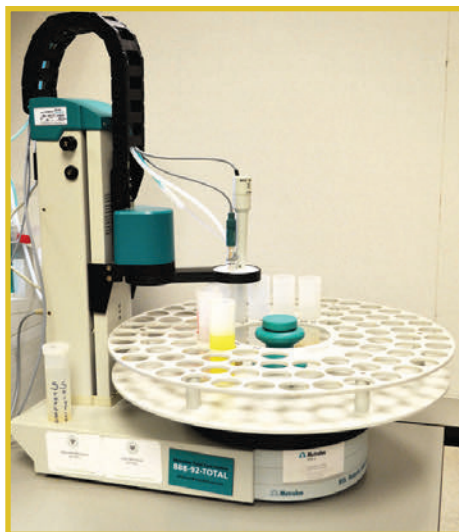
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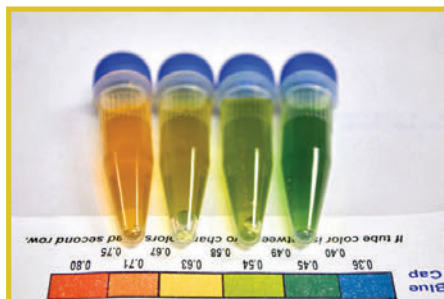
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Metrohm Titrator

The Metrohm Titrator measures TA content. Due to its purchase price, it is useful in situations that require a high sample throughput (such as larger packing house operations or research stations). Also, the Metrohm requires systematic calibration and maintenance under lab conditions. Titration with the Metrohm is the standard method to measure the TA content of all experimental fruit at the WTFRC.



Accuvin Titratable Acidity Test Kit

Currently, the Accuvin acidity tube test is the fastest and easiest method to determine apple fruit acidity levels of all test kits evaluated by WTFRC to date. Due to its lower accuracy, this test should be used if gaining information about the acidity range is more important than an exact value, such as when trying to group lots of Honeycrisp apples based on high or low TA levels for different storage durations. We noted that this test requires minimum training and can be performed in the field or at receiving.



BSG wine acid test

In general, the wine acid test from BSG is cheaper to purchase than the Accuvin tube test. However, due to the additional equipment needs and the higher time requirement to perform the actual test, the overall operating costs are higher. Also, this test is not suitable for field use.



Felix F-750

The F-750 allows the nondestructive measurement of certain parameters. However, a model has to be created for each parameter and each lot of fruit separately. During a proof of concept study, the WTFRC attempted to develop a firmness, DMC, TA, SSC and DA model for Fuji, Honeycrisp and Cosmic Crisp apples. Our results showed it was possible to create DA and dry matter models. However, no model could be created for firmness, SSC and TA with the current software. More specific research is required to see if there is a need to develop models for individual varieties, pre- and postharvest measurements and to work out specific recommendations for the measuring procedure. The device is not currently ready for field application.

Summary

While there was little progress in the commercial development of new devices to help growers and packers accurately, quickly and economically determine common maturity parameters, several options have become available in recent years. Some devices, such as the Accuvin Titratable Acidity Test Kit, should be able to be used successfully without any problem. Others, like the Felix F-750 are very promising, but will need further refinement in order to be easily adoptable for quality control personnel or others. ●



Atago PAL-BX | ACID5

Atago's PAL-BX | ACID5 is able to measure the SSC and the TA one after another from the same juice sample. However, in order to be able to measure the TA content after the SSC measurement, a 1:50 dilution has to be made. This step can lead to calculation errors. Overall, the device showed an accuracy of about 78 percent.

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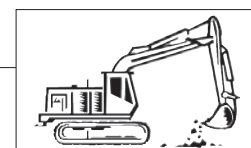
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GOOD TO GO

For a complete listing of upcoming events, check the Calendar at www.goodfruit.com

SEPTEMBER

September 13-15: Fresh-cut Produce: Maintaining Quality & Safety Workshop, Davis, California, UC Davis Campus, postharvest.ucdavis.edu/Education/FreshCut.

September 14-16: Macfrut 2016, Italian Fruit & Vegetable Trade Fair, Rimini Fiera, Italy, macfrut.com.

OCTOBER

October 14-16: Produce Marketing Association Fresh Summit, Orlando, Florida, www.pma.com/events/freshsummit.

NOVEMBER

November 8-10: The Methyl Bromide Alternatives and Emissions Conference, Orlando, Florida, www.mbao.org.

November 9-10: Northwest Cherry Research Review, Wenatchee, Washington, www.treefruitresearch.com. For more information, contact Kathy Coffey, (509) 665-8271, ext. 2.

November 10-11: Washington State Grape Society Annual Meeting and Trade Show, Grandview, Washington, www.grapesociety.org.

November 11-13: Tilth Annual Conference, Wenatchee, Washington, seattletilth.org/special_events.

November 14-15: Sustainable Ag Expo, San Luis Obispo, California, 805-466-2288, www.sustainableagexpo.org.

November 22: Stone Fruit Research Review, CPAAS, Prosser, Washington, www.treefruitresearch.com. For more information, contact Kathy Coffey, (509) 665-8271, ext. 2.

DECEMBER

December 5-7: Washington State Tree Fruit Association 112th Annual Meeting and NW Hort Expo, Wenatchee Convention Center, Wenatchee, Washington, www.wstfa.org.

December 5-9: Irrigation Show and Education Conference, Las Vegas, Nevada, info@irrigationshow.org; www.irrigationshow.org.

December 6-8: Great Lakes Fruit, Vegetable and Farm Market Expo, Grand Rapids, Michigan, www.glexpo.com.

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LAST BITE

More Young Growers at goodfruit.com/yg

Jared Gidley

grower / Parkdale, Oregon

age / 31

crops / Pears and cherries

business / Orchard View Inc., Gidley Ag Management

family background / Jared is a first-generation farmer who worked several orchard jobs growing up in Parkdale, Oregon. He has a daughter, Kate, is the son of Jim and Joyce Gidley, and his wife, Kathryn, grew up in a farming family.

How did you get your start?

“I got my taste of farming when I was about 15 years old, thinning Bartlett pears. I think it would take me about a day to thin one tree. I hated it, but I made it through the summer. Years later, I started working for a cherry orchard planting trees in the spring, did irrigation work, weed spraying and mowing — just about everything — and I found myself loving the pace of it. I ended up doing it every summer from high school through college and it helped me get through school.

How did you make the transition to agriculture?

“When I was in college, I pursued economics. I thought I'd have it made and there were jobs everywhere. It didn't happen that way. My first job out of college was not in finance, it was for a roofing company. I ended up getting laid off right before cherry harvest, so I jumped right back into harvest. It was something I could just jump in and do. When the season was over, I started looking for a “real job” and I found one at a bank. When I realized that banking wasn't for me, a job opened up at a packing house in Hood River as a field representative. I've been working as a field representative for about six harvests now.

What can other young growers learn from being a field representative?

“As a field representative, I'm a liaison between the packing house and the grower. So I am always working through issues with the market, fruit quality, scheduling of the fruit. Basically I'm that person on the front line of relaying all the information from one central source to 20 to 30 sources. One thing I didn't expect when I took the job was how personal relationships can get between grower and representative. There are intense periods of the year, and sometimes you are with them every day, sometimes multiple times a day checking on them. You really get to know the people you work with on a very in-depth, professional level.

“There are plenty of challenges starting out so you need to be pretty determined.”

by TJ Mullinax

More from this interview and other Young Growers at goodfruit.com/yg.



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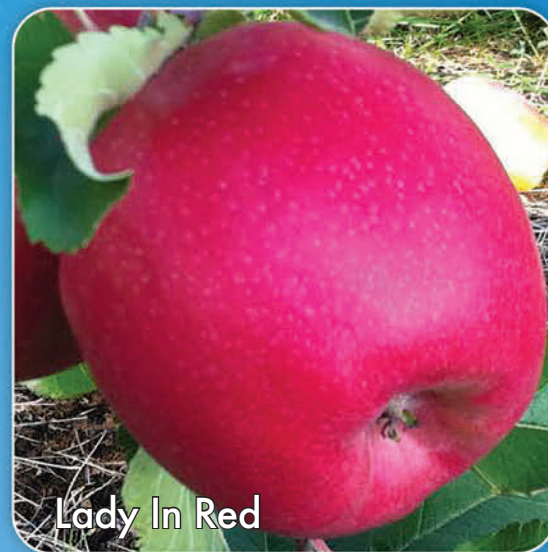
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