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SHORTS

This is the last issue of Massachusetts Berry Notes -

Announcing UMass Berry Notes transition to combine with UMass Healthy Fruit: Beginning in 2019 the monthly *Berry Notes* newsletter will merge with the sister publication *Healthy Fruit*. This change will allow for more frequent and locally focused information delivery. Berry information will appear in *Healthy Fruit* each week during the growing season and will focus on brief timely topics and pest alerts that link the reader to more in-depth information online. There will continue to be periodic releases of information during the ‘off-season’ with meeting notices and other relevant topics. *IPM Berry Blasts* will continue in parallel with *Healthy Fruit* for 2019 and then be fully merged with that publication as a comprehensive fruit e-newsletter from the UMass Extension Fruit Program.

Questionnaire on Language Barriers on the Farm - Having trouble communicating with Spanish- or other non-English-speaking staff or crew? The goal of this questionnaire is to **document existing challenges** and to **develop farm-related language resources** such as factsheets, vocabulary and phrase guides, short videos, or workshops that **improve communication and/or mitigate problems on vegetable and fruit farms in the Northeast**. The survey is open to anyone who works on, manages, or owns a farm where multiple languages are spoken and should take about 8 minutes of your time, we appreciate your contribution. Please direct any questions to Sue Scheufele sscheufele@umext.umass.edu or call 413-577-3976. The survey should take an average of 8 minutes to complete. Thanks for your input.

Announcing the FruitGuys Community Fund 2019 Grant Cycle for Small Farm Sustainability – Each spring, The FruitGuys Community Fund provides grants of up to \$5,000 to small American farms for sustainability projects that have large positive impacts on the environment, local food systems, and farm diversity. This funding helps independent farmers become community leaders who serve as models of self-reliance and land stewardship. Find out more at: <https://fruitguyscommunityfund.org/announcing-the-fruitguys-community-fund-2019-grant-cycle-for-small-farm-sustainability/>

STRAWBERRY

Overwintering Strawberries

Understanding the timing of fall mulch application and spring removal for best success

Laura McDermott, Cornell Cooperative Extension, Washington Cty.

Successful overwintering of strawberries is a tricky business, and not giving it enough consideration can result in poor yield the following year.

Strawberries are perennial, and like most perennial plants, they begin to go dormant as day length diminishes and cold temperatures set in. During this period of cold acclimation the plants are still very active—in fact, this is when the fruit buds are being developed for the following season’s crop. You will see changes in the appearance of the berry plants as cold acclimation advances. Leaf development stops, the leaf petioles become horizontal, and the plant appears to flatten out, and older leaves turn red.

The challenge with cold acclimation is that plants don’t become hardy until cold acclimation is completed. Hardiness is effectively reached when freezing temperatures exist for 2 to 3 days—so not just night minimums, but a good hard cold spell. Ideally, that cold would continue for the duration of the winter. Hardiness allows plants to resist low-temperature damage. Strawberry plant hardiness—or ability to resist cold damage—continues to increase as the days get shorter.

Photosynthesis is also required for cold acclimation to occur, so plants that are mulched before these environmental conditions have been met will not be fully winter hardy. Strawberry plants are not as tolerant of cold temperatures as other perennial fruit crops even when fully acclimated. Variation in production systems like raised, plastic mulched beds further complicates a seemingly easy task.

Cold injury appears in the spring as either fully dead plants or, more likely, very weak plants. The crown tissue browns. Temperatures in the single digits can kill crown tissue, but even temps in the mid-teens can cause fewer flowers and fruit, if those temperatures occur while tissue is in a non-dormant phase.

This is where mulch comes in. Mulch mimics snow, which is a great insulator against cold. Mulch prevents crown desiccation from wind, moderates soil temperatures, and prevents freeze-thaw cycles that can damage plant roots and lift crowns out of the soil. Research suggests that using soil temperature as your timing guide is the best way to plan for mulch application. When soil temperature drops to 40°F or below, after three hard freezes (this usually happens between mid-November and mid-December), apply mulch. Mulch should be applied at 2.5 to 3.5 tons per acre and should be an evenly distributed depth of 2 to 3” thick after it settles.

What type of straw? Straws from wheat, oats, rice, or Sudan grass can be used—just be sure the straw is free from weed seeds, and don’t use straw that was treated with glyphosate at harvest, as strawberry plant injury has been reported when the straw was treated close to the date it was baled. Straws coarser than Sudan grass and hay are not recommended, as they tend to mat down and trap water during the winter, which can damage strawberry crowns. Strawberry growers can produce their own straw, often cutting the straw before the grain seed is viable. If grain seedlings become a weed problem, apply sethoxydim in the spring.



Figure 1. A round bale buster being loaded prior to straw mulch application at Hand Melon Farm in Greenwich.



Figure 2. Strawberry field with heavy overwintering row cover. Note the rocks that are weighing down the overlapping edges of cover.

Raised beds complicate things. Raised beds can be at least 5°F colder than flat beds, but mulching overcomes most of this negative effect. An additional challenge is that the berry cultivars grown in raised beds are sometimes not as winter hardy as traditional June-bearing varieties.



Figure 3. Lighter-weight row cover over strawberries that have been successfully overwintered with straw mulch at Stanton's Feura Farm in Fuera Bush. The mulch has been raked back and the row cover applied to provide frost protection when blossoms appear. (Photos courtesy of Laura McDermott.)

There are two methods that have proven successful for growers using raised beds covered with black plastic mulch.

1. Floating row covers, like the heavyweight Typar 518 (1.25 oz/yd² or 42 g/m²) can be used instead of straw. Row covers should be applied on a calm day using the same soil temperature guides as with straw mulch. The edges should be anchored with rocks or sand bags and then covered with soil to prevent the fabric from becoming a sail during the winter. Many growers have reported that the combination of black plastic lined beds, with a floating row cover, provides adequate winter protection, even in colder regions of the northeastern United States.

2. The second method requires straw mulch applied at a heavier rate than in a flat field situation. It's important to provide enough straw so that if it slides off the top of the bed into the row alleys, there is still some straw left to protect the crowns. The rate will vary with the height of the beds, but usually it requires a minimum of 4 tons per acre of straw in a raised bed system.

Many growers are experimenting with combining straw and row covers, or using double layers of row covers. Whatever the method you choose, make sure that you are timing the application properly by using soil temperature as your guide.

Proper timing of mulch removal is critical. This past spring, the weather was cold and cloudy for most of March and into April. The concern over bloom protection in frost events (admittedly the worst job in farming) led growers to keep mulch on berry plants far too long, resulting in many poor-looking berry plantings. Keep in mind that unlike deciduous perennials, strawberries still have leaves during their dormancy. That results in a very low level of respiration that occurs even during the winter—but as air and soil temperatures warm, and day length increases, the plants move out of dormancy and start growing. They have received sufficient chilling and they are ready to go!

For overall success, growers should remove mulch when soil temperatures reach 40 degrees, or they should plan to do it by early April in our region. Leaving mulch on the plant well into April results in crown rot and starved plants that don't bounce back in time for harvest. This situation is one reason why growers have moved to using row covers for mulching. Row covers allow some light and the plants can start growing a bit earlier than they might with a heavy straw cover. Straw mulch can be raked off by hand or modified hay rakes have been specifically designed for the purpose.

"The challenge with cold acclimation is that plants don't become hardy until cold acclimation is completed. Hardiness is effectively reached when freezing temperatures exist for 2 to 3 days—a good hard cold spell."

What about fertilizing plants after mulch is removed?

If plants look very stressed, or have obvious winter injury or lots of deer browse, a light fertilizer application might be appropriate. Research results indicate that nitrogen rates above 30 lbs/acre applied in the spring will push plant growth at the expense of fruit production. Calcium nitrate is absorbed well in cold soil situations, and potassium will be pulled up through the plant as it transpires. Nitrogen rates ranging from 5 to 15 lbs of actual N per acre have been seen as appropriate at this early stage.

Other factors that impact overwintering success include deer browse and diseased plants. Autumn deer browse is a serious problem in our region. Deer fencing is the only consistently effective way to ensure that deer don't get into your strawberries. Applying mulch earlier than required is not a good way to minimize deer browse.

Strawberry plants with serious leaf spot infections have been shown to have significantly poorer bud development in the fall and thus lower yield in the spring. There is some indication that these plants are more susceptible to winter injury, compounding the loss the following year. (**Source:** NYS Berry Growers Association News, Issue 12, December 2018)

Strawberry Variety Review

Courtney Weber, Cornell

The most critical aspect of establishing a healthy berry planting is obtaining high quality planting stock that has a vigorous root system and is free from disease and insect pests. The plants should be obtained from a reputable nursery that participates in a certification program to ensure plants are free from diseases such as viruses and root diseases. Mother plants or stock plants derived from tissue culture for starting propagation fields provide the best source of disease and pest free plants. Plants should be ordered well in advance of planting to ensure an adequate supply the desired varieties and plant sizes.

Strawberries are one of the most variable and temperamental of the fruit crops and the choice of varieties is extensive because individual varieties are often adapted to a relatively small growing region. The most commonly grown varieties in the northeastern U.S. are June-bearing types and new varieties are constantly being developed. Most varieties have weaknesses so growers are advised to try new ones on a limited scale to determine how they will perform in each situation.

VARIETY DESCRIPTIONS

Early Season

AC Wendy (Nova Scotia) produces large blocky/conic fruit with very good quality and flavor and higher yields than most early season varieties. Ripening tends to be uneven leaving white tips and/or shoulders. Establishment of new plantings has been uneven. It is susceptible to leaf spot late in the season.

Annapolis (Nova Scotia) is a large fruited early season variety. The fruit is pale red and soft with good flavor. Suitable for local retail. It yields well. It is susceptible to powdery mildew and Verticillium wilt.

Daroyal (France/Spain) produces large, blocky fruit in the Honeoye season. It is new to the U.S. and little information is available at this time.

Earliglow (USDA, MD) is still considered the best tasting berry around. Primary berries are large and attractive and are suitable for retail or wholesale. Berry weight drops off quickly after the primary berries and yields are relatively low. It is susceptible to powdery mildew after harvest.

Evangeline (Nova Scotia) fruit is long conical in shape with a pronounced neck and generally small with low yields. The interior is pale, and it is susceptible to red stele. The fruiting laterals are stiff and upright which keeps the fruit off the ground and clean.

Honeoye (Cornell University, NY) has reigned as the yield king for many years and produces an abundance of large, attractive, firm, berries that are suitable for all markets. Closer to an early mid-season, the look of this berry sells

it, but taste is the major drawback as it can be tart and can develop disagreeable aftertastes when over ripe or in heavy soils. It is susceptible to red stele disease but is manageable.

Itasca (MNUS 138, University of Minnesota) is a cross between Seneca and Allstar. It fruits early to early-midseason in New York. The fruit is larger than that of Annapolis, conic to blunt wedge shaped. Fruit flesh is orange-red with an average to good flavor. Itasca is resistant to five races of red stele, and its foliage is highly resistant to mildew.

L'Amour (Cornell) produces very attractive heart shaped berries with bright red color. The fruit has a very good, aromatic flavor with good eating quality. The plants are vigorous and disease resistant and remain productive for many years. The fruit is larger than most early season varieties.

Northeaster (USDA, MD) was billed as a replacement for Earliglow and out performs it in all ways except flavor. Yield is higher and fruit size and attractiveness are equal to Earliglow but the flavor is unusual. The grape Kool-Aid like aftertaste can be a turn off to many customers.

Sable (Nova Scotia) is slightly earlier than Earliglow and is equal or better in flavor. Unfortunately it lacks fruit size and firmness. This variety is only suitable for direct retail and u-pick operations. Frost damage can be a problem because the flowers open very early.

Mid-Season

Brunswick (Nova Scotia) has fruit weight and yield similar to Honeoye. However, it has a squat, round shape and tend to be dark and bruise easily. The flavor is good but can be tart when under ripe.

Cavendish (Nova Scotia) is a high yielding, high quality berry in a good year. However, high temperatures during ripening can cause uneven ripening that can be a real problem.

Chandler (University of California) is a standard southern variety grown for wholesale markets in plasticulture. High yields have been experienced throughout the Carolinas and California. Not well suited for planting north of the mid-Atlantic region due to lack of winter hardiness. Chandler is also susceptible to anthracnose disease.

Darselect (France) is a large fruited, high yielding variety. The berries are attractive and bright red with a long conical shape. The flavor is very good. However, it tends to be soft. It is susceptible to powdery mildew, which can be a problem in areas with morning fog.

Elsanta (Netherlands) is one of the most widely planted varieties in northern Europe. It is June-bearing with high yield potential. Fruit is firm and aromatic. It is susceptible to red stele, anthracnose, and Verticillium wilt.

Herriot (Cornell University, NY) is a new mid-season variety from the Cornell University breeding program. It produces large, bright red fruit that are uniformly conic in shape. The fruit is firm with good flavor. The plants renovate better than Jewel and are disease resistant.

Jewel (Cornell University, NY) continues to be the favorite in this season. The high quality berries are large and attractive with good flavor. Yields are moderate. On a good site, it's hard to beat. It is susceptible to red stele and can have vigor problems in poor or cold sites.

Kent (Nova Scotia) produces medium sized berries with very good yield, especially in new plantings. Hot weather can cause skin toughness. It is very susceptible to leaf spot and scorch and to angular leaf spot. It is very sensitive to Sinbar herbicide. It does not do well in hot weather.

L'Amour (Cornell University, NY) is an early mid-season type with excellent fruit quality. Berries are bright red and firm but not hard, with excellent eating quality and flavor. Fruit is long round conical with a fancy calyx, which makes them very attractive. No significant disease or insect problems have been noted to date.

Mesabi (University of Minnesota) is a very high yielding berry with large berries and good flavor, but does not store well. It is resistant to red stele and tolerant to leaf diseases and powdery mildew.

Raritan (Rutgers University, NJ) is productive with the fine taste of an heirloom strawberry. Raritan is very flavorful. Its small, deep-red berries are easy to pick. Plants are susceptible to a wide range of diseases.

Sapphire (University of Guelph, Ontario) is a late mid-season variety with bright red and large berries. It is reported to be tolerant of the herbicide Sinbar (terbacil).

Late Season

AC Valley Sunset (Nova Scotia) produces large conic fruit into the late season. The conic fruit tends to be a bit rough in shape but still attractive. As with all late season varieties, tarnished plant bug can become a problem and extra care at renovation is warranted.

Allstar (USDA, MD) is good yielding, high quality variety with good flavor. Unfortunately, the color is pale to orangish and is unacceptable to an uninformed consumer.

Cabot (Nova Scotia) produces impressive berries. Average fruit weight is larger than any variety currently available. Primary berries often top 40-50 g. The color can be pale throughout the berry and primary berries are often irregular in shape. Yields are very high. It is resistant to red stele but is susceptible to virus infection and cyclamen mites.

Clancy (Cornell University, NY) was developed through a joint venture with the USDA breeding program in Beltsville, MD. Its parents were resistant to red stele root rot. The fruit is a round conical shaped with darker red color and good flavor. The flesh is very firm with good texture and eating quality. The fruiting laterals are strong and stiff, keeping the fruit off the ground until they reach full size. No significant disease or insect problems have been noted to date.

Donna (France/Spain) produces large blocky fruit in the late season. The fruit is darker than Darselect with similar quality. It is new to the U.S. and has not been widely trialed.

Eros (Italy) is a light colored late season variety with large but somewhat squat berries that are not particularly attractive. Yields are adequate in good stands but it does not renovate exceptionally well. It is susceptible to cyclamen mites.

Ovation (USDA, MD) is extremely late. It doesn't flower until after most others are past their peak bloom. Fruit quality is average but there is little to compare it to in this season. Yields are moderate.

Record (Italy) produces large fruit in the late season with good yields reported. The color is darker than Idea which it replaced but still considered light to slightly orange, similar to Allstar.

Seneca (Cornell University, NY) is probably the firmest variety available for the east. The fruit is large, bright red and attractive but the flavor is only average. It does not runner heavily and can be adapted to plasticulture.

Serenity (University of Guelph, Ontario) is a late season variety that is also tolerant to Sinbar (terbacil). The fruit is large and bright red. The skin tends to be soft. It reported to be moderately resistant to scorch and mildew.

Winona (University of Minnesota) has very large berries and average yields but cannot compete with Jewel for fruit appearance. It has good vigor though and might be useful where Jewel does poorly.

Day Neutral

Albion (University of California-Davis) produces large attractive berries with good flavor. The color is bright red with little interior color. They are only weakly day-neutral and do not fruit heavily in the fall in temperate climates. Developed for plasticulture systems, overwinter potential and root rot resistance are unknown but doubtful.

Evie 2 (U.K.) produces medium large beet-shaped fruit that are bright red. Fruit production in the fall in temperate climates has been moderate. This variety is relatively unknown and needs to be trialed more extensively for a temperate climate.

Seascape (University of California) is a day neutral that is seeing some success in the east. The fruit is large and very

attractive. It is firm and good quality. It does not runner and is only suited for plasticulture. Over wintering can be a problem with this one.

Tribute and **Tristar** (USDA, MD) have been the standard day neutral varieties for the northeast for the last 20 years. They are disease resistant, vigorous and runner enough for matted row production. Both are relatively small fruited and low yielding but off-season fruit may pay off. Of the two, Tribute has better size and Tristar has better flavor.

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(Source: Cornell University Berry Production Webpage: <http://www.fruit.cornell.edu/berry/production/strawberryproduction.htm>)

Additional Strawberry Variety Notes

Sonia Schloemann, UMass Extension

Junebearing:

Flavorfest (USDA) – mid-season high-yielding variety adapted for both plasticulture and matter row systems. Berries large and firm with excellent flavor. Plants show some resistance to red stele and some leaf diseases and tolerance to Anthracnose crown and fruit rot. May work well in organic production systems.

Galletta (NC State Univ.) – Fruit on this early-season variety (Earliglow hybrid) is large and glossy with excellent flavor. Plants moderately vigorous and have some tolerance to red stele and leaf diseases.

Malwina (Germany) – very late-season variety with glossy high flavored dark fruit. Late flowering can also be useful for avoiding frost/freeze damage during bloom. Berries are large and size holds well through several harvests. Plants vigorous showing resistance to Powdery Mildew and tolerance to Verticillium and red stele.

Mayflower (U.K.) – late mid-season productive variety with good flavor and tolerance to wet conditions.

Mira (Ontario) – late mid-season high-yielding variety with light color and good flavor. This variety replaces ‘Blomidon’ which had held a lot of promise 20 years ago but developed genetic instability and was discontinued.

Rubicon (CAES) – mid-season variety with moderate fruit size that has excellent flavor. This variety is distinctive in showing resistance to Black Root Rot and adult Black Vine Weevil feeding. This may make this a valuable variety for replant sites. Plant patent problems may limit the availability of this variety.

Rutgers Scarlet (Rutgers) – mid late-season variety with large firm fruit with excellent flavor. Plants are moderately vigorous and shoe resistance to red stele but not to leaf spot diseases.

Sonata - Sonata (Netherlands) mid-season variety that produces dark red fruit with good flavor. Fruit firmness is variable. Plants are vigorous but show some susceptibility to leaf diseases.

Sparkle (UNK) – heirloom variety of note due to its devoted following. Late season fruiting yields moderately sized, highly flavored fruit prized by many for over 60 years. Fruit size and softness reduce its commercial value, but excellent for small scale or home production.

Yambu (Netherlands) - early-midseason vigorous variety with firm, glossy fruit with good flavor. Yield potential appears promising and it has a long harvest season.

Dayneutral:

Mara Des Bois (France) – small to medium fruit with excellent flavor. Limited use for commercial production due to size and yield but flavor makes it appealing for pyo and home production.

Moterey (Univ. of Calif.-Davis) moderate yielding variety with excellent flavor and tolerance to high temps. Moderate vigor and some tolerance to leaf diseases, but susceptible to powdery mildew.

Portola (Univ. of Calif.-Davis) – strong yielder with very large, firm, light-colored fruit with good flavor.

San Andreas (Univ. of Calif.-Davis) – moderate yielder with large, firm fruit with excellent flavor. Plants are vigorous and it shows some disease resistance.

Verity (UK?) – high yield potential with proper management, good – excellent flavor. Plants vigorous with upright dense growth habit and show tolerance to powdery mildew.

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C. Weber, 2015. *Performance of New Berry Varieties at the NYAES in Geneva, NY*. New York Fruit Quarterly, Winter 2015.

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RASPBERRIES/BLACKBERRIES

Small Fruit Cold Hardiness – Winter Injury in Brambles

Richard Marini and Kathy Demchak, Penn State University



Cold-injured primary blackberry bud (left) and uninjured secondary bud (right). Photo credit: Fumi Takeda, USDA-ARS-AFRS

Weather is becoming more variable resulting in early-winter cold snaps and winter thaws followed by extreme cold events. The net result of these types of weather events is cold injury to many perennial crops. During the fall of 2015, after a brief cool-down, temperatures fluctuated considerably. Unusually warm temperatures occurred in December in PA mainly because a bend in the jet stream allowed warm air from the South to spill into the Northeast.

Winter injury in brambles (raspberries and blackberries) is often expressed as dieback of the terminal ends of the canes or dead buds in spring. There is little we can do to influence temperature, other than select good planting sites or grow plants in protected environments such as high tunnels. If we understand how plants are influenced by temperature, we may be able to develop cultural practices that maximize their cold resistance, and also adjust pruning practices to retain the maximum number of buds that will be fruitful.

Winter Injury Terminology

Before going any further it is important that we understand the terminology concerning winter injury. The terms "winter hardy" and "cold hardy" refer to the ability of a plant to tolerate cold temperatures. However, it is important to realize that the cold hardiness of plants will differ during the winter and the relative cold hardiness of different varieties may depend on environmental conditions. The best example I can think of to illustrate this is to consider the peach rootstock 'Siberian C'. This rootstock survives winter temperatures of -20°F in Ontario, New York and

Michigan, but it is killed by temperatures above zero in South Carolina and Georgia.

So a variety that is winter hardy in one region or during a particular winter may not be very hardy in a different situation. This is why it is so difficult to evaluate cold hardiness of plants. Many years are needed to evaluate plants under varying field conditions. Therefore, pomologists have relied on controlled freezing experiments to evaluate hardiness by exposing plants or parts of plants to a range of temperatures in freezers and then recording the amount of injury sustained by the plant either by rating tissue browning or evaluating growth in the greenhouse.

This is not to be confused with cold-injury related to the chilling requirement being met too early in the season, as is the case when cultivars that are better-adapted for southern conditions (certain low-chill varieties of blackberries or blueberries) begin to come out of dormancy too early in late winter or early spring and then are subsequently injured by cold temperatures.

Acclimation and De-acclimation

"Cold acclimation" is the process by which plants develop cold hardiness. Raspberries cease growing in late summer and blackberries continue to grow into the fall. In mid-summer raspberries shoots are killed at about 18°F. During the fall, the leaves sense the shortening days and this induces the first stage of cold acclimation and by Mid-October the plants can withstand about 10°F. The second stage of acclimation is induced by temperatures just above or below freezing. As a result of a mild frost, the cold hardiness of woody plants can increase by 6 to 10 degrees within 24 hours. By early November raspberries can withstand about 1°F and by early December they can survive -10°F to -35°F depending on the variety.

Early in the acclimation process the plants enter a period of dormancy called "rest". There is quite a bit of confusion and different terms concerning dormancy and different stages of dormancy, but for this discussion I will assume that there are two stages of dormancy. When plants are in rest they will not grow even if they are placed in environmental conditions that are ideal for growth (long days and warm temperatures). Plants remain in rest until they have been exposed to adequate chilling.

The ideal chilling temperature is about 47°F; temperatures above 65°F and below 32°F do not contribute to chilling. The chilling requirement for

most brambles is usually between 800 and 1,000 hours. A study in New Jersey in cooperation with Cornell University showed that holding potted summer-bearing red raspberries at 40°F for 40 days was adequate to satisfy chilling for greenhouse production. In Pennsylvania, the chilling requirement for brambles is usually satisfied by early January. After the chilling requirement is satisfied the plants will de-acclimate in response to warm temperatures and they will also lose some cold hardiness. If exposed to lower temperatures gradually, the plants will partially re-acclimate and regain most, but not all of their cold hardiness. This is why fluctuating winter temperatures can be so harmful.

In Poland, Pocholak (1978) determined the T50 (temperature at which 50% of the canes were killed) throughout the winter for the hardy variety 'Latham' and the less hardy variety 'Malling Promise'. He reported that in October 'Malling Promise' had a T50 of about 10°F, in January the T50 was about -31°F and in February the T50 was only -11°F. For 'Latham' the T50 was also 10°F in October and -20°F in January, but -20°F in February. So 'Malling Promise' and 'Latham' were equally hardy during the fall and mid-winter, but 'Malling Promise' was more susceptible to cold following a winter warm period because it was more responsive warm mid-winter temperatures and de-acclimated more than 'Latham'.

Craig and Aalders (1966) compared 6 red raspberry varieties in Nova Scotia and reported that bud survival for 'Viking' and 'Trent' during the winter of 1963-64 was 9% and 71%, respectively and they speculated that 'Viking' was affected more by the mid-winter fluctuating temperatures. Hummer et al. (1995) evaluated maximum cold hardiness of more than 120 varieties and selections of brambles at the USDA-ARS Germplasm Repository in Corvallis, Oregon.

The plant material was first preconditioned at 31°F for 4 weeks, so the tissue should have been at its maximum hardiness. Buds and sections of the canes were then frozen at a range of temperatures from 0 to -40°F to estimate the T50. Although within each group, varieties differed in their cold hardiness, summer-bearing red raspberries and purple raspberries were most hardy, followed by black raspberries, then fall-bearing red raspberries, whereas blackberries were least cold hardy. In general the T50 of canes was 2 to 16°F lower than for buds and the bud base, where it attaches to the cane, was less hardy than the buds.

Warmund and George (1990) evaluated the hardiness of primary and secondary buds of bramble varieties from the Arkansas and Minnesota breeding programs as well as plant growing in Missouri and Illinois. In Arkansas, 'Darrow' was the hardiest blackberry and 'Wells Beauty' was least hardy. In Minnesota, 'Canby'

was hardier than 'Latham' and 'Titan' red raspberry. In general the more fruitful primary buds were less cold tolerant than the secondary buds, which are less fruitful.

General Conclusions

1. Brambles develop hardiness rapidly during November and buds will lose hardiness during warm periods in January and February.
2. During December and until there is a warm period in January most varieties are quite hardy and will survive temperatures typical in Pennsylvania; most varieties will survive at least -25°F.
3. Winter injury usually occurs during mid-winter when several warm days are followed by a cold snap.
4. There is a range of cold hardiness between and within each type of bramble. Summer-bearing red raspberries are hardier than fall-bearing varieties and black berries are least hardy.
5. Researchers have developed several methods for assessing winter injury that occurs in the field and growers can probably use these methods to evaluate the extent of winter injury before they start pruning in early spring. Some researchers cut canes at the base and placed them in water in warm conditions. They changed the water every other day to eliminate bacteria in the water. Before the chilling requirement is satisfied, it took 15 to 50 days for buds to start growing. By early January buds begin to grow in 10 to 15 days. Buds that begin to develop into shoots will likely produce fruit and the buds that don't grow have been killed. So a grower can estimate the percentage of buds that have been lost to winter injury. However, if growers attempt to grow the shoots too early, before their chilling requirement is satisfied, the canes will not break bud for period of weeks, and the conclusion might be erroneously reached that the canes are dead.
6. Some buds can be cut lengthwise (tip to base) as they swell, and examined for blackened centers surrounded by green tissue (an indication that the flower buds were killed), or for tissue that is completely dead. Magnification, as with a 16x hand lens or greater, will be required. This is most easily done as the buds are beginning to swell.
7. The warm temperatures in December would not necessarily have resulted in more winter injury, so growers should not be overly concerned about the warm conditions. Temperatures dropped gradually enough after the warm period that plants probably acclimated before the colder weather in January. Most injury is thought to occur later in the winter

and early spring when the plants are less dormant, and thus cold-injured more easily (at higher low temperatures). Growers may want to delay pruning as long as possible, preferably after testing some canes as recommended in steps 5 and 6 above, and possibly leave a few more canes than usual until a

judgement can be made as to how much winter injury occurred. The extra canes can be removed later.

(*Source: Penn State Fruit Times, Oct. 25, 2017*)

Raspberry Variety Review

Courtney Weber, Cornell University

Raspberry varieties are classified as floricanes (summer) or primocane (fall) bearing. (A few primocane bearing types are described as everbearing, which produce a small to intermediate fall crop and can be managed in a double cropping system.) Raspberries are naturally biennial with a perennial crown. Primocanes grow the first year, go dormant in fall, get chilled in winter, and fruit the following summer (the primocanes are now called floricanes, which die after fruiting). New primocanes are growing as the floricanes fruit. Floricane varieties must be pruned in the spring to thin the fruiting canes and remove dead canes for better disease management and fruit size. There are red (*Rubus idaeus*), black (*Rubus occidentalis*), and purple (red x black hybrid) raspberry varieties suitable for production in temperate states.

Primocane varieties fruit on the first year's growth in the fall of the year. Currently, only red varieties (and some a few yellow) are available of this type although developments in black and purple raspberries include primocane fruiting. The strength of fruiting in primocane types varies widely from tips only on some floricanes varieties to nearly the whole cane in varieties such as 'Autumn Britten' and 'Himbo Top'. Later primocane varieties such as 'Ruby' and 'Heritage' can have yield reductions from early frosts in more northern growing regions. Pruning in primocane varieties is done by mowing spent canes to the ground before primocanes emerge in early spring.

Currently available black and purple raspberry varieties are floricanes bearing with most developed in New York or derived from germplasm from the region. New raspberry varieties are actively being developed in about 11 public breeding programs around the world with the majority suitable for production in the temperate regions of the U.S. coming from Cornell University ('Heritage', 'Encore', 'Prelude', 'Titan', 'Ruby', 'Taylor'), University of Maryland ('Caroline', 'Anne', 'Jaclyn') and Ag Canada in Nova Scotia ('Nova', K81-6). Increasingly, new varieties from European programs are being introduced in to the U.S. ('Autumn Bliss', 'Autumn Britten', 'Polana', 'Polka', 'Himbo Top' and others). No variety will work well in all locations, soil types, and production systems, but many have proven to be useful in many different situations. By planting a series of varieties, it is now possible to have fruit from mid to late June until fall frost (or longer with

protection) in much of the temperate U.S. with only a short late-summer lag in production. Cornell's newest variety, 'Crimson Giant', released in 2011, extends the season in the fall to the end of October and beyond with large, high quality, bright red fruit.

PRIMOCANE RED RASPBERRIES

Autumn Bliss (Great Britain, Plant Patent #6597) is an early ripening raspberry with large, highly flavored fruit. It ripens 10 to 14 days before Heritage. Much of the crop is produced within the first two weeks of harvest, which is an advantage in northern climates. It produces short canes with few spines. The fruit is dark red and darkens with storage and is fairly soft. It is susceptible to raspberry bushy dwarf virus.

Autumn Britten (Great Britain) is early ripening with large, firm, good flavored fruit. The fruit tends to be dark and darkens in storage. It is taller than 'Autumn Bliss' with better fruit quality but lower yields. It produces sparse cane numbers.

Caroline (University of Maryland, Plant patent #10,412) is a large, good flavored, conical fruit. The fruit will darken with storage. It produces tall upright canes. The short fruiting laterals can be challenging to pick, but yields are very good for the fall. It has moderate to good resistance to Phytophthora root rot.

Crimson Giant (Cornell University-NYSAES, Plant patent applied for) is the latest release from the Cornell program and has large, bright red fruit with a conical shape. The berries are firm and flavorful. It ripens after 'Heritage' and extends the season until late October or later with high tunnels. There is a significant risk to the crop from early frost with outdoor production.

Heritage (Cornell University-NYSAES) is considered the standard for fall bearing varieties. These tall, rugged canes have prominent thorns and can be very high yielding if the complete crop can be harvested. The primocane crop ripens relatively late. Fruit is medium-sized and has good color and flavor, firmness, and good freezing quality. It is resistant to most diseases. Due to its late ripening, this variety is not recommended for regions with cool summers or a short growing season with frost before September 30 unless high tunnels or other cold protection is used.

Himbo Top™ (variety ‘Rafzaqu’) (Switzerland) produces good quality, large fruit. The fruit is bright red with good flavor. Plants are vigorous and upright and medium in height with very long fruiting laterals that require trellising. Sucker production is somewhat sparse leading to moderate yields.

Jaclyn (University of Maryland, Plant Patent #15647) is an early season variety with large firm berries ripening 2 weeks before Heritage. The fruit is dark red with superior flavor and will darken with storage. The fruit is very long conical and adheres tightly until fully ripe. Plants are vigorous and erect but susceptible to yellow leaf rust. Potato leaf hoppers show a strong preference for this variety and can cause significant damage.

Joan J (Great Britain) is an early season variety with very firm fruit with a thick texture. The fruit is conic and dark red and will darken with storage. The canes are vigorous, upright and spineless making picking easy. Yield and fruit size is very good. The fruit skin is thin and can be damaged easily, especially in high temperatures.

Josephine (University of Maryland, Plant Patent #12,173) fruit is large with very good flavor ripening in the late season. Berries are firm and cohesive. The color is dark red. Plants are upright and vigorous needing little containment trellising. It is resistant to leaf hopper and Phytophthora root rot. This variety will extend the season in a high tunnel system.

Polka (Poland) has medium large primocane fruit that ripen in the mid-fall season. The fruit is somewhat soft with good quality and a shiny red appearance. It is a vigorous variety with good sucker production. Potato leaf hoppers so a strong preference for this variety and can cause significant damage.

PRIMOCANE YELLOW RASPBERRIES

Anne (University of Maryland, Plant patent #10,411) produces large, conic, pale yellow fruit that ripen mid- to late season. It has very good flavor and texture. Tall upright canes sucker sparsely requiring higher planting density. It is resistant to Phytophthora root rot but susceptible to leaf hoppers and rust.

Kiwigold (New Zealand, Plant patent #11,313) and **Goldie** (cv. Graton Gold) (California, Plant Patent #7,625) are amber sports of Heritage, similar in all characteristics except fruit color. Fruit blushes pink when overripe with Goldie slightly darker. The fruit is medium-sized and has good flavor and firmness and ripens relatively late. They are resistant to most diseases. [*Editors Note: these varieties are no longer available.*]

FLORICANE RED RASPBERRIES

Early Season

Boyne and **Killarney** (sibling varieties from Manitoba) perform very similarly. Both have are early season with small to medium sized fruit with good eating and freezing

quality but can be somewhat dark and soft. The plants are spiny and produce many suckers. They have excellent winter hardiness but are susceptible to anthracnose. Boyne is moderately resistant to late yellow rust and tolerant to Phytophthora root rot and crown gall, but is susceptible to raspberry fireblight. Killarney is moderately resistant to Phytophthora root rot and is susceptible to mildew.

Prelude (Cornell University-NYSAES, Plant Patent #11,747) is the earliest summer fruiting variety available. The fruit is medium sized, round, and firm with good flavor. It is very resistant to Phytophthora root rot and has good cold hardiness. A moderate fall crop is large enough to warrant double cropping. It is the best early season variety available for the northeast.

Mid Season

Canby (Oregon) canes are tall, nearly spineless, and moderately productive. The fruit ripens mid-season, is medium to large in size, firm, and bright red with excellent flavor. It has moderate to poor cold hardiness, and buds may winter kill in cold climates. It is susceptible to Phytophthora root rot. It is also susceptible to powdery mildew making it unsuitable for tunnel production.

Moutere (New Zealand) is large fruited variety with very firm fruit. The canes are vigorous and tend to weep with the heavy fruit load. The fruit is light red with a waxy, dull appearance. The yields are very high but the flavor is poor. Hardiness in NY has been good.

Nova (Nova Scotia) is vigorous and upright with long, fruiting laterals. The canes have very few spines. The fruit ripens in mid-season and is medium sized, bright red, firm, and somewhat acidic in taste. It is considered to have better than average shelf life. The plants are very hardy and appear to resist most common cane diseases, including rust. It will set a late fall crop.

Titan (Cornell University-NYSAES, Plant patent # 5404) produces large canes with very few spines with suckers that emerge mostly from the crown, so it is slow to spread. It is susceptible to crown gall and Phytophthora root rot but is extremely productive. Fruits ripen mid to late season and are extremely large and dull red, with mild flavor. Berries are difficult to pick unless fully ripe. With only fair hardiness, Titan is for moderate climates. It is resistant to the raspberry aphid vector of mosaic virus complex.

Late Season

Encore (Cornell University-NYSAES, Plant patent # 11,746) is one of the latest summer fruiting raspberry varieties available. It produces large, firm, slightly conical berries with very good, sweet flavor. The fruit quality is considered very good. It is moderately susceptible to Phytophthora root rot and has good cold hardiness.

K81-6 (Nova Scotia) produces canes that are medium tall with spines only at the base. The fruit is very large with good flavor that ripens very late summer with average

firmness. It is resistant to late yellow rust but is susceptible to leaf curl virus and raspberry fire blight. It has shown good cold hardiness in NY trials.

Octavia (Great Britain) is a new late season variety that promises to close the summer gap before primocane varieties begin. The fruit is large and generally round shaped and light red. The flavor is poor to average with adequate sun. The canes are semi-spineless with good resistance to aphids and cane botrytis. It is susceptible to spur blight, raspberry bushy dwarf virus and Phytophthora root rot.

FLORICANE BLACK RASPBERRIES

Black Hawk (Iowa State University) fruit is small and glossy with good firmness. Plants are vigorous, similar to wild types. The canes are relatively hardy, and resistant to anthracnose. Yields are moderate. This variety is generally falling out of favor due to its small fruit and wild growth habit.

Bristol (Cornell University-NYSAES) fruit is medium to large and firm, with excellent flavor. Plants are vigorous, high yielding for black raspberry and hardy. It is susceptible to anthracnose and tolerant to powdery mildew.

Haut (USDA-ARS, Maryland) fruit is large sized but soft. The dark shiny black color makes them very attractive. It ripens over a long period producing good yields. The plants are vigorous and upright with good productivity.

Jewel (Cornell University-NYSAES) fruit is large, firm, glossy, and flavorful. Plants are vigorous, erect, hardy, and productive. This variety appears to be more disease resistant than others including resistance to anthracnose.

Mac Black (Michigan) ripens medium large berries 7-10 days later than most varieties. The fruit is large, moderately

firm and flavorful. The canes are vigorous, erect, and hardy.

FLORICANE PURPLE RASPBERRIES

Brandywine (Cornell University-NYSAES) ripens later than most red varieties and are large, reddish-purple, and quite tart. Berries are best used for processing. This is a high yielding variety. Canes are very tall with prominent thorns, and suckers grow only from the crown so the plant will not spread. It is susceptible to crown gall but partially resistant to many other diseases.

Royalty (Cornell University-NYSAES, Plant patent # 5405) is the most widely planted purple variety. Fruit ripen late and are large and reddish-purple to dull purple when fully ripe. Berries tend to be soft but sweet and flavorful when eaten fresh. It is excellent for processing and can be harvested when fruit is red for fresh eating. Canes are tall and vigorous, with thorns, and are extremely productive. Royalty is immune to the large raspberry aphid, which decreases the probability of mosaic virus infection, but is susceptible to crown gall.

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(Source: Cornell University Berry Production Webpage: <http://www.fruit.cornell.edu/berry/production/pdfs/raspcultreview2012.pdf>)

Blackberry Variety Review

Courtney Weber, Cornell University

Cultivars

New cultivars are released all the time, and the vast majority of them fail to catch on for various reasons including poor adaptability to diverse growing regions, unforeseen disease or insect susceptibility or fruit characteristics that are unacceptable to the buying public. No cultivar will work well in all locations, soil types, and production systems, but many have proven to be useful in many different situations. This list is by no means complete but should address most situations.

Blackberries come in many types with the three predominant types being thorny erect, thornless semi-erect and trailing (thorny and thornless). In newer varieties, the distinction between erect and semi-erect has become less pronounced. All varieties are floricanes fruiting in the mid to late summer except for the new primocane fruiting

varieties released in recent years from the University of Arkansas breeding program. The primocane varieties are all thorny types but thornless varieties are under development. High temperatures (above 85°F) during primocane bloom tend to reduce fruit set in these varieties. In NY and regions of similar climate, most blackberry varieties will suffer cold injury on floricanes from low winter temperatures with thorny erect being generally most hardy followed by thornless semi-erect and trailing. Overwintering in closed high tunnels has been successful in avoiding winter damage in trials. A description of the types follows.

Thorny blackberries (erect)

Blackberries are more vigorous than red raspberries and benefit from summer pruning. Thorny blackberry (erect) canes are tipped when 0.9 to 1.2 m in height to stiffen the

canes and encourage lateral branching. The laterals can be shorted in early spring to 30 to 40 cm in length and canes thinned to 5 canes per meter of 30 cm wide row. Longer laterals will produce more but smaller fruit. Alternate year mowing can be used to avoid the difficult job of pruning thorny blackberries. In this procedure, half the planting is mowed each year with the other half allowed to fruit with only minimal pruning and row width management.

Thornless blackberries (semi-erect)

For two years after planting, many semi-erect blackberry varieties tend to grow close to the ground like a vine. The trailing canes may need to be moved into the row to allow for cultivation and mowing. After two years, the canes become more upright and naturally branched. Growers often take special precautions in colder growing regions to protect thornless cultivars because of their increased cold sensitivity. Some growers will tip the canes at 60 cm to better able to protect them from the cold. In the spring, the canes should be tied at least 90 cm about the ground to trellis wires. Fruiting canes can be shortened to the height of the top wire or woven around the wire with 60 to 80 cm of overlap with the next plant. Laterals should be shortened to 45 cm and lower ones removed. Thinning to 6 to 8 canes per hill will maintain acceptable production and aid in weed control.

Trailing blackberries (thornless and thorny)

Trailing blackberries are not cold hardy and generally not productive in most cold climate locations. These varieties produce canes that grow along the ground and must be physically tied to a trellis for production to keep the fruit off the ground. Overwintering in cold climates is done by removing the canes from the trellis and laying them on the ground and covering with an insulating material. Cold damage still occurs in many cases, reducing yields considerably. They are not recommended for NY and regions of similar climate. Varieties include Marion, Evergreen, Black Diamond, Obsidian, Olallie and others and will not be described further in this review.

Thorny

Darrow (Cornell University, NY) produces large, long conic and often irregular, black, glossy fruit in the late season. The fruit is mildly sub-acid with good quality. Secondary fruiting laterals produce fruit into the early fall. The erect canes are vigorous and winter hardy for a blackberry.

Illini Hardy (University of Illinois) fruit is medium sized with good flavor and quality but acidic until fully ripe. Ripens in the late season. Canes are erect and vigorous with good winter hardiness. It suckers mainly from the crown and is resistant to *Phytophthora* root rot.

Kiowa (University of Arkansas) produces large fruit on erect canes. Yield potential is moderate over a long harvest period (6 weeks).

Shawnee (University of Arkansas) produces high yields over an extended period late into the season. The fruit

quality is good but tends to be soft and is suitable for local markets.

Primocane varieties (thorny)

Prime Ark 45 (University of Arkansas) is a late season primocane fruiting variety. Harvest is too late for NY outside of tunnels (up to 2 weeks after Prime Jim) and may be too late in tunnels as well except in more southern locations. The canes are erect and produce firm, medium sized berries.

Prime Jan (University of Arkansas) is a late season primocane fruiting variety but is the earliest available at this time. It produces medium sized berries in September-October in Geneva, NY with only modest productivity. The fruit is generally too soft for shipping and is suitable for home growers and local markets. The canes are semi-erect and require trellising for good production.

Prime Jim (University of Arkansas) is a late season primocane fruiting varieties that produces a few days after Prime Jan. The fruit is medium sized and moderately firm but still only suitable for local markets and home growers. The canes produce in September-October in Geneva, NY with only modest productivity. The canes are semi-erect and require trellising for good production.

Thornless

Apache (University of Arkansas, USA) produces conical fruit with good quality and flavor and ripens mid-season with high production. Sunburn can be a problem following rain. The fruit is well presented for picking. Erect, strong canes are self-supporting. Canes are vigorous and prolific. It is resistant to orange rust. Winter hardiness is similar to other thornless varieties.

Arapaho (University of Arkansas) produces medium sized, firm berries with smaller seeds than most varieties. It produces in the early season with a concentrated harvest season. The canes are moderately vigorous and erect for a thornless type with reported good hardiness. It is reported to be resistant to orange rust.

Black Satin (USDA, Illinois, USA) ripens late with large, firm and dull black berries that are slightly tart. These plants are very vigorous, semi-erect, productive, and resistant to anthracnose. More winter hardy than 'Thornfree' but not outstanding. Fruit is excellent for jams, jellies, and pies and more suitable for the local market.

Chester (USDA/Southern Illinois University). The late ripening fruit is somewhat difficult to pick but is of high storage quality with little breakdown. It produces high yields of medium sized fruit with average flavor. The glossy black color and firmness holds well in hot weather, and the variety does well in high tunnels. Vigorous canes are semi-erect. Chester is considered the hardiest of the thornless cultivars. It is resistant to cane blight. Flowers are lavender colored.

Dirksen Thornless (USDA/Southern Illinois University) produces large berries with low acidity. The color can be

slightly dull when fully mature. They ripen in the early season. Canes are vigorous, semi-erect and moderately winter hardy. It grows mainly in a crown with few suckers. It is tolerant to Septoria leaf spot and anthracnose and moderately tolerant to powdery mildew.

Doyle (private breeder, Texas) is a very vigorous midseason cultivar capable of producing high yields. Fruit quality and size are average outdoors; quality is significantly higher in tunnels.

Loch Ness (SCRI, United Kingdom) produces large glossy black fruit with good quality suitable for local markets. The canes are semi-erect and moderately vigorous with hardiness equal to 'Chester'.

Natchez (University of Arkansas) is the earliest ripening thornless variety with high production potential. The fruit is large with good flavor. The canes are semi-erect and require trellising for good performance. Cold hardiness is unknown but expected to be only average.

Navaho (University of Arkansas) produces high yields of small fruit with very good flavor. The fruit is firm and stores well. The new canes (non-bearing primocanes) are very vigorous and benefit from tipping at 5-6 ft. several times during the season.

Ouachita (University of Arkansas) produces high yields of medium sized berries with good flavor and firmness. The very erect canes show poor cold hardiness and are at risk

for significant winter injury in northern regions. The plants are resistant to orange rust, anthracnose and double blossom/rosette disorder. Harvest starts a week after Arapaho and a week before Navaho.

Triple Crown (USDA, Maryland, USA) has large, sweet aromatic berries with excellent flavor and is very productive. Canes are semi-erect, vigorous and sturdy, but have insufficient cold hardiness for most northern regions except in tunnels where they do well.

The information, including any advice or recommendations, contained herein is based upon the research and experience of Cornell Cooperative Extension personnel. While this information constitutes the best judgment/opinion of such personnel at the time issued, neither Cornell Cooperative Extension nor any representative thereof makes any representation, endorsement or warranty, express or implied, of any particular result or application of such information, or regarding any product. Users of any product are encouraged to read and follow product-labeling instructions and check with the manufacturer or supplier for updated information.

(Source: Cornell University Berry Production Webpage: <http://www.fruit.cornell.edu/berry/production/pdfs/blkbvarietyreview.pdf>)

Additional Bramble Variety Notes

Sonia Schloemann, UMass Extension (adapted from C. Weber, Cornell Univ)

Primocane Fruiting:

BP-1 (Italy) – this cross between Polka and Tulameen yields large, firm fruit of high quality and excellent flavor. Plants are moderately vigorous with tall upright canes.

Double Gold (Cornell) – this gold variety has a deep peach colored blush and yields medium sized, firm fruit with excellent flavor. Plants are vigorous and hardy and show some disease resistance.

Crimson Night (Cornell) - produces medium to large dark colored fruit with excellent flavor. Flavor holds up well to freezing. Its canes are upright, highly pigmented and relatively short with heavy branching.

Fall Gold (Cornell) – produces large, light colored yellow fruit with good flavor. Plants are moderately vigorous and thorny.

Imara® (Netherlands) – highly productive variety with good fruit quality (though sometimes a bit dry), large, firm fruit (>5g) and excellent flavor. Harvest begins one week after Polka. Fruit has good shelf life. Plants are vigorous and show some resistance to spider mites.

Kwanza® (Netherlands) – productive variety with large fruit with light orange-red color and good-excellent flavor.

Canes are compact and upright with few spines making it easy to harvest.

Kweli® (Netherlands) – productive variety with large fruit and good flavor. This variety has notably long shelf life (up to 10 days). Plants are compact and vigorous, producing a lot of laterals and show some disease resistance.

Niwot (private, Colorado) – the most recent development in primocane fruiting is this new black raspberry variety. It is a vigorous productive variety with high yield of good sized fruit with moderate flavor. When growing this variety for a double crop (overwintering canes), primocanes should be tipped to encourage lateral branching.

PrimeArk® **Freedom** (Univ. of Arkansas) – productive thornless primocane blackberry variety ripening in August. Fruit large (10g) and have good flavor though not very firm for shipping.

PrimeArk® **Traveler** (Univ. of Arkansas) – vigorous thornless primocane blackberry variety ripening in August.

Floricanne Fruiting:

Cowichan (British Columbia) – productive mid-season variety with firm fruit and excellent flavor. This variety is noted for its resistance to Raspberry Bushy Dwarf virus. Hardy only to Zone 5.

TulaMagic® (Switzerland) – cross between Autumn Bliss and Tulameen makes this variety capable of primocane fruiting in late fall, but it is primarily considered for its floricanne fruiting potential. It is an early mid-season variety fruiting just after Prelude. Fruit are large and firm

(from Tulameen) with very good flavor and shelf life. Plants are vigorous and show some tolerance to Phytophthora.

Reference:

C. Weber, 2015. *Performance of New Berry Varieties at the NYAES in Geneva, NY*. New York Fruit Quarterly, Winter 2015.

N. Nourse. 2016. *Strawberry Trial Updates*. Nourse Farms Fall 2016 Newsletter.

BLUEBERRIES

Understanding Cold Injury in Blueberries

Nicole Mattoon, NYS IPM Program

Adapted from: <http://berrygrape.org/winter-acclimation-and-cold-hardiness-of-blueberry/>

Blueberry cold hardiness varies tremendously among types and cultivars. Highbush, half-high, and lowbush blueberries are generally hardy to at least -20 F, although some cultivars are not. During recent years, blueberry breeding efforts in the northern United States have produced commercial cultivars which are hardy to between -30 and -40 F if snowfall is sufficient.

Cold injury

Not all of the tissues of a blueberry plant attain the same degree of cold hardiness. In fully dormant plants, the wood is normally somewhat hardier than the buds, and the roots do not develop any great degree of cold hardiness. Mulching with bark or sawdust can help moderate root zone temperatures and minimize root freezing injuries.

The basal tissue that connects the flower bud to the shoot is the part of the bud that is most easily injured during the dormant period. Following a freeze, florets in a bud may show no injury even though the basal tissue is injured. The amount of growth of a new shoot or flower cluster depends on the extent of injury at the base of the bud. If injury restricts the flow of nutrients and water, growth of the shoot or flower cluster is slow or stunted, or completely inhibited.

Injury to the basal tissue can be determined by slicing longitudinally through a bud from the tip through the bud base with a sharp razor blade. Freeze-injured tissues will have a brown, water-soaked appearance, while healthy tissues will be green or white. For best results, wrap tissues to be tested in a plastic bag and hold at room temperature for several days before slicing and examining for browning.

Sudden collapse is usually related to the onset of hot weather, which increases the demand for water by the developing shoots and fruit. Injured vascular tissues are unable to supply the needed water and nutrients and the shoot collapses. Often, injury to vascular tissue can be determined by scraping away the bark a healthy vascular

cambium is bright green, whereas one injured by cold is brown.

Site selection in cold regions

Selecting cultivars which are adapted to a growing site is the most important step in preventing freezing injury. Because blueberries are long-lived plants, average minimum temperatures are less of a concern than the probability of a killing freeze.

The best method of selecting blueberry cultivars is to determine how often severely cold temperatures are likely to occur in your area and base your selection upon the life expectancy of the blueberry planting and the probability of a killing freeze. If you do use the hardiness zone concept, select cultivars that are classified at least one zone hardier than the planting site.

Acclimation

The degree to which a blueberry bush hardens off in the fall depends upon many factors, including length of the growing season, alternating day/night temperatures, nutrition, pruning, and fluctuating temperatures during the dormant season. Actively growing tissues are not cold hardy and are injured by temperatures around 28 F. As the daylength shortens and temperatures decrease in fall, blueberry canes cease active growth and begin a very complex process known as acclimation. Optimum cold hardiness develops when day/night temperatures decrease steadily from mid-summer to late fall, followed by several mild frosts. The degree of cold hardiness varies, according to temperatures, throughout the dormant season. A minimum of 850 to 1,000 chilling hours is needed for shoot growth and flowering to occur the following spring.

Maximum cold hardiness occurs after fully acclimated plants have been exposed continuously to several days of non-lethal, sub-freezing temperatures. Hardiness is lost during periods when temperatures rise above freezing. Most freezing injury occurs when temperatures fluctuate above and below freezing, and is typically associated

with sub-freezing temperatures which follow mid-winter thaws.

Cultural practices that promote late fall growth can interfere with acclimation and inhibit cold hardiness development. For example, excessive or late fertilization with nitrogen forces late season growth that is susceptible to early fall frosts. Pruning too early in the fall, before plant dormancy, interferes with cold acclimation by stimulating late, tender growth. Even if no visible growth develops, early pruning can cause cane tissues to de-acclimate. Delay pruning until canes are fully dormant. Pruning during late winter and early spring also allows for identification and removal of injured wood and buds. Insect damage, disease, other stresses which damage foliage, and overcropping limit the production of food reserves and interfere with acclimation.

Frost injury

When the flower buds begin swelling in early spring, the florets are the most easily injured part of the bud. Once a flower bud opens, it has lost all of its cold hardiness

and will be injured at about 28 F. The tip buds on canes and the tip florets within buds are the first to develop and are the most susceptible to early frost.

To reduce spring frost injury, avoid planting in frost pockets and ensure good drainage of cold air by removing cold air dams formed by trees and brush around blueberry fields. In regions where spring frosts are common, select planting sites on gently sloping hillsides.

Overhead sprinkler systems are effective in reducing spring frost injury if enough water is available. Applying about 0.10 to 0.15 inch of water per hour can protect open blossoms down to a temperature of 25 F. Water must be applied continuously until the air temperature warms above 32 F (wait for ice to melt), or frost injury may occur.

(Source: New York Berry News, Vol. 15, No. 1, Winter 2016)

Blueberry Physiology, Production Systems & Management

Online course for industry

led by Dr. Bernadine Strik, Oregon State University

Online blueberry course offered through Professional and Continuing Education (PACE) at OSU **will be offered again starting on January 25, 2019**.

The online blueberry course led by Bernadine Strik at OSU has been very popular with four offerings to date and full enrollment. As a reminder, “students” have access to 3 to 4 hours of narrated lectures per week over this 6-week-long course (**January 25 – March 11, 2019**). A new set of lectures are available each week. Students can interact with the instructor and each other through a discussion board. So far, students have included new and experienced growers of northern and southern highbush blueberries from small to large conventional or organic farms, farm or crop advisors, consultants, owners, nurseries, and

extension and research faculty. Evaluations have been excellent from all of these types of students. You can see testimonials on the web site for the course.

We hope you will be considering registering for the January 2019 offering as soon as possible. Since the Fall 2018 offering had to be canceled, registrations for the course are ahead of schedule.

See the link to register:

<https://pace.oregonstate.edu/catalog/online-blueberry-physiology-production-systems-management>

We hope to see you in the January 2019 offering of the **Blueberry Physiology, Production Systems & Management** course.

Blueberry Variety Review

Courtney Weber, Cornell University

The most critical aspect of establishing a healthy berry planting is obtaining high quality planting stock that has a vigorous root system and is free from disease and insect pests. The plants should be obtained from a reputable nursery that participates in a certification program to ensure plants are free from diseases such as viruses and root diseases. Mother plants or stock plants derived from tissue culture for starting propagation fields provide the best source of disease and pest free plants. Plants should be ordered well in advance of planting to ensure an adequate supply of the desired varieties and plant sizes.

Blueberry nursery plants come in a variety of types (bare root, container grown, tissue culture) and sizes (rooted cuttings, tissue culture plugs, and 2-3 year old plants). Larger plants will mature and produce a crop sooner than smaller plants. Container grown plants may have some advantage to bare root plants, especially if planting is delayed in the spring because they withstand temperature and moisture fluctuations better. However, shipping of containerized plants is more expensive and they may require root pruning if they are root bound when they arrive.

Several characteristics should be considered when selecting varieties including harvest season, yield, fruit quality, hardiness, growth habit, vigor, and disease resistance. The plants go dormant in late fall and over winter in the field. Storing capacity varies greatly among varieties but is considerably higher for blueberries than most other berries. The market has also shifted towards larger fruit for various reasons including greater consumer appeal and increased harvest efficiency, but there is a good market for small “wild type” blueberries from low bush types. Most of the processing market is machine-harvested fruit and some fresh market fruit is sorted from machine harvested lots as well.

Variety Descriptions

Early Season

Bluetta is very hardy but has small dark berries that are difficult to machine harvest and somewhat unattractive in the fresh pack. The large scar on the berry is also a problem. This variety has a weak growth habit and must be pruned carefully to maintain vigor and yield. Winter hardy to -35°C.

Duke is considered the best early season cultivar available. It has late bloom that avoids many frosts and still produces an early crop. The fruit size and quality is very good but the flavor can be bland if picked late. It can be machine harvested. Frost tolerance and winter hardiness is good. Winter hardy to -25°C.

Hannah’s Choice produces medium large fruit with high sugar content. The fruit is firmer with better flavor than Duke. Yields are moderate.

Spartan fruit is firm and very large with very good flavor. A late bloom date avoids many frosts, but it still produces a large, early crop. It does best on ideal sites but performs poorly in soils that have to be highly amended for blueberries. It harvests well mechanically and has some resistance to mummy berry. It requires cross pollination for best yields. Winter hardy to -25°C.

Mid-Season

Berkley berries are light blue, firm and very large with very good storage capacity. Fruit flavor is fair. Winter hardiness is moderate. The bush is moderately tall and spreading and suitable for machine harvesting. Care should be taken in pruning to maintain bush shape. Winter hardy to -25°C.

Bluecrop is the most widely planted mid-season cultivar in the world. It produces high yields of medium sized, firm fruit with good flavor. It is hardy in all but the coldest sites and can be machine harvested. The canes tend to be weepy so care should be taken to maintain the shape. It has very good disease resistance. Winter hardy to -25°C.

Bluejay has an upright open growth habit that grows rapidly. It produces moderate crops of medium sized, high quality fruit that can be machine harvested and ships well.

It is resistant to some viral diseases and moderately resistant to mummy berry. Winter hardy to -25°C.

Blueray is also a widely planted mid-season cultivar. Fruit size is very good with good flavor and high yield potential. Extra pruning is needed with this spreading bush, as canes tend to weep due to heavy bearing. It has very good winter hardiness. Winter hardy to -25°C.

Cara’s Choice produces medium sized fruit with 30% more sugar than Duke and Bluecrop. The fruit can hold on the plant for an extended period before harvest. The bush is low to moderate in vigor. Yields are moderate compared to Bluecrop.

Chippewa is a very winter hardy half-high variety that is productive with large firm fruit. Winter hardy to -35°C.

Draper produces a concentrated harvest between Duke and Bluecrop that can be machine harvested, even for fresh market. The flavor is very good with good hardiness.

Northland is very winter hardy. It is an extremely productive half-high type with medium sized, dark, soft fruit. It can reach 1.25 m tall and produces many canes, which require heavy annual pruning. Winter hardy to -35°C.

Patriot is winter hardy but frost sensitive due to early bloom. The fruit is large and firm with a small blossom scar. Full ripeness is needed for good flavor and sweetness. The bush is small to medium and grows slowly but is still productive. It must be pruned hard for large fruit and be fully ripe for best flavor. Suspected susceptibility to tomato ringspot virus has limited its use in recent years, but it is more tolerant to heavier soils than most varieties. Winter hardy to -25°C.

Sierra is productive and has large firm berries that can be machine harvested. It has a medium sized bush and is less hardy than other cultivars. Winter hardy to -25°C.

Toro is a productive cultivar with large fruit that ripen uniformly. The clusters tend to be tight which makes picking harder. The canes tend to be too upright and thick. Competes with Bluecrop, which may be somewhat better in quality. Winter hardy to -25°C.

Rubel is a wild selection that can be grown for the natural foods market. The fruit is small, firm and dark like low bush varieties. The flavor is fair and yields are moderate. It has very good winter hardiness. Winter hardy to -35°C.

Late Season

Aurora is the latest variety available, producing 5 days after Elliot. The fruit is very firm and stores well. It colors early and can be tart if picked too soon. The fruit size is large with very good yield.

Bluegold produces medium sized berries with small, dry blossom scars. It has good flavor and firmness. It is a low growing bush with many branches and very good hardiness. Winter hardy to -25°C.

Brigitta produces large, firm, flavorful fruit that stores well. It is vigorous but can be less hardy because it grows late into the fall. Excess nitrogen will make this worse. It is susceptible to Phomopsis. Winter hardy to -25°C.

Chandler produces very large berries with good flavor. It has a long ripening season over 6 weeks, which is better for hand harvesting. The bush is vigorous with a slightly spreading habit that can reach 1.5 to 2 m high. Winter hardy to -25°C.

Elliot is a very late season berry with very good shelf life, 30-45 days in a modified atmosphere. The fruit is large and firm but can be tart because it turns blue before ripe. It is a good producer. The bush has an upright habit and forms a dense center that should be pruned to promote air movement. Winter hardy to -25°C.

Jersey is an old (1928) cultivar that is adapted to a wide soil range. It has high yields of machine harvested fruit but the berries are small and soft. The bush has an upright habit and forms a dense center that should be pruned to promote air movement. Winter hardy to -35°C.

Liberty produces fruit approximately 5 days before Elliot with better flavor. The plants are vigorous and upright with good hardiness. The fruit has very good storage capacity.

Nelson is productive with firm, attractive, good flavored that can be machine harvested. The fruit can hang on the bush for extended periods. It is a vigorous, hardy bush with wide soil adaptation. Winter hardy to -25°C.

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(Source: Cornell University Berry Production Webpage: <http://www.fruit.cornell.edu/berry/production/pdfs/bbcultreview2012.pdf>)

Additional Blueberry Variety Notes

Sonia Schloemann, UMass Extension

Arlen (N. C. State) – late season variety ripening just before Elliot. Good yield with medium to large sized fruit with good flavor. Fruit firm with small car. This variety has shown resistance to Anthracnose, and some stem blights. Hardy to Zone 5.

Baby Blue (wild selection, Michigan) – Very low growing (<6”) with large light blue fruit and hardy to Zone 3.

Blue Boy (wild selection, Michigan) – somewhat taller lowbush variety (12”) with light blue fruit with excellent flavor. Fall foliage color makes this appealing for landscape applications. Hardy to Zone 4.

Elizabeth (Heirloom from NJ) – Named for co-founder of American commercial blueberry industry, Elizabeth White. This mid to late-season variety is a shy yielder but produces fruit with exceptional flavor. Plants are vigorous

with an upright to slightly spreading habit. Hardy to Zone 5.

Meader (NH) – Vigorous early to mid-season variety with good flavor and quality. Hardy to Zone 4.

Rancocas (heirloom) – early to mid-season variety with small fruit with very good flavor. Plant moderately vigorous with moderate yield, and is the only variety shown to have tolerance to Witch’s Broom. May also have resistance to Blueberry Stunt Virus (BSV). Hardy to Zone 4.

Reka (New Zealand) – very vigorous highly adaptable early season variety will grow well in a variety of soil types. Fruit is large, somewhat dark in color and has excellent flavor. Hardy to Zone 4.

How Grapevine Flowers Form

Tim Martinson, Cornell University

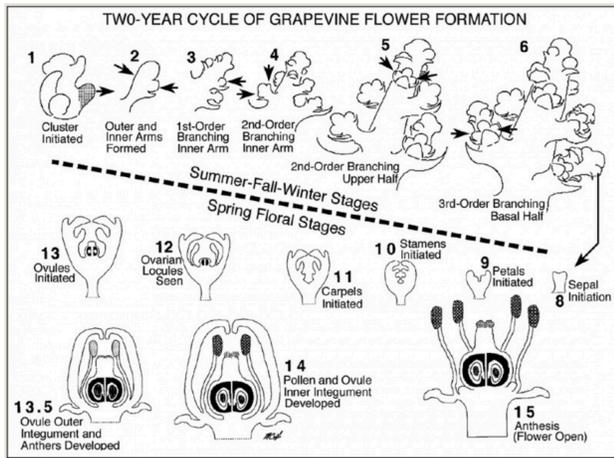


Figure 1. Floral development follows a two-year cycle. Stages 1 to 6 depict initiation of clusters in primary buds of grapevine in June to time of winter dormancy in December. Stages 8 to 15 depict post-winter stages from floral initiation through anthesis (bloom) the next growing season. Stage 7 would describe the very rare instance of a flower initiated by winter. Figure by Martin Goffinet.

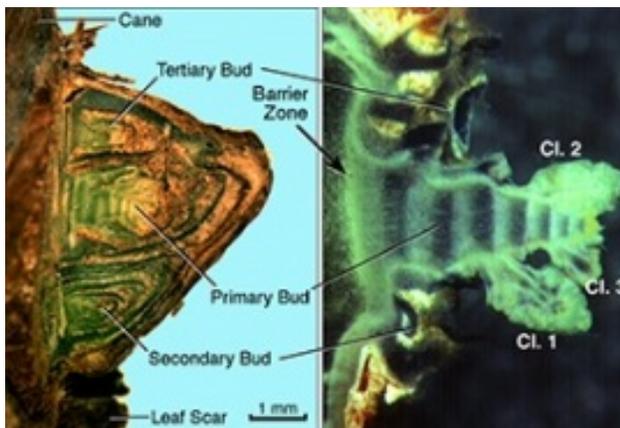


Figure 2. Dormant buds carry the crop potential for the coming year. They have a set number of clusters, whose development started around bloom during the previous growing season. Photo by Martin Goffinet.

Grapevine flowers turn into berries, so the process by which they are formed is a key component of vineyard productivity. How many inflorescences form and how many florets and berries they end up producing is heavily influenced by the process of bud formation, the light environment in which the buds are formed, and the physiological state of the vine – both during the middle and end of the growing season, and early on as buds awakened from dormancy in the spring.

Like many other perennial crops, grapevine bud and flower formation is a two-year process. Buds initiated during shoot growth in the first season produce shoots with

flowers for the following growing season. Anatomists divide flower formation into three separate processes:

Inflorescence initiation. Inflorescences form within complex, or compound, buds in grapevines. Fruitful buds are initiated in leaf axils (located where the leaf stalk, or petiole, meets the growing shoot). A bud’s apical meristem (cells at the tip of developing tissues that actively divide) produces lateral meristem primordia that are at first “uncommitted” – that is, each lateral meristem can either develop into a tendril or an inflorescence, depending on factors influencing tissue differentiation. This occurs within each of the individual bud branches (primary, secondary, and tertiary) that will make up the final compound bud retained over the coming winter period.

Flower initiation. Around the time that four or five leaf primordia have been formed inside the newly-developing bud, the lateral meristem tissue differentiates into either an inflorescence or a tendril. This process is influenced by the light environment surrounding the bud and leaves (particularly the leaves on the same side of the stem that are one node above or below the developing bud), the amount of photosynthate flowing into the developing bud, temperature conditions, and the vine’s nutrient status.

By around véraison (about three months after budburst), the number of inflorescences within “fruitful buds” up and down the canes is pretty much set.

Floral differentiation: Inflorescence branch formation before dormancy. Committed inflorescence primordia further develop by forming branches (initiating several lateral meristems that turn into branches and individual florets). This process begins around bloom, starting with the most basal buds and moving up the shoot, and continues until buds enter dormancy. At dormancy, inflorescence primordia branching is well developed, but individual flowers and their parts are not yet initiated.



Floral differentiation: Bud swell to bloom. As buds are reactivated in the spring, floral development resumes. Each fine-branch meristem produces clusters

of 3-4 flower primordia before bud burst, with formation of a calyx (fused sepals at outer edge of



flower). After bud burst, individual flower organs (corolla made up of fused petals and pollen-producing stamens) first appear, followed by the pistil, ovaries and individual ovules (female organs). This process may be largely complete by about 15 days after bud burst.



Anthesis (flowering). About two weeks after ovules are formed, the calyptra (fused petals surrounding flower parts) separates at the base, and is shed. In our climate, most flowers open within 5-7 days; but cool temperatures can delay and extend the bloom period. Bloom is well-synchronized in our climate with its severe winters, but can extend over 3-4 weeks in Mediterranean climates with mild winters (see: [Climate, Duration of Bloom, and the Window of Risk for Grapevine Diseases](#)). Anthers (pollen-laden structures at the tip of stamens) release pollen after cap fall.

Pollination. Commercial cultivars with perfect flowers (both male and female parts) are often self-pollinated, but most wild grapevines have either male or female flowers, and require cross-fertilization. Once the pollen lands on the stigma (receptive part of the pistil), the pollen germinates and produces a pollen tube, which fuses with the ovule.

Importantly, the rate of growth is critical, because the ovules are only receptive for a short time after bloom. At high temperatures (25-30° C) fertilization occurs within 12 h; at 20°C, this process takes 24 h, and at low temperatures (15°C), 48 hours. With cooler temperatures, growth of the pollen tube may be so slow that fertilization doesn't occur.

Factors affecting flower formation and fertilization. Weather conditions, the light environment, and vine stressors such as water or nutrient deficits can have dramatic effects on the processes leading to inflorescence and flower formation, and ultimately fruit set – many of which are beyond a grower's control. Here are a few of them:

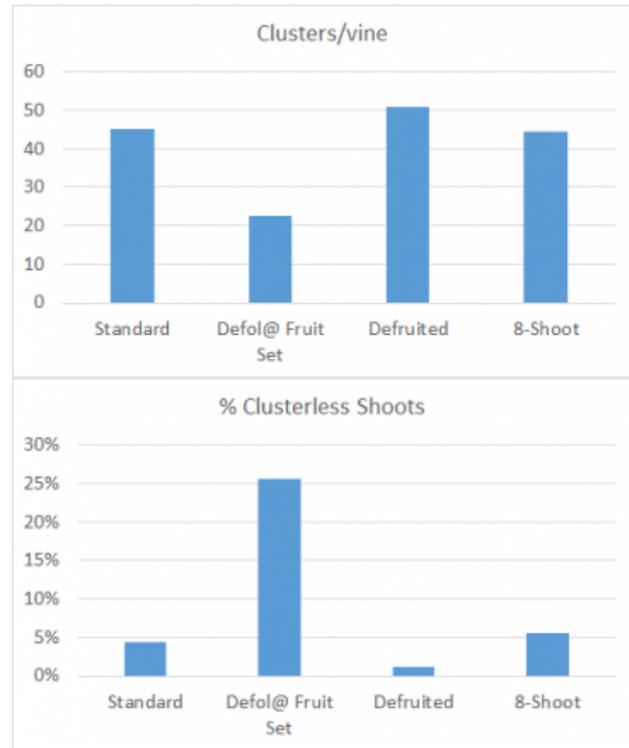


Figure 2. Carryover effects on cluster number and the percent of clusterless shoots in 2018 resulting from complete defoliation at fruit set in 2017.

Light environment. Shoots that are shaded in a dense canopy tend to have less fruitful buds. In practice, the period of inflorescence induction for the first 6-10 nodes retained at pruning tends to occur during 3 or 4 weeks centered around bloom.

Supply of photosynthates to buds. Assimilates (sucrose, N), whether produced by leaves or from stored reserves, are key factors influencing inflorescence induction in developing buds. Stored reserves that fuel early-season growth are largely exhausted by bloom (see [Sources and Sinks: Allocation of Photosynthates during the Growing Season](#)), so reductions in leaf area from cluster-zone leaf removal or poor early-season canopy development can reduce bud fruitfulness and return bloom the following year.

One example comes from a 2017 study where we completely defoliated Riesling vines at fruit set (we left the shoot tips on, and they produced a new canopy by veraison). In 2018, these vines had a 50% reduction in cluster number, and 25% of shoots were clusterless, 19 compared to 4% in the 'Standard' treatment.

Stored Reserves. If vines enter the dormant season with low amounts of stored carbohydrates, floral development in the spring can be compromised. This can be the result of over-cropping, disease that reduces leaf area (think downy mildew), or early leaf fall in cool seasons. Goffinet (2004) measured carbohydrate reserves in minimally-pruned Concord vines, some of which were defoliated at veraison – and therefore over-cropped. The defoliated vines depleted starch reserves the following spring a week earlier than balance-pruned vines, and produced fewer mature leaves to export newly produced photosynthate to the flowers. High crop-to-leaf areas during the ripening season strongly influenced overwintered reserves and primary bud potential.

Low temperatures, cloudy weather and extended bloom. Temperatures at or below 15° C can delay pollen tube growth, resulting in poor set. Cloudy weather that results in less carbon assimilation than on sunny days can limit the supply, also resulting in poor fruit set.

Understanding the timing and sequence of floral development – and the factors that affect it – can help

growers diagnose some of the reasons for poor fruit development. Some practices (crop level adjustment, timing and extent of cluster-zone leaf removal) are manageable, while others (weather) are not.

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Goffinet, M. 2004. Relation of applied crop stress to inflorescence development, shoot growth characteristics, and cane starch reserves in 'Concord' grapevine. Proc. 26 International Horticulture Congress, Acta Hort. 640, pp 189-200.

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(Source: Appellation Cornell, Issue 35, November 2018)

Recent Releases and Numbered Selections from the Geneva Grape Breeding Program

Bruce Reich, Cornell University

Red Cultivars

'Corot Noir' (formerly NY70.0809.10 - SV 18-307 x Steuben) produces a highly ranked vinous, vinifera type wine. The vine is vigorous and very productive at Geneva. Some cluster thinning is usually required to avoid overcropping. Vines are healthy with good powdery mildew and Botrytis rot resistance and often maintain green leaves up until frost. Fruit maturity is late, with harvest Oct. 15-20 in Geneva. Predicted temperature of 50% primary bud kill in mid winter = -15.1 F *

'Noiret' (formerly NY73.0136.17 - [(NY33277 x Chancellor) x Steuben]) produces an excellent full-bodied wine with a distinct pepper character and moderate tannin content. Vines have generally been vigorous and productive in the Finger Lakes of New York, though older vines occasionally show a slow decline in vigor that may be indicative of a need for grafting. The leaves show moderate resistance to powdery mildew, but both fruit and leaves require a regular spray program to control downy mildew. Fruit maturity is mid-season, approx. Oct. 1 in Geneva. Predicted temperature of 50% primary bud kill in mid winter = -14.3 F *

'Geneva Red' ("GR 7") - (Buffalo x Baco noir) highly vigorous, highly productive and winter hardy, with moderate resistance to diseases. 'GR 7' makes dark red wines with a classical hybrid aroma. It has better tannin structure than Baco noir and De Chaunac. It still has a short finish. It is best made as a light (not heavily

extracted) wine. Use hot pressing, short skin contact time or some carbonic maceration. It has a place in traditional red hybrid blended wines, and is already in limited commercial production. Predicted temperature of 50% primary bud kill in mid winter = -17.1 F *

'Arandell' (NY95.0301.01) - Red wine grape with high disease resistance and potential to produce red wines of good quality. Most years at Geneva, NY, fruit and foliage are free of downy and powdery mildew, and only a low level of black rot appears under fungicide-free conditions. In 2009, under season-long conditions conducive to downy mildew development, moderate foliar symptom appeared in September, but not prior to that. The vine is moderately productive (>13 lbs. fruit/vine) and winter hardy (estimated temperature of 50% primary bud kill in mid-winter is -14 F). Wine is very drinkable and enjoyable, with clean light aroma, and a very nice mouth feel, good structure, with blueberry fruit character. The color is dark red and it ranks low for hybrid character. Predicted temperature of 50% primary bud kill in mid winter = -14.1 F *

White Cultivars

'Valvin Muscat' (formerly NY62.0122.01 - Muscat du Moulin x Muscat Ottonel) produces an excellent, high quality muscat wine that may be made into a dessert wine or used in blending. Own-rooted vines are small (1.4 lb./vine in Geneva), and therefore grafting is recommended. Though grafting improves vine size,

planting at somewhat closer than normal spacing (approx. six feet between vines within rows) may also improve vineyard productivity. The fruit is highly flavored, very juicy, and ripens mid-season. Predicted temperature of 50% primary bud kill in mid winter = -14.6 F*

'Aromella' (NY76.0844.24) - (Traminette x Ravat 34) makes a top ranked floral, muscat wine. Own rooted vines have been highly productive, highly vigorous (24 lbs. of fruit/vine; 4.3 lbs. pruning weight average for '96-'03) and very winter hardy. Clusters are large and loose. Leaf phylloxera have been an occasional problem. Maturity is mid-season, ripening in mid-late September

in Geneva.
Predicted temperature of 50% primary bud kill in mid winter = -16.8 F*

NY81.0315.17 - (Cayuga White x White Riesling) produces a floral and sometimes spicy light muscat wine. Highly rated for wine quality for several years. Only available grafted because own rooted vines have been small. *Botrytis* rot has been negligible and winter primary bud hardiness ranks better than Cayuga White, and with many French-American hybrids.

(*Source: Cornell Grape Production Page: <http://www.hort.cornell.edu/reisch/grapegenetics/cultivars.html>*)

Additional resources for Cold Climate Grape Cultivar Descriptions

Sonia Schloemann, UMass Extension

There are a number of excellent resources with comprehensive listings of grape cultivars and their characteristics. Some are listed below:

- **Iowa State Cold Climate Cultivar Review:** <http://www.extension.iastate.edu/viticulture/cold-climate-cultivars>.
- **Minnesota Hardy Grape Page:** <http://mnhardy.umn.edu/varieties/fruit/grapes>
- **Midwest Grape Production Guide:** http://www.oardc.ohio-state.edu/fruitpathology/Bulletins/mw_grape_12aug05%20S.pdf.
- **Missouri Cold Hardy Table Grape Variety Review** (ppt) - <http://extension.missouri.edu/greene/documents/Horticulture/TableGrapeCultivars.pdf>
- **Northern Grapes Project** - <http://northerngrapesproject.org/>

GENERAL INFO

TECHNICAL TIPS from the UVM Extension Ag Engineering Team

Mighty Clean and Comfortable - Check out the on-line case study of Lisa MacDougall's new wash/pack shed at Mighty Food Farm in Shaftsbury. This is part of a series of wash/pack case studies that will include videos as well. More to come. <http://go.uvm.edu/mighty>

Bins, Buckets, Baskets & Totes - Thinking about harvest and storage totes? Vented, solid. Single color or sortable? Cleanable? See a summary of the key features of totes and sources in this new post: <http://go.uvm.edu/totes>

Hanging Hoses - Having water when and where you need it can make a big difference in vegetable wash station efficiency. Investing in a hose hanger, hose reel, or a trolley can help keep the hose off the ground, resulting in a cleaner and more safe work environment. See some of the options in this new post: <http://go.uvm.edu/hoses>

(*Source: Vermont Vegetable and Berry News –November 19, 2018*)

Berries, Weather & Tunnels

Mary Concklin, UConn Extension

2018 was another year in which we experienced weather extremes from a delayed spring, early drought followed by a very hot and humid summer followed by rain that still doesn't seem to want to end. Fruit diseases were a constant challenge as the season progressed. Fall brambles and strawberries experienced heavy losses from botrytis even with the best disease management programs. It is tough

when Mother Nature insists on raining for several days in a row – tough on picking and pest management. These weather extremes are predicted to continue in the future and are likely to include frosts or freezes coming earlier in the fall as well as possibly later in the spring. Do you change what you grow or do you alter how you grow the crop you are already growing?



Growing brambles and strawberries in tunnels is an option worth exploring for several reasons. When it rains harvest doesn't stop – the berries are dry and so are the pickers. Disease incidence, particularly gray mold, is greatly reduced and often non-existent, which reduces fungicide applications which in turn saves you money. You control the amount of water delivered to the roots eliminating saturated soils.

Yields in tunnels have been shown to be higher than in the open field and fruit quality is better. Production of day-neutral strawberries, also called everbearing strawberries,

is increased by extending the season on both ends of the normal harvest season. June bearing strawberries can be brought in earlier in a tunnel but the economics of growing them in a high tunnel aren't there. For those, consider a low tunnel or caterpillar tunnel.

There are trade-offs. Humidity may be higher in some types of tunnels than in the open field so powdery mildew may need to be addressed. The Haygrove tunnel is more open than tunnels enclosed on all sides so humidity buildup is less of an issue, but rolling the sides all the way up and opening the ends of other styles of tunnels works very well. Installing fans helps too. If you fertigate there is the need to watch the soluble salt levels that build up the soil. Flushing the soil in the off-season will help to reduce that issue.

Additional information can be found at the Tunnel Berries multi-state university project website, <https://www.tunnelberries.org/>. A video detailing how to grow raspberries in a high tunnel can be viewed at <https://www.tunnelberries.org/tunnelberriesblog/archives/09-2018>. A lot of very useful information to help you decide if this is right for you.

(Source: *UConn Crop Talk*, Vol. 14, Issue 4, December 2018)

UPCOMING MEETINGS:

- December 1, 2018** – *New England Vegetable & Berry Grower's Association Winter Meeting*. Holiday Inn Portsmouth 300 Woodbury Ave Portsmouth NH 03801 For more information see <http://nevbga.org/MeetingsNEVBGA.php> and/or contact Chris Grant at: nevbga@gmail.com.
- December 4-6, 2018** – *Great Lakes Expo*. Devos Place Conference Center and The Amway Grand Plaza Hotel, Grand Rapids, MI. Registration opens September 25, 2017. Go to <http://glexpo.com> for more details on program and registration.
- December 6, 2018** – *2018 Mass. Farm & Sea to School Conference*, 8:30am – 4:30pm. Doubletree Hotel, 99 Erman Way, Leominster, MA. For more information go to: <https://www.massfarmtoschool.org/get-involved/conference/>
- December 12, 2018** – *Massachusetts Food System Forum* - 9:30 am - 3:30 pm, Doubletree Hotel, 99 Erdman Way, Leominster. Registration is \$25. More information, and online [registration here](#).
- January 4, 2019** – *New England Vegetable & Berry Grower's Association Winter Meeting*. Hadley Farms Meeting House, 41 Russell St., Hadley, MA. For more information see <http://nevbga.org/MeetingsNEVBGA.php> and/or contact Chris Grant at: nevbga@gmail.com.
- January 7, 2019** – *UConn Extension's Vegetable & Small Fruit Grower's Conference*, 9am – 3pm Maneely's Conference Center, South Windsor, CT. Registration 440-460 includes Trade Show, Continental Breakfast, Coffee and Lunch. **Have questions?** Contact mackenzie.white@uconn.edu or 860-875-3331 or click [here](#).
- January 8, 2019** – *UConn Cut Flower Workshop*. 9am-3pm. Scout Hall, 28 Abbe Rd., East Windsor, CT. \$50 includes refreshments and lunch. Registrations due by Dec. 28, 2018. For more information contact Mary Concklin at mary.concklin@uconn.edu.
- January 9, 2019** – *NH Winery Association Winter Workshop*. Flag Hill Winery, 297 North River Rd., Lee, NH. 8:00 – 3:30. For information or to register go to: <https://extension.unh.edu/events/nh-winery-association-winter-workshop>

- January 10, 2019** – *Massachusetts Fruit Growers Association Annual Meeting*. 9am – 3:30pm. Great Wolf Lodge, 150 Great Wolf Drive, Fitchburg, MA. 3 pesticide credits. \$40 MFGA members, \$50 non-MFGA members, includes lunch. For more information and to register, go to: <http://massfruitgrowers.org/2019/annualmeeting.html>.
- January 9-11, 2019** – *North American Raspberry & Blackberry Conference*. Savannah Georgia. For program information and to register, go to: <http://www.raspberryblackberry.com/2019-north-american-raspberry-blackberry-conference/>.
- January 15, 2019** – *Maine Vegetable & Small Fruit Growers Association Annual Meeting*. 9am – 4pm. Augusta Civic Center, Augusta, ME. \$10. Pesticide credits pending. For more information go to: <https://extension.umaine.edu/highmoor/>
- January 17, 2019** – *University of Maine Cooperative Extension Strawberry School*. 10am – 4:30pm. Augusta Civic Center, 76 Community Dr. Augusta, ME. Cost: \$25. Preregistration strongly advised. 2 pesticide credits available. For more information or to register, go to: <https://extension.umaine.edu/highmoor/>
- January 21-22, 2019** – *Vermont Vegetable & Berry Growers Association Winter Meetings*. Lake Morey Resort, Fairlee VT. 8am - 4pm each day. To register for meetings: <https://vrbga2019.eventbrite.com>.
- February 3-6, 2019** – *North American Strawberry Growers Association Annual Meeting & 9th North American Strawberry Symposium*, Wyndham Orlando Resort, Orlando FL. For more information or to register see: <https://nasga.org/n-american-strawberry-growers-conference.htm>
- February 24-28, 2019** - *62nd Annual International Fruit Tree Association (IFTA) Annual Conference and Tours*, Rochester NY. \$840 before January 7th. \$940 thereafter. Includes 2 day speaking program and 2 days of tours with 14 stops, lunches and hot breakfast each morning, Sunday welcome reception and Tuesday social event. For complete program information and registration info, go to: https://www.eventsquid.com/event.cfm?event_id=4940.
- February 27-28, 2019** – *Harvest New England Marketing Conference and Trade Show*. Sturbridge Host Hotel, Sturbridge MA. More information coming soon.
- March 14, 2019** – *Pollinator Habitat Conference*, CT Ag. Experiment Station. Save the date. More info coming soon.
- March 25, 2019** – *2019 Maine Vegetable & Fruit School*. Seasons Event & Conference Center, Portland ME.
- March 27, 2019** – *Massachusetts Ag Day at the State House*, 9am – 4pm. Mark your calendars!

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Questions can be directed to Sonia Schloemann at sgs@umass.edu. Please cite this source if reprinting information that originates here.

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