Fruit Notes

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Cornell Cooperative Extension
Lake Ontario Fruit Program

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Spring 'To do' List for Berry Crops

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Blueberries

- **Apply early season herbicides** – see separate article elsewhere in this issue.
- **Finish pruning mature bushes**
- **Scout for mummy berry disease** – Mummified berries can look like tiny black pumpkins (Figure 1) and may be found on the ground or still hanging on the plant. If you saw mummy berry strikes last year, then you may need to spray for this disease as buds break. However, physically disrupting the soil will help, as will a dormant spray of lime sulfur. In addition, ground sprays of urea have been shown to burn the developing apothecia (Figure 2).

Figure 1 (left) Sclerotium of *Monilinia vaccinii-corymbosi* (mummy berry) (Photo: Gerald Holmes, California Polytechnic State University at San Luis Obispo, Bugwood.org). Figure 2 (right) Mummy berry apothecia (Photo: Caleb Slemmons, National Ecological Observatory Network, Bugwood.org)

- **Remove dead canes** and look for evidence of **canker**. Canker diseases can be controlled with copper, Quilt, Quash, Pristine or lime-sulfur sprays before bud-break.
- **Look for scale insects**

An application of dormant oil will help control scale insects, as will later applications of Brigade, Triple Crown or Esteem when crawlers emerge in early spring.

- **Remove and destroy blueberry stem galls** – usually not a huge problem, but may be a challenge in young plantings. Look for large, hard, bulbous/kidney-shaped galls on the stems, often near the terminals. These are caused by the larvae of a tiny wasp. The adults overwinter in the galls, emerge in early June, and move to other stems to deposit eggs.

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- **Apply sulfur if soil pH is higher than 5.2** – 200 lb/A is the maintenance rate that should be applied 1-2 times annually to prevent soil pH from creeping up. Remember that the target pH is 4.5.
- **Review past years' foliar nutrient recommendations** and make sure your fertility plan is in line with them. If you have never done foliar sampling, add a reminder to your calendar that this should be done in early August.

Strawberries

- **Apply early season herbicides** - see article elsewhere in this issue.
- **Remove straw from June-bearing strawberries as soon as possible**. The delayed spring has resulted in berry plantings with winter straw mulch still in place. Studies have shown that delaying the removal of straw mulch can result in a yield decrease as high as 27% (mostly in terms of total berry numbers, not individual berry size). The decrease in yield caused by the delayed removal of straw mulch can be as high as the losses that would be due to winter injury if you had not mulched them at all. Work by Marvin Pritts and others[1] found the best results in treatments in which the straw mulch was applied later in the winter (Dec. to February) and then removed at the earliest possible time—in the case of their study at the end of February. This consistently resulted in the best winter survival and best overall productivity—likely because it allowed plants to get access to light early.
- **Plan for frost protection** – inspect irrigation equipment and row covers. Make sure you have an adequate temperature detection system at the field level.

Brambles

- **Brambles are generally still dormant** although, like blueberries, this will change quickly when we get some sustained warmth. Blackberry fruiting may be limited to those plantings that are protected or wintered by using a cross-arm trellis.
- **Complete the necessary pruning**: After you finish blueberry pruning you can begin with brambles. Remember to keep cane density at no more than 4 canes per square foot. There may be some winter injury so look for that and prune it out.
- **Apply early season herbicides** - see article elsewhere in this issue
- **Check for disease or insect issues as you prune.**

Ribes

- **Some spring freeze injury has been noted in *Ribes***. Hopefully there won't be a significant loss but it's difficult to tell at this point.
- **Prune bushes now** – gooseberries and currants respond well if 4–5 year old wood is removed. Canes should be removed from the crown.
- **Inspect for pest issues while pruning**.
- **Apply early spring herbicides.**

References

[1]Pritts, M. P., K. A. Worden and M. Eames-Sheavly (1988) Row-cover material and time of application and removal affect ripening and yield of strawberry. *Journal of the American Society for Horticultural Sci*ence **114:** 531-536

2018 Apple Fungicide Update for New York

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(Reprinted from *Scaffolds*)

Fungicide selection for apple disease management may be complicated, but it is doable. Complicating factors include pathogen resistance to older fungicides that have been rebranded, pre-mix products of multiple fungicides, an abundance of new chemistries in the same fungicide group (a FRAC group is made up of similar modes of action determined by the Fungicide Resistance Action Committee), and the potential for injurious tank-mix combinations during thinning timings.

The prevalence of practical fungicide resistance in commercial populations of *Venturia inaequalis* (the apple scab pathogen) seems to have subsided in recent years. This is likely due to widespread use of multi-site (mode of action) protectants and inclusion of the succinate dehydrogenase inhibitors (SDHI; group 7) in rotational programs with products from several other fungicide classes. While selecting the right fungicides has become more complicated, it is now possible to rotate more than four fungicide classes in a single season without considering multi-site protectants. Although resistance to QoI (group 11) and DMI (group 3) fungicides in populations of *V. inaequalis* may be widespread throughout the Northeast, continuing to use these fungicides in your apple fungicide program will 1) capitalize on their high level of activity against powdery mildew and summer diseases, and 2) reduce selection for resistance to the new SDHI (group 7) fungicides.

In 2018, the tendency to market products of pre-mixed fungicides continues to wane as more single-fungicide products are being developed by the agrichemical industry. However, it is not known whether the forthcoming fungicide chemistries will be marketed alone or in combination with another fungicide. Some pre-mix products have been recently labeled for use in NY, but were developed and validated several years prior. There are some products that will be new to growers in 2018. With each new fungicide product, the use of low volume applications combined with the complexity of tank mixes during thinning, and incompatibilities with existing products will continue to present issues. Below we present an update on the newest and most important fungicide products and provide our perspectives on the use of existing products.

Available fungicides

Dodine (syllit)

Syllit (dodine) can only be applied twice prior to pink according to the label. However, applications after bloom are still allowed on pears. There are concerns that the use of Syllit after pink may predispose selection for resistance or increase the chance of injury in complex tank mixes. We haven't been able to find an isolate with dodine resistance in research or commercial plantings in many years, and there appear to be no more *V. inaequalis* (apple scab) populations with practical resistance to dodine. We have a few *V. inaequalis* isolates from research orchards in Geneva that can grow in the presence of dodine in culture. However, these isolates seem to possess multi-drug resistance and the orchard populations as a whole seem to be sensitive to Syllit. Moreover, Syllit provided excellent control in this orchard for the last three seasons.

To avoid practical resistance, Syllit should be applied in combination with mancozeb and applied no more than twice. The label now also requires mixing with either mancozeb or captan, but mixing with captan increases the risk of phytotoxicity. If there are heavy rains prior to pink, Syllit may be a good choice for high-inoculum orchards, as it has

some post-infection utility even in orchards that were once shifted towards resistance. Since copper is often applied at silver/green tip to suppress fire blight inoculum, Syllit plus mancozeb could be applied from late green tip to tight cluster. If powdery mildew is a concern, Syllit may not be a good choice at tight cluster, as it has no activity against mildew. Syllit is not very effective on rust diseases, but including mancozeb as a tank-mix partner may help in orchards with light rust pressure.

Captan and Mancozeb

Combinations of mancozeb and captan applied on a 5–7-day schedule have been popular to manage primary apple scab from green tip to 2nd cover. The combination referred to as "captozeb" usually consists of the 3 lbs/A of Mancozeb (75% active) mixed with 2.5 lbs/A Captan (80% active). These contact fungicides are protectants and must be applied before rains, or at least before the end of an apple scab infection period. If this combination is applied in the rain, there will be some residual activity after the rains end. The captozeb combination is effective for apple scab, but captan and mancozeb are ineffective on powdery mildew. Moreover, the 3 lb/A rate of mancozeb may not be effective against cedar apple rust in high-inoculum orchards. In this instance, other single-site fungicides would be needed to manage powdery mildew and cedar apple rust.

As the orchard progresses into bloom, captan should be used with caution because it is phytotoxic if absorbed into plant cells. By the time apples are in petal fall, the risk of captan injury will be highest. At this time, tank mixes become increasingly complex due to the need to manage insects and diseases, provide foliar nutrients, and manage crop load. Growers are trying to reduce application volume to reduce the number of times they need to refill their sprayer and reduce water use. Reduced water volumes also greatly increase the risk of concentrated captan deposits on leaves. Adjuvants, oils, and other tank mix partners are needed to improve the efficacy of agricultural chemicals. These materials can enhance the uptake of captan and increase the chances that it will penetrate the cuticular layer of leaves and fruit. Captan uptake into young susceptible fruit tissues can be further enhanced if applications are made under slow drying conditions on an overcast day, in the early morning, in the late evening, or during a light rain. Although there have been no reports of captan-related injury in the last two years, we still recommend that growers curtail applications of captan at petal fall and first cover when the cuticles of apples leaves and fruit are not fully developed.

Many of the newly released fungicides are formulated in organic carriers and haven't been evaluated in the context of tank mixes with captan and penetrating surfactants and in low volume applications (<50 gal/A). Therefore, captan compatibility problems under high risk conditions may be largely unknown for many of the newer fungicides. If mancozeb is selected over captan after bloom, it will be important to also avoid any pre-bloom applications of mancozeb or Polyram that exceed 3 lbs/A, to remain in compliance with labeling restrictions. If rates of mancozeb higher than 3 lbs/A are used at any time during the early season, the label will not allow post-bloom applications of mancozeb.

SDHI fungicides

There are many SDHI fungicides registered for apples (Table 1) and more are forthcoming. SDHI fungicide products are either marketed alone or pre-mixed with another fungicide belonging to the QoI, AP (anilinopyrimidine), or DMI fungicide classes. SDHI fungicides in general have a high level of activity against apple scab and a moderate level of activity against apple rust diseases and powdery mildew. Because the AP fungicides are typically more effective against apple scab in the early season when the weather is cooler, and have no activity against powdery mildew and rust diseases, it would be best to apply pre-mix products with AP fungicides prior to bloom. SDHI fungicide products with QoI mix partners are more effective against powdery mildew and rust diseases. Hence, these pre-mix products are best applied from bloom to first cover. Since the SDHI plus QoI pre-mix products also work well for many summer diseases, using them at first cover and in the final pre-harvest cover is often advisable. While there are concerns about QoI fungicide resistance in NY and New England, the performance of the SDHI

plus QoI pre-mix products is not often affected by the presence of QoI-resistant apple scab or powdery mildew. In our research orchards, where there is documented QoI resistance to apple scab and powdery mildew, QoI/SDHI pre-mix fungicides seem to provide the same level of control as their SDHI counterpart. Irrespective of the resistance status, one should include 3 lbs of mancozeb (a multi-site contact fungicide) with all SDHI fungicides to preserve the life span of this fungicide class. Mancozeb is often preferable to captan, given the concerns regarding captan injury at petal fall and 1st cover. Beyond first cover, SDHI fungicides can be safely combined with captan in summer sprays. Always use caution when mixing SDHI fungicides, since nearly all SDHI fungicide products are petroleum-based formulations, which could slightly enhance the uptake of captan under slow drying conditions. Table 1 summarizes the various features of the current and forthcoming SDHI fungicide products.

Table 1. Features of current and forthcoming SDHI fungicide products.

Trade name (Manufacturer)	Fungicide Chemistries (FRAC group)	Disease efficacy at currently labeled field rates	Registration Status
Fontellis (DuPont)	SDHI (7)	High: apple scab, Low to Moderate: Rust and Mildew	Special Local Need
Merivon (BASF)	SDHI (7) + QoI (11)	High: apple scab, Moderate to High: Rust and Mildew	Restricted Use
Sercadis (BASF)	SDHI (7)	High: apple scab, Moderate to High: Mildew, Low: Rust	Restricted Use
Pristine (BASF)	SDHI (7) + QoI (11)	High: apple scab, Moderately High: Rust and Mildew	Not-restricted
Luna Tranquility (Bayer)	SDHI (7) + AP (9)	High: apple scab, Moderate to High: Mildew, Low: Rust	Restricted Use
Luna Sensation (Bayer)	SDHI (7) + QoI (11)	High: apple scab, Moderate to High: Rust and Mildew	Restricted Use
Aprovia (Syngenta)	SDHI (7)	Exceptionally High: apple scab, Low to moderate: Rust and Mildew	Not-restricted

QoI or strobilurin fungicides

The QoI or strobilurin fungicides provide a high level of activity against apple scab, apple rust diseases, powdery mildew, sooty blotch and flyspeck, and summer fruit rots. Unfortunately, resistance to QoI fungicides has been documented in MI, IN, NY and several New England states. The development of resistance may appear gradual at first, but can quickly progress to a near complete loss of effectiveness. In recent years, we've obtained some QoI resistant isolates of *Podosphaera leucotricha* (apple powdery mildew), and *Colletotrichum fioriniae* (bitter rot), *Botrytis cinerea* (gray mold), and *Botryosphaeria dothidea* (white rot) from NY apple orchards or apple samples sent in for diagnosis. Given the possibility of QoI resistance present in NY orchards, evidenced by occasional serendipitous identification of isolates as part of routine diagnostic work, it may be best to limit stand-alone QoI fungicide products to only two applications each season. Consider saving these materials for applications from petal fall to 2nd cover; they still perform well against apple powdery mildew and the ascospore inoculum of fly speck sooty blotch. When possible, consider using a SDHI/QoI

fungicide pre-mix product such as Merivon, Luna Sensation, or Pristine instead of a stand-alone QoI fungicide product. The SDHI/QoI pre-mix fungicides would provide the same activity as a standalone QoI fungicide, but with less risk of resistance development.

DMI fungicides

Resistance to DMI fungicides (Rubigan, Rally, Indar, Rhyme, and Inspire Super) in populations of *V. inaequalis* (apple scab) is widespread in the northeastern United States. Resistance to this class of fungicides is rate-dependent and gradual, meaning that resistance may be overcome by higher rates of DMI fungicide products. Selecting DMI chemistries with higher intrinsic activity against apple scab or apple powdery mildew is the key to overcoming pathogen resistance and achieving the best control. For example, difenoconazole, a DMI fungicide in the product Inspire Super, is so effective at blocking ergosterol biosynthesis in *V. inaequalis* that resistant isolates do not have the metabolic capacity to overcome the fungicide. Simply put, if Inspire Super is applied at the highest labeled rate, the effective dose of difenoconazole is greater than that which *V. inaequalis* can tolerate, even in populations with a high level of DMI resistance. Even if we can beat the fungi with a more effective fungicide, DMI fungicides should still be used with extreme caution, and not used for post-infection activity or used on cultivars that are highly susceptible to apple scab (e.g., McIntosh). Products containing the highly-soluble DMI fungicides fenarimol, myclobutanil, and flutriafol (Rubigan, Rally, and Rhyme, respectively) are the least intrinsically active against apple scab and the most likely to lead to field failures in resistant populations. However, one can still use the high-solubility DMI fungicides and mitigate practical fungicide resistance. In research trials in Geneva, we've been able to avoid product failures due to DMI resistance with the newest formulation of flutriafol (Rhyme) applied at the labeled rate with Mancozeb (75%) at 3 lbs/A.

Since the fungicide application timings are the same for both apple scab and apple powdery mildew, it is likely that populations of *Podosphaera leucotricha* (apple powdery mildew) in the same orchard also have DMI resistance. Since it is extremely difficult to grow apple powdery mildew in culture and there are no known genetic mutations conferring resistance, we cannot test for DMI resistance in this pathosystem. At best, we can only make inferences from reported commercial product failures and the need to use higher rates of DMI fungicides to achieve control in research trials.

Practical resistance to DMI fungicides in apple powdery mildew is most commonly observed in programs where low solubility DMI fungicides are used. These include fungicides like difenoconazole (Inspire Super) and fenbuconazole (Indar 2F). By comparison, highly soluble DMI fungicides like myclobutanil (Rally) and flutriafol (Rhyme) are still highly effective against DMI-resistant powdery mildew, but now require higher rates. The label for Rally 40 WSP has changed over the years to allow rates as high as 10 oz/A. While growers achieved excellent control of powdery mildew with Rally at 4 oz/A when this fungicide was first introduced, 5 or 6 or even 8 oz/A are now needed to get the same level of mildew control. Using myclobutanil (Rally) at rates above 6 oz/A at petal fall and first cover (two critical mildew timings) may be effective, but could result in undesirable plant growth regulator effects. These effects would include smaller length/diameter ratios (i.e., less ‘true to type’ fruit) and/or slightly decreased fruit thinning. All of these concerns aside, the DMIs are still some of the most effective materials for managing apple powdery mildew and apple rusts.

Summary
Selecting the right fungicides for your apple program can be challenging and confusing. There are now more options, considering the number of new products, new product names, mixes of fungicides, and more classes of fungicides than there were 10 years ago. There is fungicide resistance in more pathosystems, and growers are adding more things to the spray tank to ensure success in apples. Fortunately, every fungicide product registered has some utility against some disease. Hence, there are few truly bad choices or poor decisions that one can make when selecting fungicide products in 2018. The best plan involves the use of protectants early against apple scab, the use of single-site fungicides from tight cluster to harvest to manage multiple diseases, avoiding captan during thinning, and making a few applications from each class of fungicides throughout the season to manage fungicide resistance.

'Run-through' trees: A More Efficient Production System to Produce Taller, 'Calmer', and More Fruitful Nursery Trees for 2-D Canopies or Fruiting Walls

Mario Miranda Sazo

During the last few weeks several growers have asked me if they should or should not knip on-farm nursery trees this year. My response has been very straightforward: it really depends if you are planning to establish a very efficient fruiting wall by planting apple trees at 2–2.5ft instead of 3ft in-row spacing.

Figure 1 A trellised nursery to produce 'run-through' trees as pictured on August 20th, 2017. Notice that trees are taller, calmer, and full of short, fruitful feathers. These nursery trees are ideal for apple orchards to be planted with a 2ft in-row spacing.

If you are planning to plant the future orchard with a 2–2.5ft in-row spacing you should **leave the trees for one more year in the nursery** and don't knip the trees this season. This method of tree nursery production is called 'run-through' and was originally developed for the production of pear trees in England, Holland, and Belgium. This new system (with some modifications developed by innovative apple growers Jose Iñiguez, Jason Woodworth, and Rod Farrow in Western NY) has become a very successful method for the production of fruiting walls of apples. The run-through trees start off the same way as knip trees, **but instead of being headed now at dormancy** (at 24–26 inches above the ground), **they are allowed to 'run through' the second year** with a short trellis support system (Figure 1). Any strong growth is removed via summer pruning, resulting in a tall tree (if well supported) with many short and fruitful feathers (or dards), ready to bear fruit in the future orchard.

If a new shoot re-grows as a result of summer pruning it should be contained (or frozen) by a directed Apogee spray (preferred), or it should be pruned again (much more labor intensive, less recommended) to maintain very short (4–5 fingers length) fruiting units. More details about how to produce run-through trees will be sent via our *Fruit Facts* this season.

Summary

Run-through nursery trees are taller, calmer, and have shorter feathers than the traditional knip tree. **Knip trees are more suitable for the 3ft in-row spacing**. **Run-through trees are more suitable for the 2ft in-row spacing** and for those growers interested in producing very efficient fruiting walls. This new canopy system will help growers to get the full benefits of orchard mechanization and future advances in autonomous apple picking.

Early-season weed control in berry crops

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First, make sure that you understand the nomenclature regarding berry crop groups when reading herbicide labels. 'Bush berries' includes blueberries, currants, and gooseberries (all the multi-stem shrubs), while 'caneberries' refers to brambles. Elderberries and Juneberries may be listed in the category of bush berry, but if in doubt, err on the side of caution.

Bushberries and Caneberries

One of the earliest herbicides that can be used is Casoron. This product occurs in two different formulations: Casoron 4G (granular) can be used in bush berries, caneberries, and cranberries. The granular material should be applied before May 1st, but the earlier the better. If you apply it in April, make sure to apply before soil temperatures exceed 45 °F and before any annual weed seeds germinate. Casoron CS (which is not labeled for *Ribes*) can be applied a little later but still needs to be incorporated by rainfall before weed germination; it is labeled for 1 year old blueberries, as well as blackberry and raspberries if applied before new shoot emergence. Casoron controls annual grasses and broadleaves, as well as some perennial grasses. Follow Casoron with a post-emergent to kill pre-emerged weeds or apply glyphosate when weeds are actively growing.

Another pre-emergent is Surflan. Again there are two formulations. Surflan AS can be used in non-bearing and bearing brambles at a rate of 20-40 gallons per acre. To broaden the spectrum of weed control, tank mix Gramaxone, Princep or Solicam. Irrigate product in to activate material. Surflan XL 2G can only be applied to non-bearing brambles.

Princep, Devrinol, Axxe, Solicam or Sinbar can all be applied for pre-emergent weed control in brambles and blueberries. These herbicides generally do not do a great job on all weeds and need to be evaluated with respect to your weed population and which tool makes the most sense.

Sandea and Velpar are two products that are only labeled for blueberries. They can both be applied in early spring, although Sandea's real strength is that it controls nutsedge, which can only be accomplished when it is applied as a post-emergent directed spray.

Velpar can be applied to bushes that are 3 or more years old. It should be applied before the foliage on the lower limbs emerges from the buds. Effects of Velpar L vary from one soil type to another. Many growers use Velpar to control annual weeds, but it also has some effect on perennial weeds.

Strawberries

Late winter or early spring (after winter annual broadleaf weeds have broken dormancy, but before strawberries begin to grow), is a key time

for herbicide application: apply 2,4-D amine, Formula 40, or other labeled 2,4-D formulations at this time to control emerged winter annual broadleaf weeds. Add Chateau to provide residual annual broadleaf weed control. Use 1 quart of Formula 40 per acre and 3 dry ounces of Chateau after the soil is no longer frozen but before strawberries break dormancy and begin to grow. Chateau can be used once in each calendar year. If Chateau was used in the late fall of 2017, it can be reapplied in March or early April, but not used again in this calendar year. The crop should "out-grow" small application injuries that may occur, but do NOT apply after the crop has broken dormancy and begun to grow, or lasting injury may result.

Note the pre-harvest interval (PHI) for Sinbar use in strawberries is **110 days**. This effectively eliminates late winter and early spring applications of Sinbar to strawberries before harvest. A typical strawberry field grown using the matted row system begins to bloom about May 1st and harvest begins in late May or early June. The cut-off date for the 110 day PHI would be sometime in February and has already passed.

Importance of Bacterial Strains in Cultivar Response to Fire Blight

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Fire blight is a major threat to apple production in New York State. Application of antibiotics in combination with forecasting models, good sanitation and management practices can give some effective control, but unpredictable outbreaks can still lead to epidemics and great economic loss. Also, fire blight susceptibility of cultivars seems to vary from year to year. We designed an experiment to look at some causes that could explain unexpected epidemics. We know that at any one time, many strains of *Erwinia amylovora*, the bacterium that causes fire blight, exist in apple orchards, with varying aggressiveness, and this leads to different levels of infection. The overall severity of infection in the presence of primary inoculum arises from the interaction between apple resistance genes and the genetics of pathogen strains, as well as the phenological stage of host cultivars and environmental conditions.

We grafted 5 replications each of Gala, Golden Delicious, and Empire on ¼ inch M.7 rootstocks at Plant Pathology, Cornell University, Geneva. Each cultivar was inoculated with one or more of three *E. amylovora* strains (Ea273, E2002A, and E4001A), at equal concentrations, or a control, once the shoot length of most plants was above 20 cm on average. Inoculation was performed by cutting a young leaf at the tip of the shoot with scissors dipped in the bacterial solution (Figure 1).

During inoculation, humidity was maintained above 75% and temperature at 25–27 °C to ensure successful infection. The total length of the shoot from graft union to the tip of the shoot and length of necrosis (cm) was measured at 15 days post infection (DPI). Percent lesion length (PLL) was calculated by dividing the necrosis length (cm) by the shoot length (cm).

Figure 1
Method of inoculating apple trees with the fire blight pathogen in the greenhouse. Sterile scissors were dipped into the bacterial inoculum to cut the youngest leaf of the shoot.

Results and Discussion

Our results show that the three cultivars have different levels of susceptibility to fire blight depending on the bacterial strain or combination of strains, and a strain's pathogenicity is influenced by other strains present and the host response to infection. For example, when Gala, Empire, and Golden Delicious are infected with E2002A separately, the results are as expected, with Gala having the highest PLL and Empire and Golden Delicious having lower PLL. However, when E2002A is co-infected with both Ea273 and E4001A, a significant reduction in PLL is observed in all three cultivars (Figure 2).

This may suggest competition for host resources between these strains. Interestingly, when E2002A is co-infected with either Ea273 or E4001A, respectively, in Gala and Empire, there is little difference in PLL. However, when E2002A is co-infected with E4001A in Golden Delicious, PLL reduces dramatically. This may be the result of non-specific minor resistance.

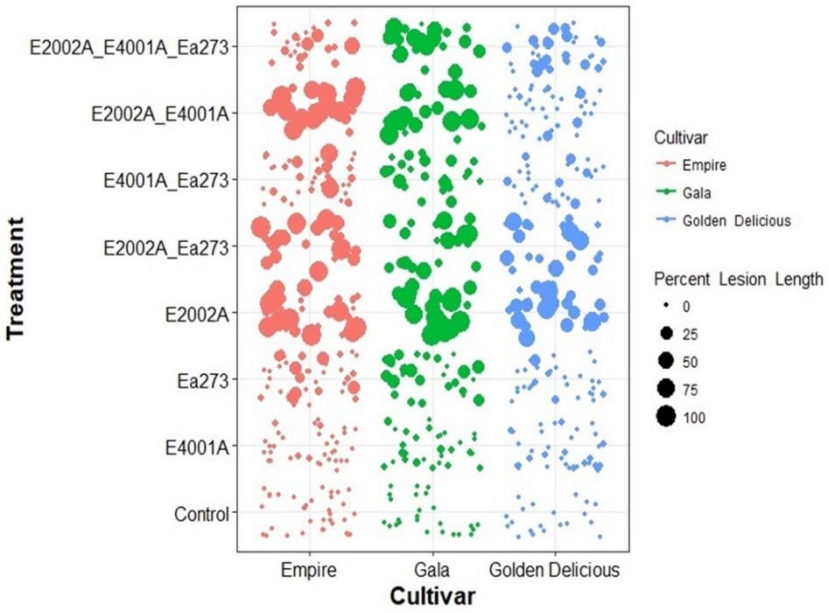

Figure 2
Scatterplot illustrating the relationship between strain x strain interactions (Ea273, E2002A, and E4001A) at 15 days post infection (DPI) for the three cultivars (Empire, Gala and Golden Delicious). The size of the dots is proportional to 0, 25, 50, 75, and 100% lesion length (PLL) for each treatment. Empire is illustrated in red, Gala in green, and Golden Delicious in blue.

Depending on the aggressiveness of the strain present in an orchard, a cultivar can be very susceptible, moderately susceptible, or resistant. Infection with a mixture of strains for 'Empire' show that the presence of multiple strains facilitates the propagation of each, such as E2002A co-infecting with either E4001A or Ea273 (Figure 2). Our results show that different apple cultivars have varying levels of genetic susceptibility to fire blight, and this susceptibility response is specific to particular *E. amylovora* strains. Aggressiveness and virulence of strains differ and could contribute to the loss of a cultivar during an epidemic. These results can help fine-tune fire blight management strategies including existing pruning recommendations, risk assessment models and/or to develop new models for accurate and precise disease prediction and antibiotic recommendations, avoiding unnecessary antibiotic applications. In the future, we would like to address further questions such as: how much do bacterial strains across NY vary in pathogenicity? Do populations of fire blight strains change over time? We also plan to identify a set of strains with variable pathogenicity levels for future screening of breeding material.

Acknowledgments

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Find Out How Your Employee Compensation Compares by Participating in the Benchmark Survey

Richard Stup, Cornell Agricultural Workforce Specialist

Would you like to know more about farm worker compensation trends? Do you want to compare and manage your compensation strategy with accurate, up-to-date, and relevant information? Then participate in the Farm Employee Compensation Benchmark Survey!
By participating in the survey you can find out how your employee compensation compares to benchmark data in your farm industry and across the state.

How can you participate?

1. Gather information about one or a few of your workers for the year 2017. How much did you pay them: wages, bonus/incentive, benefits? And how many hours did they work?
2. Log into this website: https://cornell.qualtrics.com/jfe/form/SV_d6h8UvVmdm9zsOx. (This link is also posted in the Announcements on the Lake Ontario Fruit Program homepage:

(https://lof.cce.cornell.edu/) or https://lof.cce.cornell.edu/submission.php?id=540&crumb=business|business).

3. Enter another employee by simply clicking the link in Step 2 again. If you have different types of employees such as front line, middle, and senior managers, add a few representative employees to the benchmark.
4. That's all, you're done. Just look for the summary report from me in your email.

What do you get for this?

- Every person who submits at least one usable survey will get a summary and analysis of the benchmark data in a written report.
- Additionally, you can request a "My Employee" report to compare one or more of your employees to relevant peers in the benchmark. Just ask me to provide you with the "My Employee" report.

All of your individual farm data remains confidential. Reports will only be issued in aggregated form as analysis and summary of the data with no way to identify individuals.
For any questions, contact: Richard Stup, Ph.D., Cornell Agricultural Workforce Specialist by e-mail at rstup@cornell.edu, or by telephone at (607) 255-7890.

Resource Round-up

1. Reminder: NYCAMH Respirator Fit Clinic for DEC Region 8/Finger Lakes: Counties served: Chemung, Genesee, Livingston, Monroe, Ontario, Orleans, Schuyler, Seneca, Steuben, Wayne, and Yates**. Dates:** Tuesday-Thursday, May 15-17, 2018 **Location:** CCE Ontario County, 480 North Main St, Canandaigua, NY 14424. **Accepting appointments:** Monday, April 16 - Friday, May 11, 2018
2. Species profile: Spotted lanternfly. The USDA National Invasive Species Information Center has compiled a list of resources for this new invasive species. Available on-line at: https://www.invasivespeciesinfo.gov/animals/lanternfly.shtml
3. News from NEWA: Subscribe to the NEWA blog to receive updates on available services: Please see http://blogs.cornell.edu/yourenewa/. Recent posts include information on the NEWA help desk, changes to the NEWA apple tools, and maintaining your weather station.

Mark Your Calendars

Meeting Title	**FSMA PSA Grower Training Course + Optional Farm Food Safety Plan Writing Workshop**
Date	May 2-3, 2018 – last of the season in Western NY!
Times	2nd May: 8 am–5:15 pm, 3rd May: 9 am–3 pm
Location	A134 Barton Hall, NYSAES, Collier Dr., Geneva, NY 14456
Cost	Day 1 (FSMA GTC) $70, maximum of 2 people per farm/organization (attendees out of NY, $155), Day 2 (Optional Farm Food Safety Plan Writing Workshop) $75, maximum if 2 people per farm/organization.
Brief Description of Meeting	Federal requirement for most fruit and vegetable growers. Those with more than $500,000 per year food sales averaged the past 3 years (adjusted for inflation) need to be in compliance as of 1-26-18. Is your farm covered under FSMA? See flow chart here
Registration/ Contact for Information	Register online here: https://lof.cce.cornell.edu/event.php?id=929 For questions, contact Craig Kahlke at 585-735-5448, or cjk37@cornell.edu

Cornell Cooperative Extension
Lake Ontario Fruit Program
12690 Rt. 31
Albion, NY 14411

According to our records you have not yet re-enrolled with the Lake Ontario Fruit Program for 2018, this will be your last issue of "Fruit Notes". Please contact your local county office or Kim Hazel at 585-798-4265 x26 or email her at krh5@cornell.edu if you would like to re-enroll or have any questions.

Fruit Notes

YOUR TRUSTED SOURCE FOR RESEARCH-BASED KNOWLEDGE

Fruit Specialists

Craig Kahlke I 585-735-5448 I cjk37@cornell.edu
Team Leader, Fruit Quality Management

Areas of Interest: Fruit Quality and factors that affect fruit quality before, during, and after storage,

Mario Miranda Sazo I 315-719-1318 I mrm67@cornell.edu
Cultural Practices

Crops: Blueberries, Raspberries / Blackberries, Strawberries, Apples, Apricots, Asian Pears, Cherries, Currants, Gooseberries, Nectarines, Peaches, Pears, Plums

Tessa Grasswitz I 585-261-0125 I tg359@cornell.edu
Integrated Pest Management (IPM)

Areas of Interest: IPM of tree fruit and berry pests, biological control, pollinators, and impact of climate change.
Crops: Blueberries, Raspberries / Blackberries, Strawberries, Apples, Apricots, Asian Pears, Cherries, Currants, Gooseberries, Nectarines, Peaches, Pears, Plum

Mark Wiltberger I 315-272-8530 I mw883@cornell.edu
Business Management

Crops: Apples, Cherries, Nectarines, Peaches, Pears, Plums

For more information about our program visit us at lof.cce.cornell.edu