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IN THIS ISSUE:

SHORTS:

Agricultural Business Training Course – *Deepening Roots, Growing Success Business Training - For Startup Urban Farmers & Food Processors in Boston:* The Carrot Project is excited to announce Deepening Roots, Growing Success, a business training program for current or aspiring Boston-based urban farmers and locally-sourced food processing business operators. The training program starts with a Saturday Intensive Crash Introduction to the world of growing, sourcing, and processing local foods. Local experts and business leaders will present on panel discussions for an introduction to the local food landscape. Then, eight Monday evening sessions will provide participants with in-depth business expertise to help launch and develop their business models, also presented by local experts and business leaders. More Information and Full Program – Register here

Conservation Stewardship Program Applications Available – USDA Natural Resources Conservation Service will accept and process applications for enrollment in the Conservation Stewardship Program (CSP) beginning in November, with sign-up running through February 3, 2017. Producers can expect to see nearly double the enhancements and conservation practices offered previously. The program also has new methods and software for evaluating applications. More information here.

Crop insurance deadline November 20! – Crop insurance for apples is available in all Massachusetts counties. Crop insurance for peaches is available in Hampshire, Hampden, Middlesex & Worcester counties. Peaches in other Massachusetts counties may be insured by Written Agreement (a process completed by a licensed Federal Crop Insurance agent using existing actuarial data from neighboring counties) if specific criteria are met. If crop insurance is not available, similar protection may be available through the Non-insured Crop Disaster Assistance Program (NAP) from the USDA - Farm Service Agency (FSA) Office that serves your farming operation. All other fruit crops may be insured through a Written Agreement or NAP.

Winter Mulch for Strawberries

Sonia Schloemann, UMass Extension

An important fall job in commercial strawberry production is mulching. Strawberries are commonly grown in cold climates, such as the northern US and Canada, but the strawberry plant itself is actually quite vulnerable to cold injury. Research has shown that, without mulch, strawberry crowns can suffer damage at temperatures below 12°F and unprotected strawberry plants can suffer desiccation damage from drying winter winds. A protective mulch can protect strawberries from cold by providing insulation, and from desiccation by providing a barrier against drying winds. Mulches will also protect plants from injury caused by soil heaving, which results from freezing/ thawing cycles during the winter. So, a key to consistent quality strawberry production in cold climates is in protecting the plants from severe temperatures or temperature swings through the practice of mulching.

Production systems can also affect the need for mulching. Plants on raised beds, for example, are more vulnerable to cold and desiccation injury than plants in level plantings, especially in locations that are exposed to strong winter winds. Annual production systems, such as fall planted plasticulture, may utilize less hardy or disease susceptible cultivars. As we will see, mulching practices must adapt to these new systems.

When should the strawberry grower plan to apply mulch? Research suggests that a good timing guide is to apply mulch after three consecutive days with a soil temperature of 40°F or below. This soil temperature usually occurs after multiple frosts, and when the plants have slowed growth in response to cooler temperatures. It is best to apply mulch before the soil freezes solid. In New England mulches are applied in late November.

What is a good mulch material? The traditional mulching material for strawberries in New England is straw. Straws from wheat, rice, oats, or Sudan grass work well. Straws coarser than Sudan grass are not recommended. Straw should be clean, free from weed seed, and contains a minimum of grain seed. Strawberry growers can produce their own straw, often cutting the straw before the grain seed is viable. Store straw for mulching in a dry area. Occasionally, grain seedlings can become a weed problem the following spring; an application of sethoxydim will give good control.

How much mulch should be applied? A traditional, level matted row planting will require 2.5 to 3 tons of straw per acre for a 2 to 3 inch deep mulch, or about 300 small bales of average weight. Raised bed plantings and sites with strong wind may require twice this amount for adequate coverage.

How is the mulch applied? Smaller plantings may be mulched by hand by shaking out the bales of straw over the row. Larger plantings often use bale choppers to break up the straw bales and distribute the straw over the bed. Choppers are available for both small bales and large round bales.

How and when is the much removed? In the spring, when plants begin to show growth under the winter mulch (new green tissue), the mulch should be raked off the

rows to allow sunlight to penetrate and reach the foliage. Delaying removal will delay plant growth and flowering and may reduce yield. Mulch can be raked off by hand with ordinary yard rakes in smaller plantings. In larger plantings, various mechanical tools are available ranging from modified hay rakes and tedders to equipment specifically designed for the purpose.

Floating row covers as mulch. These covers are composed of a plastic such as polypropylene, spun-bonded into a fabric that is permeable to light, air, and water. Research and growers' experiences demonstrate that these covers are useful for winter protection of strawberry plantings. While floating row covers are available in several weights, only the heavier weights are recommended for winter protection. At present a widely available weight recommended for winter strawberry protection is 1.25 oz/yd^2 (42 g/m^2). A variety of fabric widths are available, with common widths ranging from 15 feet to 60 feet. This material currently costs about 4 cents per square foot. With proper care, this heavier fabric should last 3-4seasons. Floating row covers are widely used to protect annual plasticulture plantings.

Row covers are best applied on still days. Be sure to line up sufficient labor to place the row cover. If possible, use wider widths for more efficient application. The row cover edges must be anchored, as must areas where two covers overlap. A variety of methods are used to anchor the edges. Edges may be anchored with posts, rocks, or tube sand. The edges may also be covered with soil.

Once the mulch is in place, the job is not done for the winter. Monitor the planting frequently. If straw has blown off areas, replace at once. Watch the edges of row covers, and adjust anchors if needed. Repair any rips or holes as soon as possible.

Any reference to equipment or product brand names does not constitute endorsement over like products or equipment.

RASPBERRIES/BLACKBERRIES

Rust Diseases On Raspberries

Pam Fisher, Ontario Ministry of Agriculture, Food and Rural Affairs

There are several rust diseases that attack raspberries. Rust diseases often have complicated life cycles that include alternate hosts, and most produce several types of spores. If you see rust diseases on your raspberry crops, it is important to identify which disease is present, so you can manage it effectively.

Late Leaf Rust *(Pucciniastrum americanum)*
Crops attacked: Red and purple raspberries

Alternate hosts: White spruce

Symptoms: Pale orange powdery spores on lower leaf surface, upper surfaces develop small yellow areas that gradually turn brown. Severe infections may result in early leaf drop, reduced plant vigor and yield and increased winter injury to infected canes. On fruit, bright orange powder y spore masses develop on infected drupelets.

Control: Prune and trellis raspberries to encourage air movement and rapid leaf drying. Prune out and remove old canes. If possible, remove nearby white spruce which are required for the disease to complete its life cycle. Prebloom applications of Ferbam to raspberries might help reduce infections. Currently there are no other fungicides registered for control of late leaf rust in Ontario.

Comments: Late leaf rust is common in Ontario. While summer-bearing cultivars often escape fruit infections, fall-bearing raspberries tend to develop fruit infections if weather conditions are favourable for disease development. The cultivars Heritage, Jaclyn, and Caroline seem especially susceptible.

Figure 1. *Late leaf rust on raspberry leaves.*

Orange Rust (*Arthuriomyces peckianus, Gymnoconia nitens*)

Crops attacked: All raspberry species except red raspberry

Alternate hosts: none

Symptoms: Plants develop symptoms the year following infection. New leaves are stunted, pale and spindly. Bright orange waxy pustules develop on the lower leaf surface, later becoming bright orange and powdery. Infected plants are unproductive.

Control: This disease is systemic - once a plant is infected it is always infected. Remove infected plants, preferably before orange pustules break open and spores spread to more plants. Remove wild black raspberries from adjacent woods and hedgerows.

Comments: Very common on wild black raspberries and blackberries.

Figure 2. *Late leaf rust on raspberry fruit.*

Yellow Rust (*Phragmidium rubi-idaei*)

Crops attacked: Red raspberries

Alternate hosts: none

Symptoms: In spring and early summer, yellow pustules appear on the upper leaf surface of young leaves. As summer progresses orange pustules are produced on the lower leaf surface, eventually turning black as the overwintering spores are produced. If infections are early and severe, the disease can cause early leaf drop and reduced winter hardiness.

Control: Purchase clean plants from a certified plant grower. Reduce inoculum by pruning out old canes and cultivating to reduce leaf debris. Several group 3 fungicides, such as Nova, Tilt and Bumper, are registered for control of yellow rust. Apply before symptoms appear.

Comments: This disease is not prevalent in Ontario, although it is common in the Pacific Northwest. Yellow spots on the upper leaf surface can help growers distinguish between yellow rust and late leaf rust, which does not produce symptoms on the upper leaf surface.

Figure 3. *Orange rust on black raspberry.*

(***Source****: Ontario Berry Grower, November 2015*)

Table 1. Rust diseases of raspberry and black raspberry

Common Name (Scientific Name)	Crops Attacked	Alternate Host	Symptoms	Control
Late leaf rust (*Pucciniastrum americanum*)	Red and purple raspberry (common in Ontario)	White spruce	Orange powdery spores on lower leaf surface, and on fruit. No distinct spots on upper leaf, but eventual necrosis.	Crop sanitation, trellising and pruning to assist with quick drying. Remove nearby white spruce.
Orange rust (*Arthuriomyces peckianus Gymnoconia nitens*)	All raspberry species except red raspberry	None	Bright orange waxy pustules develop on the lower leaf surface, later becoming bright orange and powdery.	Remove infected plants. This disease is systemic in plants.
Yellow rust (*Phragmidium rubi-idaei*)	Red raspberry (not common in onatario)	None	Yellow pustules on upper leaf surface of young leaves. Orange powdery spores on lower leaf surface turning black in late summer.	Crop sanitation and use of registered Group 3 fungicides in spring and early summer.

Making A Comeback- Revisiting Raspberry Crown Borer Control

Pam Fisher, Berry Crop Specialist, OMAFRA

Raspberry crown borer (RCB) is a sneaky pest that attacks raspberry crowns. Larvae tunnel and feed in the crown for up to two years. As a result, fruiting canes are weakened, and primocanes become scarce and spindly over time (Figure 1). Because these symptoms could have a variety of causes, raspberry crown borer is often overlooked.

Figure 1 *- RCB - damage to field*

In the past, growers have managed this pest with a well-timed spray of an organophosphate insecticide directed to the base of the cane in late fall or early spring. However, due to the phase-out of diazinon in 2016, we can expect raspberry crown borer will be making a comeback. Growers will be using new methods to control this pest.

The first step in control is to recognize raspberry crown borer damage before it causes significant damage. In spring, watch for wilting or dying primocanes and areas of weak growth. By early summer, affected canes will pull out easily from the crown with a sharp tug. In late summer and early spring you might see canes with CN-tower shaped swellings near the base of the cane. But to accurately diagnose raspberry crown borer you need some gloves, a spade, and a pair of clippers. Dig up the crown, clip off the canes and cut through the crown to look for frass, larvae and tunnelling (Figure 2).

Figure 2 *- RCB larva and frass in crown*

In late summer, watch for RCB adults (Figure 3) and eggs (Figure 4) to help optimize control. Researchers have been unsuccessful in developing a stable pheromone for field use. However adult RCB are active on sunny days and can be found on foliage in August and September. Eggs are also visible on the underside of leaves. Figure 5 shows the raspberry crown borer life cycle, depicted in an Agriculture Canada Publication in the 1960"s.

Figure 3 *- RCB adult*

Figure 4 *- RCB egg (photo by Carolyn Teasdale)*

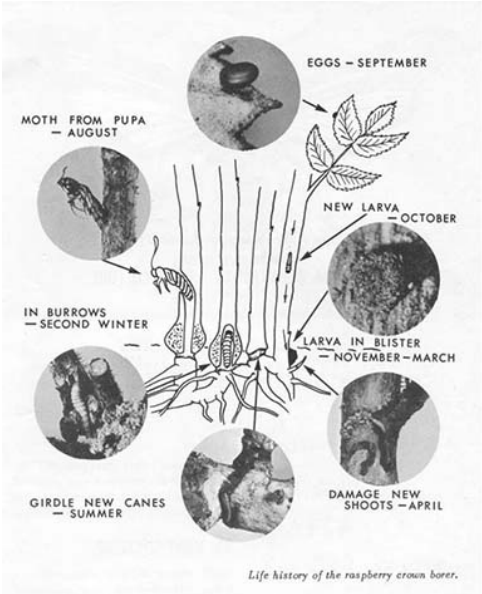

Figure 5 *- RCB life cycle (photo by Agriculture Canada)*

Altacor insecticide is registered for raspberry crown borer. This product will control hatching eggs and young larvae . Apply the first spray in late August or early September when eggs are hatching, ensuring good coverage of the whole plant. Follow this with a second application in early to mid- October, using a high volume spray which includes the base of the cane to target young larvae. Prune old canes close to the ground and control weeds in the row to help discourage further crown borer attack. In future, degree day models, pheromones, mating disruption, and biocontrols could be developed for crown borer management. However, this pest will likely make a resurgence before research dollars are directed towards improved control. (***Source**: Ontario Berry Grower, Nov. 1, 2016*)

BLUEBERRY

Phomopsis Twig Blight of Blueberry

Daniel J. Anco and Michael Ellis, The Ohio State University

Phomopsis twig blight may be the most common canker disease of blueberries. This disease has the potential to severely decrease yields, particularly on susceptible varieties. Losses result from premature ripening of the fruit, decreased productivity due to death of stems or entire plants, and rotted fruit.

Symptoms

Shortly after green tip, symptoms become visible. Infected buds become brown and die. A necrotic, brown lesion forms on the twig around the blighted bud, and the sunken necrotic area spreads as the disease progresses (figure 1). On stems, Phomopsis twig blight symptoms may be confused with symptoms of *Fusicoccum* canker (figure 2). Wounds that are infected can result in girdling cankers that kill the entire twig. Later in the growing season, leaf spots may develop (figure 3). Stems that are infected may wilt during summer, causing their leaves to change color (red or brown) prematurely (figure 4). A fruit rot can also develop at harvest. Infected fruit become very soft and split easily.

Figure 1. *Necrotic tissue spreading from an infected bud through a twig.* Courtesy of P. Wharton, University of Idaho, used with permission.

Figure 2. *A blighted twig caused by Phomopsis vaccinii*. Courtesy of W. Cline, North Carolina State University, used with permission.

Figure 3. Leaf spot symptoms caused by *Phomopsis vaccinii*. *Courtesy of A. Schilder, Michigan State University, used with permission.*

Figure 4. Flagging (rapid drying) of an infected twig with prematurely reddish to brown colored leaves. *Courtesy of A. Schilder, Michigan State University, used with permission.*

Causal Organism and Disease Cycle

Phomopsis twig blight is caused by the fungus *Phomopsis vaccinii*. The fungus survives the winter in dead or infected twigs. From bud break to bloom, fungal spores ooze from small black structures (pycnidia) on previously infected twigs and are spread by rain or overhead irrigation. These spores infect flower buds, and the fungus spreads into and through the twig to other flower and leaf buds. The fungus does not, however, grow into and infect older wood.

Control

Prune and destroy infected twigs during the dormant season. This removes sources of inoculum and limits availability of wounds as points of infection during the growing season. If pruning is done during the growing season, avoid unnecessary wounding.

Avoid overhead irrigation in order to limit spread of the pathogen.

The use of resistant cultivars can help control Phomopsis twig blight, and several resistant cultivars are available, including Bluetta and Elliott. Rubel is moderately resistant. For a list of cultivars commonly grown in the Midwest with resistance to this disease or others, consult Bulletin 861, *Midwest Small Fruit Pest Management Handbook*.

A delayed dormant application of lime sulfur or sulforix after leaf buds begin to break can be effective in reducing early season inoculum and is an important spray if the disease is established in the planting. For the most current spray recommendations, commercial growers are referred to Bulletin 506-B2, *Midwest Commercial Small Fruit and Grape Spray Guide,* and backyard growers are referred to Bulletin 780, *Controlling Diseases and Insects in Home Fruit Plantings.* These publications can be obtained from your local OSU Extension office or OSU Extension's online bookstore at estore.osu-extension.org.

Harvest fruit often enough, at least every 7 days, to prevent overripe fruit from remaining on the bush. This reduces loss from the fruit rot stage.

(***Source**: Ohioline Bulletin HYG-3214*)

Integrating Herbicide and Cover Crop Management for Cost Effective Results

Kevin Martin, Penn State Extension

We are starting to see increases in herbicide management costs [Tang, et al, 2014]. Some of you know all to well that 1-2 applications of herbicide do not provide adequate control of weed competition in vineyards. Complicated tank mixes that cost over $100 per applied acre are not a practice I would consider sustainable. Some growers, though, would disagree.

The cost of materials is not increasing substantially. More frequent applications and a need to apply better materials more often is driving costs up. The majority of herbicides used by growers are off patent these days and available almost exclusively in generic form. A third or even fourth vineyard pass, could be sustainable. The cost of materials and materials selected needs to be looked at comprehensively with the number of passes required to obtain adequate control.

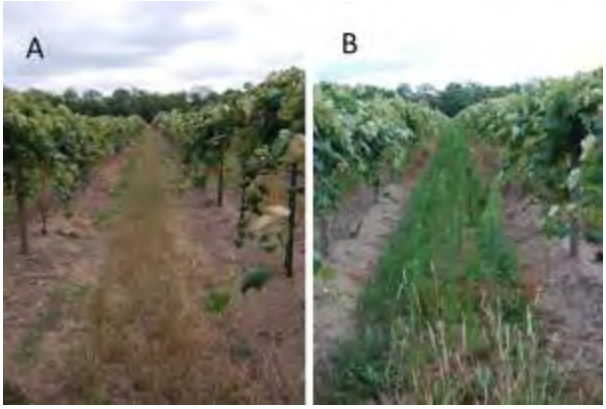

Figure 1: *Side by side cover crop trial in a commercial vineyard showing cover crop suppression of Horseweed (Marestail) pressure. Image B is the control and shows significant Horseweed (Marestail) pressure. Photos by Luke Haggerty, LERGP*

There may be a potential for cover crops to improve the effectiveness of weed control [Bowman, et al, 2012]. We can observe this not just in row middle management, but to a lesser extent under trellis management. Cover crops do not offer the potential to reduce herbicide applications in situations where growers are applying between 1 and 3 per year. Rather, they offer an option to improve results without adding an additional pass. This is because cover crops can reduce vine size when row middle competition is undesirable. In 2016 field trials we observed smaller berry size when cover crops were planted in the late summer of 2015 and were not terminated before June 1, 2016. Particularly where hard to control species get established, some growers have added a late summer or fall application to bring their total number of herbicide application to 4-5. In this scenario, the right cover crop mix offers the potential of superior control with one less pass. Cover crops do require some form of termination (usually chemical). By selecting the right species, a low rate of round-up may offer excellent row middle control.

Figure 2: *Under vine cover crops in a commercial vineyard. Photo by Suzanne Fleishman, a previous graduate student that worked with Dr. Michela Centinari*

Cover crop mixes being trialed are similar in cost to an herbicide application. Low-end rye grass and radish blends are comparable to many post emergent row middle applications. Higher end seed mixes with oats, more radishes or even buckwheat range between $12 and $15 per seeded acre in materials. Legumes increase costs but potentially reduce fertilizer use[Bowman, et al, 2012]. Easy to kill hybrid crimson clover complicates the economic analysis. It may reduce urea applications by 50%, but could be more difficult to grow. Understanding effective seed mixes, their primary benefits and potential secondary benefits will be key to the success of moving cover crops into perennially systems in a cost-effective (saving) way. Regional differences in seed prices also complicated the matter. One of our primary suppliers of cover crop seeds in the Lake Erie Region is Ernst Seed Co. 2016 prices were used to calculate the cost of various seed mixes used in trials.

LERGP, led by Luke Haggerty, is taking an integrated look at cover crops in Concord vineyards. As he observes benefits, I'll help quantify them. There is a lot we still do not know. While preliminary results show promise for increasing economic sustainability where

herbicide program prices are spiraling upward, a few years' worth of data will allow us to clearly observe measurable benefits in herbicide programs. Right now, it just seems like there are less weeds and more cover crop in row middles that have been seeded.

References

Bowman, Greg, Craig Cramer, and Christopher Shirley. *Managing Cover Crops Profitability*. 3rd ed.: Sustainable Agriculture Research and Education. *SARE*, July 2012, http://www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition Accessed 3 Nov. 2016. pp. 394.

Id. At 122 – 124.

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(***Source**: PA Wine & Grapes U Blog, Nov. 4, 2016*)

How Does Delaying Spur-Pruning To The Onset Or After Bud Burst Impact Vine Performance? Insights From Recent Studies

By Michela Centinari

Now that harvest is finally over and wines are tucked away in the cellar, it is time to prepare for the next year. One of the first concerns that many growers feel in a new growing season is that worry of spring frost and the associated potential risk of vine injury. In the spring of 2016, for example, an unusually warm March was followed by a very cold start to the month of April, which resulted in damaging frost incidences in some vineyards of the Mid-Atlantic region.

Susceptibility to frost injury increases with advanced phenological growth stage [1], therefore, growers and scientists have explored different techniques for delaying bud burst of grapevines to increase the chance of avoiding spring frost damaging events. Vegetable-based oils (e.g., Amigo oil) can be sprayed on the canes/buds during the winter to slow down bud de-acclimation and delay the resumption of vegetative growth in the spring [2; 3; study at Penn State]. Delaying pruning until late winter can also be used to delaying bud burst of vines growing in frost prone areas.

Canes of cordon-trained vines can be pruned to 2-3 node spurs late in the winter or even when apical buds begin to open to delay bud burst of basal buds. Due to the strong apical dominance of *Vitis vinifera* cultivars, apical buds of an unpruned cane tend to burst first, which inhibits development and growth of median and basal buds [4] (Figure 1).

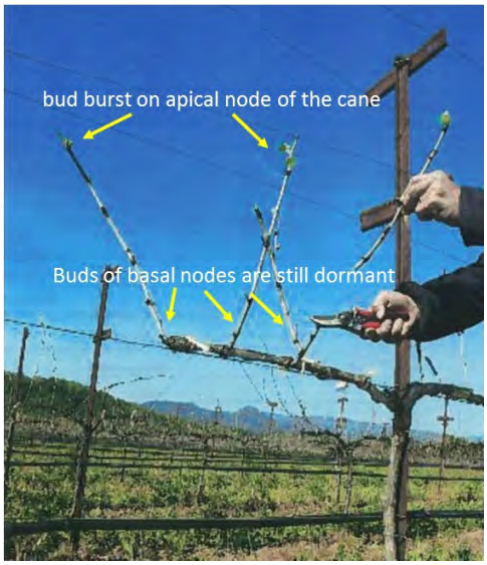

***Figure1.** Spur pruning vines while the apical buds are bursting. Photo source: McGourty, The case for double—pruning. Practical Winery &Vineyard.*

What may happen if we wait until the onset of bud burst or even later to prune the vines?

Spur-pruning the vines when the apical buds of un-pruned canes are already open may not only delay bud burst of the basal nodes, but may also postpone other phenological growth stages such as bloom, fruit-set, or even veraison with potential consequences for vine yield and fruit chemical composition at harvest [4].

I recently read two articles on this topic published in the *American Journal of Enology and Viticulture* (Post-bud burst spur-pruning reduces yield and delays fruit sugar accumulation in Sangiovese in central Italy [5]) and in *Frontiers in Plant Sciences* (Phenology, canopy aging and seasonal carbon

balance as related to delayed winter pruning of *Vitis vinifera* L. cv. Sangiovese grapevines [6]).

The studies described in these articles aimed to assess *if* and *how* delaying winter spur-pruning of Sangiovese vines to the bud swelling stage or later, after bud burst, impacted the annual growth cycle of the vines and its productivity.

The studies were conducted in Italy and the researchers were specifically interested in assessing if vines pruned around or after bud burst exhibited a delay in grape ripening as compared to those pruned during the winter, resulting in lower sugar accumulation and higher acidity in the fruit at harvest. A steady trend of increased warming is, indeed, pushing some Mediterranean grape growing regions toward accelerated ripening [7], which could lead to excessive or overly fast sugar accumulation in the fruit, high alcohol in the wine, unacceptably low acidity, high pH, and also atypical grape flavors and aromas [5].

Although excessive or overly fast sugar accumulation may not be a problem in our region, it's still important to understand if delaying winter pruning to extremes could be used to delay bud burst and reduce risk of frost damage, as well as the impact this practice may have on vine yield, and fruit and wine chemistry. This is a topic of further interest in light of changing climatic conditions and the potential increase of unpredictable weather patterns like early spring warming and late spring frosts [8].

Below, I will summarize the two previously mentioned studies emphasizing results which can be of interest to wine grape growers in our regions.

Both studies were conducted on mature Sangiovese (*Vitis vinifera* L.) vines. The first study was established in a commercial vineyard in central Italy, whereas the second study was conducted on vines growing outdoors in 10-gal pots at a research station in northern Italy. Groups of vines were assigned to different pruning treatments. Vines assigned to the standard grower practice treatment were spur-pruned to 2 basal nodes during the winter when **buds were dormant.** Vines assigned to the other treatments were spur-pruned at more unusual times from the **bud swelling** to **full bloom** (Figures 2 and 3A).

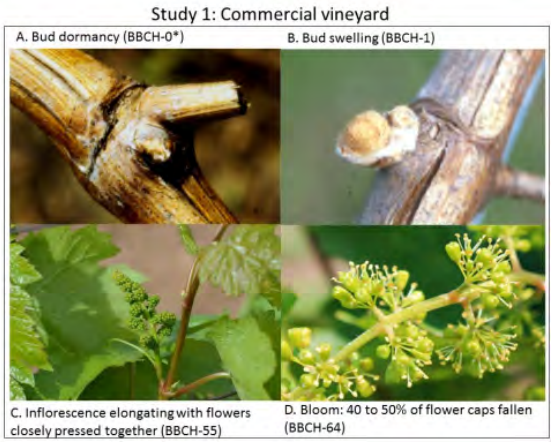

Figure 2. *Phenological growth stages of the apical shoot at the time vines were pruned to 2-node spurs. *BBCH scale was used to assess phenological stages [9] in studies described below.*

Did delaying vine spur-pruning to after bud-burst consistently delay the whole annual growing cycle?

Basal buds of Sangiovese vines spur-pruned when apical shoots were about 1.6″ long (called *late pruning* treatment; Figure 3A central panel) burst 17 days later than those of vines pruned in the winter, when buds were dormant (called *standard pruning* treatment; Figure 3A left panel). Pruning the vines even later, when apical shoots were about 4.7-5.5″ long (called *very-late pruning* treatment; Figure 3A right panel) extended the delay in bud burst to 31 days as compared to vines pruned in the winter Unfortunately no phenology data were recorded for vines pruned at bud swelling stage (study 1).

The delay in phenological growth stage decreased over the season. For example, *late-pruned* and *very-late pruned* vines reached veraison 3 and 13 days, respectfully, after those pruned in the winter (Figure 3C). Shoots of vines pruned after bud burst developed later in the season under higher air temperature than those of vines pruned during the winter. Greater air temperature may have helped shoots of *late-* and *very-late pruned* vines to reach bloom and veraison in fewer days as compared to those pruned earlier [6].

By harvest the delay was fully off-set for the *late-pruned* vines: they reached the sugar level set for ripening (~ 19 ºBrix) three days before those pruned in the winter. Grapes of v*ery-late pruned* vines reached 19 ºBrix 6 days after those pruned in the winter.

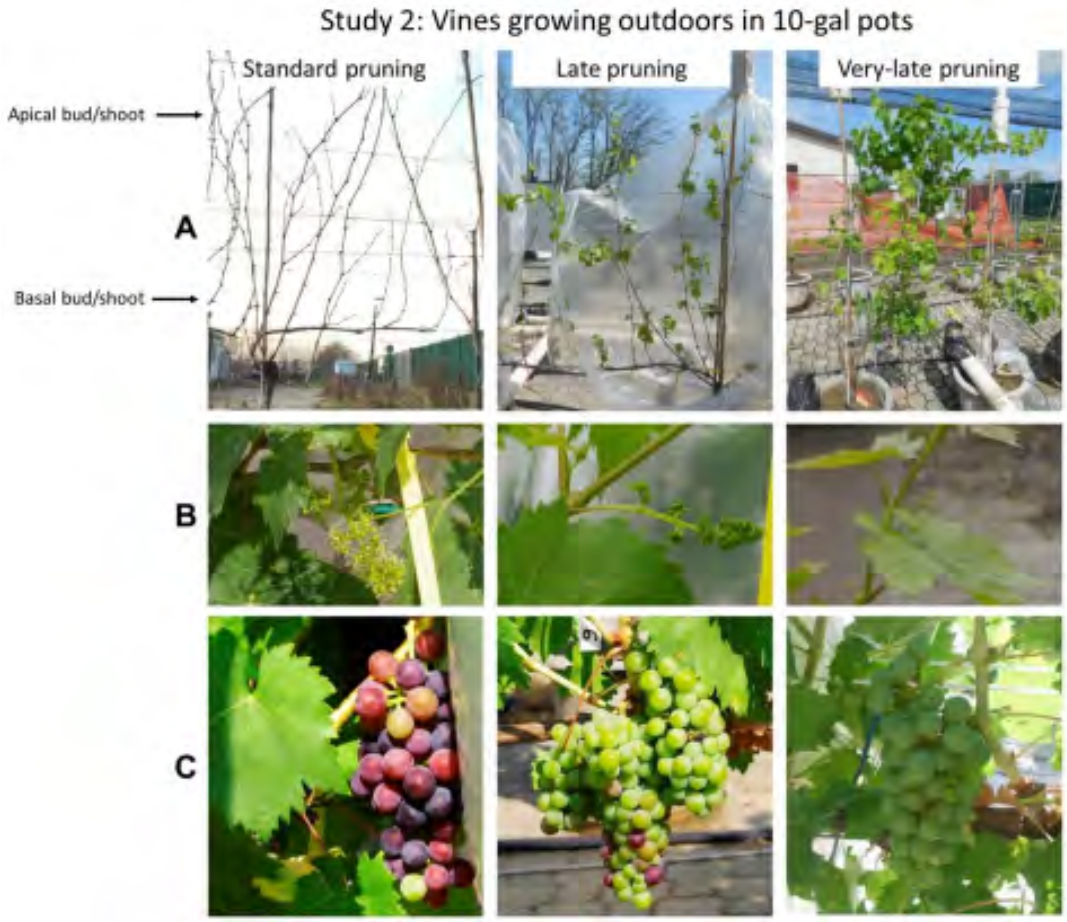

Figure 3. *Vine appearance at the time of pruning (A) and at bloom (B) and veraison (C). Note: standard winter pruning was taken as a reference for bloom and veraison. Photo courtesy Dr. Stefano Poni (professor of Viticulture, Universita' Cattolica del Sacro Cuore, Italy).*

Spur-pruning vines after bud burst significantly reduced crop yield compared to standard winter pruning

Vines pruned at bud swelling growth stage had similar crop weight, number of clusters per vine, and cluster weight than those pruned when buds were still dormant. Pruning vines after bud burst, however, reduced yield as compared those pruned during the dormant season. For example, *late pruned* vines (spur-pruned when apical shoots were about 1.6″ long; Figure 3A central panel) had 26% lower crop yield as compared to those of the standard pruning control group (spur-pruned before bud burst). Reduction of crop yield was related to lower cluster weight and lower number of berries per cluster. While there is not a clear explanation on why *late-pruned* vines had fewer berries per cluster, several hypotheses were presented including increased production of gibberellins during the initial flush of growth in the *late-pruned* vines [6].

Waiting even longer to prune the vines had a detrimental effect, reducing not only cluster weight but also the number of clusters per vine. For example, vines pruned to two basal nodes when the apical shoots were already flowering had no crop at harvest. When vines were pruned so late the basal shoots did not develop flowers and remained vegetative after pruning. I am not sure why any growers would want to wait until bloom to prune the vines, but it's still interesting to see how such a drastic treatment may limit sources of carbohydrates for developing cluster primordia [5].

Although uncertainty still exists, the authors suggested that delaying spur-pruning until after bud burst, but not to extremes, may have the potential for reducing crop yield in high-yielding cultivars such as Sangiovese planted in specific regions of Italy. However, long-term field studies are necessary to assess if it is possible to calibrate winter pruning date for managing yield reductions and/or fruit maturation rate.

Did delaying vine spur-pruning to bud swelling stage or after bud burst consistently impact fruit chemistry?

The effect of the timing of spur-pruning on fruit composition at harvest varied between studies and with

the extent of the pruning delay. For example, Sangiovese vines *late pruned* (apical shoots 1.6″ long) had higher total soluble solids (+ 1 °Brix), total anthocyanins and phenolics than winter-pruned vines. However, vines growing in a commercial vineyard (study 1) and spur-pruned to two basal nodes later in the season, when inflorescences of apical shoots were already swelling (Figure 3C), had lower sugar concentration (-1.6 °Brix) and higher TA (+1.8 g/L tartaric acid) than those pruned during the winter, but at the same time they also had higher anthocyanins and phenolic concentrations. This result suggests that spur-pruning canes after bud burst may decouple the accumulation patterns of total soluble solids and anthocyanins, phenolic metabolites. This could be intriguing for growers trying to delay fruit sugar accumulation and acid degradation, while maintaining wine color, but on the another hand it could also come with a reduction in crop yield, quantified to over 50% in this study [5].

Did delaying winter spur-pruning have negative carry-over effects on the following season?

Pruning vines at the bud swelling stage did not have negative effects on vine growth in the following year. It did not impact bud fertility (number of clusters per shoot) or winter carbohydrate storage, which is important for winter vine survival and following year resumption of growth. However, pruning the vines to two-nodes after bud burst, specifically when inflorescences of apical shoots were already swelling (Figure 3C), reduced bud fertility by 50% in the following year. Those vines were able to recover once standard winter pruning was applied again at the end of the study.

In conclusion:

These studies conducted on Sangiovese vines grown in Italy found that:

- Winter spur-pruning can be applied up to bud swelling without adversely affecting vine yield, grape composition at harvest or bud fertility in the following year.
- Vines pruned after bud burst show pronounced delay in shoot development at the beginning of the season, which increased as the pruning time was further delayed. Under the warm conditions of these studies the delay in phenological growth stage decreased or even disappeared over the season. This could be partially explained by the fact that *late-pruned* vines needed less time than vines pruned during the winter to reach maximum photosynthesis efficiency.
- Delaying spur-pruning to after bud-burst may reduce vine yield, decrease sugar accumulation and bud fertility in the following year.

Delaying winter pruning of vines located in frost prone areas to the onset of bud burst or shortly after that may be used as frost avoidance technique. However, we need to further understand how a delay in shoot development and potentially a shorter growing season (number of days from bud burst to harvest) may impact fruit ripening, yield component, vine over-winter carbohydrate storages and susceptibility to winter cold temperatures, as well as the following year growth. The studies summarized here were conducted in a warm region with a growing season longer than many areas of Pennsylvania. Further research is necessary to corroborate those results under our regional climatic conditions.

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Investigating Forage Radish and Compost as a Means of Alleviating Soil Compaction in Post-Plant Bramble and Blueberry Fields

Mary Concklin, UConn

Long term perennial berry crops (highbush blueberry, brambles) are grown on over two thousand eight hundred acres in New England, of which five hundred eighteen acres are in Connecticut (USDA Census 2012). They generate high value since they are sold almost exclusively to the fresh market. Poor growth leads to reduced production and reduced grower revenue, and is the result of one or several factors including site related issues, soil fertility, soil compaction, plant damage from wildlife, insects and diseases, and abiotic disorders.

One of the factors leading to poor plant performance in established fruit plantings is soil compaction. It is measured as pounds per square inch (psi) using a penetrometer pushed into the soil to a depth of six inches (surface hardness/compaction) and a depth of six to eighteen inches (subsurface hardness/compaction). Root growth is restricted in moderately compact soils with a surface (0– 6 inch depth) penetrometer reading of 125-220 psi, and a subsurface (6 – 18 inches depth) penetrometer reading of 220 to 280 psi. Penetrometer readings greater than 220 psi (surface) and 300 psi (subsurface) are considered severely compacted soils (4).

Compacted soils have reduced pore space which causes a restriction in root growth (2, 15). Blueberry and bramble plants have fibrous root systems that do not easily penetrate compacted soils which can result in reduced plant growth. In addition, compacted soils have been shown to reduce water and nutrient uptake by plants, and in Wisconsin, research has shown potassium uptake is reduced in compacted soils (15), a high demand element that is critical in blueberry and bramble production (9, 10).

As a part of a separate study with Cornell, soils in established berry fields were tested for a number of biological, physical and chemical parameters in 2012. Of the five Connecticut fruit farms participating in that project, four had compacted soils in established berry fields as determined by penetrometer readings, as well as poor production and poor plant growth as determined by the growers.

There is extensive research supporting pre-plant cover crops and incorporation of compost for alleviating soil compaction for annual cropping systems. Research also supports the use of cover crops and incorporating compost in soil to alleviate soil compaction as a pre-plant management tool in perennial crops. Little research has been done using cover crops and compost in a post-plant situation to alleviate soil compaction. (6,7,8,12,15,16)

This study investigated two treatments to alleviate soil compaction in addition to the check: the effectiveness of a forage radish cover crop system; and a surface application of compost. The treatments were applied at three farms: an established raspberry field planted in 2010 on sandy loam soil; and two established blueberry fields, one planted in 2006 on gravelly loam soil, and a certified organic block planted around 1985 on fine sandy loam soil. Treatments were applied within the plant row, and replicated three times at each site, to determine if they would reduce soil compaction. At the raspberry field each rep was 10 feet long for a total of 90 feet. At the two blueberry fields, each rep consisted of 3 bushes for a total of 27 bushes per farm.

There were two requirements for a cover crop for this study – that it winter kill to reduce competition with the berry plants for water and nutrients in the spring as well as the need for herbicide or hand weeding, and that the cover crop be known for alleviating soil compaction. The forage radish, a brassica, is a tender plant that quickly germinates when seeded in the early fall, is killed with low winter temperatures and decomposes in a relatively short time in the spring. It large taproot, often growing to one to two feet, penetrates compacted soils, increases large pore spaces in the soil and decomposes quickly, increasing water and air infiltration and opening soils for greater root penetration. (1,4,11,13,14)

Compost applied to the soil surface will attract soil microbes that decompose the compost and aerate the soil as they move through the soil profile, a process that will increase soil pore space and soil organic matter content over time. (3,5,10) Incorporating compost throughout the root zone provides more immediate results, (7,8) but is not practical in an established berry field due to the shallow root systems of berry plants.

Procedures:

In early September 2013, compost was evenly spread in a 2'-2.5 wide band in the raspberry row, in a 2.5'-3' wide band in the conventional blueberry row, and in a 2' diameter circle around the organic blueberries (grower mows around each plant) to a depth of 2-3 inches. The forage radish was seeded at the rate of 15 lbs. per acre on bare ground in the raspberry and non-organic blueberry plots and through the sod and weed covered mulch in the organic blueberry plot.

Pre-treatment soil penetrometer readings were taken at each treatment at depths of 0-6 inches and 6-18 inches, 5 locations per rep at each depth. All three locations are pick-your-own operations. Yield data was collected by

harvesting all ripe fruit just prior to opening to the public and estimating the remainder.

Soil penetrometer, yield and growth measurements were recorded for each of the next two years. Growth measurements included number of new canes per bush for blueberries and number of canes per ten feet of row for raspberries.

Statistical analysis was conducted looking at differences within and between treatments from years 1 to 3.

Results:
Each location was analyzed separately.

Differences among years within treatments: **Compost** – There were no statistical differences in soil compaction, yield or growth attributed to the compost treatment between years 2013-2015 at any of the three farms.

Radish – There were no statistical difference in soil compaction, yield or growth attributed to the forage radish treatment between years 2013-2015, at any of the three farms.

Differences among years between treatments (comparing the compost to the radish to the check): At the **organic blueberry field** and **raspberry field**, there were no statistical differences when comparing the radish to the compost to the check for yield, plant growth and soil penetrometer readings at surface and sub-surface depths.

At the **non-organic blueberry field**, there was no statistical difference for yield or plant growth. However, there was a statistical difference in soil penetrometer readings at the 0-6 inch depth between the check and the radish treatment in years 2014 and 2015. The compost treatment showed a statistical difference between it and the check at the 0-6 inch depth in 2015. There was no statistical difference between the compost and radish treatments. There were no sub-surface differences between the forage radish, compost and the check.

Conclusions:
The three participating farms had compacted soils prior to the trials based on soil penetrometer readings. Expectations were for reductions in soil compaction after one year with the forage radish treatment, which germinated and grew during the fall before being winter killed. Expectations were for positive impacts on soil compaction from the compost treatment by year two, due to the length of time for it to be broken down by soil microbes.

The lack of differences in soil penetrometer readings between the forage radish treatment and the check plots at the organic blueberry field can be attributed to the difficulty in establishing the radish through the sod and weeds. Although the bushes had wood chips applied around each bush in the spring, by September when the radish was planted, a heavy weed population had taken over the area. Moving the wood chips to get to bare ground for seeding was very difficult. Between the bushes was established sod. Seeding was accomplished by poking holes through the sod and weed cover. Very few radish seeds germinated and grew. The difficulty moving the wood chips also made the compost application to bare soil unattainable. The compost was applied as close to the soil as was possible. The difficulty in applying compost close to soil microbes could explain the lack of change in soil compaction. Additional years may be needed for a positive change.

At the non-organic blueberry field, each blueberry row was wood chipped and weeds were kept to a minimum through the use of herbicides. Moving the wood chips allowed for relative ease in radish seeding and establishment, as well as applying compost to the bare soil surface allowing access by soil microbes. Both treatments worked for surface compaction Additional years may be needed for positive change in sub-surface soil compaction as well as to see significant differences in growth and yield.

At the raspberry field the weeds were at a minimum within the rows. The radish easily established and grew. Longer time may be needed for positive impacts on sub-surface compaction, yield and growth.

Alternatively, there may not be any changes made in the lifetime of the plantings because physical soil properties are hard to change once plants are established. Prior to planting, growers should check soil compaction levels and take corrective measures if needed.

Organic blueberry | Non-organic blueberry | Raspberry

Forage Radish Treatment

Organic blueberry | Non-organic blueberry | Raspberry

Compost Treatment

Vole Management

Mary Concklin, UConn Extension

Voles can destroy fruit trees, grape vines and berry bushes in a single winter. And if they don't kill them with their feeding, they certainly weaken the plants. Rodenticide baits are the most effective means of control although some of you have mentioned in the past you feel that the populations are getting larger with baiting. Now, before the snow flies, is the time to bait. Dr. Alan Eaton, UNH entomologist, has written an excellent vole management publication which can be found at this link, http://extension.unh.edu/resources/files/Resource003424_Rep4893.pdf. In his latest grower newsletter he wrote, "If you use one of the anticoagulants, I strongly recommend that you use some type of bait station. That maximizes the likelihood that the target organisms (usually meadow vole or pine vole) will be killed, rather than many other things. We have two types registered, Diphacinone (Ramik Brown) and Chlorophacinone (Rozol). The Ramik label specifically states the stuff is applied after harvest is complete (including drops), before spring growth, and when 3 days of rain/snow free weather are expected.

Brodifacoum is a second-generation anticoagulant available to people with restricted use permits (for use in and around buildings… not in the orchard), but I STRONGLY ADVISE AGAINST USING PRODUCTS WITH THIS TOXICANT. I think it poses too great a wildlife risk to be used.

Zinc phosphide is the toxicant most commonly used in orchards, and it has almost zero risk of secondary poisoning, because it kills quickly and the material breaks down quickly. But it has a high risk of PRIMARY poisoning…killing an organism that directly eats the bait. So if you plan on using ZnP, minimize the risk of killing non-target organisms by avoiding corn as the bait (birds and others readily spot it and eat it), and avoid broadcasting it on bare spots." (***Source**: CT Fall Wrap-Up. Oct. 30, 2015*)

UPCOMING MEETINGS:

November 1, 2016 – *Maine Course Scaling Up Event*, 10:00 – 3:30. Abromson Center at Univ. of Southern Maine, Portland ME. Co sponsored by University of Maine and Sodexo, Inc. For more information and to register contact The Maine Course Director, at 207.298.2149 or maeve.mcinnis@sodexo.com or go to: https://mainecoursebysodexo.com/2016/09/23/register-for-the-scaling-up-events/.

November 2, 2016 - *Managing Phosphorus in Organic Residuals Applied to Soils* 8:45-4pm. Holiday Inn, 265 Lakeside Ave.Marlborough, MA 01752. Approval has been requested for the following professional certifications: CGCS, CSFM, MCH, MCLP, and AOLCP. For more information contact: Kelly Kraemer, 413-545-5221, kkraemer@umass.edu or visit: https://www.regonline.com/phosphorus

November 3, 2016 – *Maine Course Scaling Up Event*, 10:00 – 3:30. Wells Conference Center, University of Maine, Orono. Cosponsored by University of Maine and Sodexo Inc. For more information and to register contact The Maine Course Director, at 207.298.2149 or maeve.mcinnis@sodexo.com or go to: https://mainecoursebysodexo.com/2016/09/23/register-for-the-scaling-up-events/.

November 4, 2016 – *2016 MA Farm & Seas to School Conference***.** Double Tree Hotel, Leominster, MA. For more information or to register, go to: http://www.massfarmtoschool.org/conference/.

November 7-9, 2016 – *2016 Southeast Strawberry Expo*, Hilton North Raleigh/Midtown, Raleigh NC. For more information or to register, go to: http://ncstrawberry.com/.

November 9, 2016 – *UMass Extension Food Safety Workshop – Product Development: Beyond the Concept*. 9:00 – 5:00. Franklin County CDC, Western MA Food Processing Center, 324 Wells St. Greenfield, MA . Cost: $200. In partnership with the regional processing centers in Massachusetts, this 1-day, content-filled course will have food safety and product development information needed to successfully launch a new food product. For more information and to register, go to: https://app.etapestry.com/onlineforms/FranklinCountyCommunityDevelo/ProdDevCourse.html

November 9-10, 2016 - *Northeast Greenhouse Conference & Expo*. Holiday Inn, Boxborough MA For more information and to register see www.negreenhouse.org or contact: Delaney Meeting & Events, 802-865-5202.

November 13, 2016 – Fruit Production for Small Scale Farming, 9:00am-12:00pm, Fairfield County Extension Center Bethel, CT Contact: jiff.martin@uconn.edu

November 15-18, 2016 – *Better Process Control School***.** 243 Chenoweth Laboratory- Conference Room, UMass, Amherst, MA. This course will train food processors principles of acidification, and container closure evaluation programs for low-acid and acidified canned foods as required by FDA regulations in CFR 108, 113 and 114. The purpose of these regulations is to help ensure the safety of consumers by training producers. This course will satisfy both USDA and FDA requirements. For more information see: http://ag.umass.edu/events/better-process-control-school-umass-amherst-campus-amherst-ma-november-15-18-2016.

November 17, 2016 – *Growing in Tunnels Conference*. Tolland County Extension Center, Vernon CT. For more information contact MacKenzie.White@uconn.edu, 860-875-3331.

November 29, 2016 – *The CT Pomological Society Annual Meeting*, 8:00 AM, Gallery Restaurant, Glastonbury, CT Contact: Erica Teveris, 860-690-2904 or Mary Concklin, mary.concklin@uconn.edu 860-486-6449

November 30 – December 2, 2016 – *New England Grows*, 8:00 am – 4:00 pm. Boston Convention & Exhibition Center. For more information and to register, go to: http://www.newenglandgrows.org/

December 4-5, 2016 – *North American Berry Conference***.** DeVos Place Convention Center and the Amway Grand Plaza Hotel, Grand Rapids, MI. For more information and to register, go to: https://www.regonline.com/registration/Checkin.aspx?EventID=1886571

December 6-8, 2016 – *Great Lakes Fruit & Vegetable Expo*. DeVos Place Convention Center and the Amway Grand Plaza Hotel, Grand Rapids, MI. For the full program and registration information, go to: http://www.glexpo.com/ .

Jan. 9 – *CT Vegetable & Small Fruit Growers' Conference*. 8:00 AM, Maneeley's Conference Center, South Windsor, CT. Contact: MacKenzie.White@uconn.edu, 860-875-3331.