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Prepared by the University of Massachusetts Fruit Team

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SHORTS:

New England Vegetable & Fruit Conference – The NEV&F Conference was a great success earlier this month. Excellent attendance was demonstrated by many sessions having standing room only in their venues. The trade show featured over 100 vendors, many of them new this year. Farmer-to-Farmer sessions were also a great success. Check out the NEV&FC website for proceedings and pdf files of many of the presentations. Several are included in this issue of Berry Notes. See you in 2017!

2016 Mass Aggie Workshop Series now posted – The 2016 line-up is set. This popular hands-on workshop series kicks off in January with '*Pruning Apple Trees for Homeowners & Enthusiasts*' and wraps up in April with '*The 100-Square-Foot, 25-Tree, 5-Variety Backyard Apple Orchard Fruiting Wall!'* Along the way you can learn about '*Growing & Pruning Blueberries'*, '*Apple Tree Grafting'*, '*Pruning Raspberries & other Bramble Fruit'*, and '*Invasive Plants in Massachusetts'*, among other topics. Check out the Mass Aggie registration site and see what you might like to learn more about.

Cover Cropping for Pollinators and Beneficial Insects Publication Available - SARE publication on cover cropping for pollinators and beneficial insects will help farmers find answers to their cover crop questions. To view or download a copy go to: http://www.sare.org/Learning-Center/Bulletins/Cover-Cropping-for-Pollinators-and-Beneficial-Insects.

Pest Management in Day-Neutral Strawberries

Pam Fisher, Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA)

Before planting

Popular day-neutral varieties tend to be very susceptible to soil born root diseases and nematodes. Day- neutral strawberry growers should pay attention to soil health. Growers who plant strawberries after strawberries, with only a year or two between crops, often rely on soil fumigants before planting to control these pests. Without soil fumigation, you will need long (4-5 years) rotations between strawberry crops, and use of preplant cover crops to reduce nematodes and soil born diseases.

Weed control

In a plasticulture system, there are two types of weed problems – in the planting hole and in the alleyways. In both cases, it is important to start with a site that has low weed pressure. Herbicides should never be applied over the plastic because residues can bind to the plastic and harm the plants, and they can wash into the planting hole and concentrate around the plant.

One way to reduce weed pressure is to pay attention to the size of the hole made in the plastic mulch when planting. Smaller holes are made when a wheel is used to mark the holes rather than punch holes in the plastic, and when a narrow blade-like planting tool is used to push the plants through the plastic. After planting, hand-weeding is important. Some growers assign rows to each worker, who is then in charge of harvest, runners and weed management in that row.

To control weeds in the alleys you will need specialized equipment for either mowing or herbicide application. A boom spray with spray hoods allows growers to apply herbicides to burn off weeds in the alleys followed by application of a residual product.

Insect pest management

Insect pests of day-neutral strawberries include tarnished plants bug, spotted wing drosophila, spider mites, and western flower thrips. There are lots of natural enemies and beneficial insects that help keep thrips and spider mites under control. However, spraying for tarnished plant bug and spotted wing drosophila can be very hard on these natural enemies, and lead to sporadic outbreaks of these pests.

It is important to scout for tarnished plant bugs (TPB) during the bloom and green fruit period of strawberries – which, for day-neutral growers, means weekly scouting and management decisions throughout the summer and fall.

Tarnished plant bug nymphs damage strawberries by feeding on bloom and green fruit, causing cat- facing and fruit deformation. Poor pollination and some environmental conditions can also cause deformed fruit. Tarnished plant bug damage is distinguished from these conditions by looking at the seeds. When damage is caused by pollination or environment, seeds stay tiny and don't develop. When damage is caused by TPB, seeds in the damaged area are fully developed and approximately the same size.

Monitor for tarnished plant bugs by tapping blossom clusters over a dish or tray. The threshold for control is approximately one plant bug nymph in 4 plants or taps. You should look at approximately 100 clusters per field each week. A sequential sampling method allows scouts to reduce the sample size when populations are very high, or very low. See www.Ontario.ca/cropipm .

In June-bearing strawberries, you can reduce TPB damage by controlling the first generation of nymphs with 1 or 2 well-timed sprays during bloom. However, in day-neutral strawberries, the second and third generation of tarnished plant bugs can also cause considerable damage. This second generation of TPB nymphs usually peaks in early-mid July, when day-neutral strawberries have abundant bloom. TPB at this timing can result in considerable damage, so monitoring is important.

Western flower thrips can also show up at this time. Western flower thrips are thin, yellow thread- like insects found in the blossom. Thrips damage the plant cells by scraping plant cells with their mouthparts and sucking up the cell contents. In strawberries, if thrips are a problem, you will see bronzing on the underside of the sepals, and on the fruit around the seeds. Fruit loses its shiny finish, and can become hard and cracked.

In the field, scout for thrips by blowing a quick puff of breath onto the blossom and quickly examining the flower for thrips. Thresholds for thrips on strawberries have not been developed for our region. In dry climates like Israel and Australia, where these pests are a major problem, thresholds of 10 thrips per bloom are used for winter production and 40 thrips per bloom are used for summer production.

In Ontario, western flower thrips are a problem at a small percentage of farms. On these farms we have found that you really can't control them with insecticides. Thrips develop resistance to insecticides very quickly. Beneficial insects, such as minute pirate bugs, are very important for thrips control. These can be encouraged by choosing IPM friendly sprays for TPB, and planting trap crops like alyssum around the field.

Spotted wing drosophila (SWD) doesn't like strawberries as much as it likes raspberries and blueberries, but it is a serious pest of day-neutral strawberries in mid-August and through September. This aggressive, invasive fruit fly lays its eggs in ripening fruit. The eggs hatch before harvest and larvae quickly develop causing soft fruit with poor shelf life. Growers should monitor fruit carefully for SWD damage by routinely sampling fruit and using salt water tests to float out larvae. Control of SWD cannot be achieved by any one method. Growers will need both crop management and use of insecticides for control. Harvest thoroughly every 2 days, rather than using a 3-4 day harvest schedule. Keep your fields clean from weeds, runners and excessive growth, and collect as much ripe from the field as possible. When SWD flies are abundant in the region, insecticides will also be needed.

Two-spotted spider mites (TSSM) require controls in some fields in some years. The overwintering adults are orange, and can overwinter and build up under floating row covers used for winter protection. Check the lower leaf surface of older leaves for overwintering mites. As plants start to grow, mites move out to newer leaves. Feeding damage from mites appears initially as a white flecking on the upper leaf surface, eventually causing leaves to be bronzed, tough and scorched. In extreme cases, webbing develops.

To sample for two spotted spider mite, collect about 50 fully expanded middle-aged leaves from various plants in the field. Assess the populations by checking the lower leaf surface with a handlens for TSSM eggs, nymphs and adults. If mites are present on 25% or more of the leaves examined, the threshold for control has been reached. Predatory mites can be useful for TSSM control, however these can be killed by sprays for TPB and SWD.

Disease management

Botrytis grey mould is an important fruit rot on day-neutrals. This disease occurs when botrytis infects strawberries during bloom. A soft lesion, covered with brownish or greyish spores, develops near the calyx of the fruit as the fruit ripens. Apply fungicides for botrytis control weekly during the bloom period, especially when the weather is cool and wet. Botrytis can develop resistance to certain fungicides if these fungicides are used repeatedly for control. It is important to know which fungicides belong to which fungicide group, and to choose fungicides from different groups when you are making consecutive sprays.

Although there are many fungicide options for botrytis control, the trick is to choose fungicides or fungicide combinations that also control the other two important diseases on day-neutral strawberries – powdery mildew, and anthracnose fruit rot.

Some varieties, such as Seascape, and Portola, are extremely susceptible to powdery mildew. Wet humid weather, or frequent heavy dews, can favour this disease. Symptoms of mildew show up first as a white powdery growth on the lower leaf surface of new growth, but this quickly disappears. A light purple speckling develops on the upper leaf surface, leading to purple leaf blotches and sometimes leaf necrosis. On Seascape, powdery mildew can infect fruit and reduce quality. An effective mildew control program should begin before widespread symptoms develop, at the first sign of speckling.

Anthracnose fruit rot can be devastating. It is common in southern Ontario, and less so in cooler regions. Anthracnose can infect during bloom but it also infects ripening fruit. Anthracnose can build up in the field before any symptoms appear. It is spread by splashing rain and favoured by warm weather. Small black spots show up on fruit, these expand to round dark brown to black circular lesions on the side of fruit. Anthracnose lesions can develop on runners and petioles, and crowns.

Management of anthracnose starts with clean plants from the plant grower. Home-grown plugs are more likely to have anthracnose. Spores can be carried throughout the field on equipment and by workers. Because older plantings tend to have more disease, work in older fields last and clean equipment between fields. Avoid working in fields when plants are wet. Fungicides for anthracnose are especially important in warm weather (i.e., temps between 80-90F) because rains following these temperatures can quickly spread the disease.

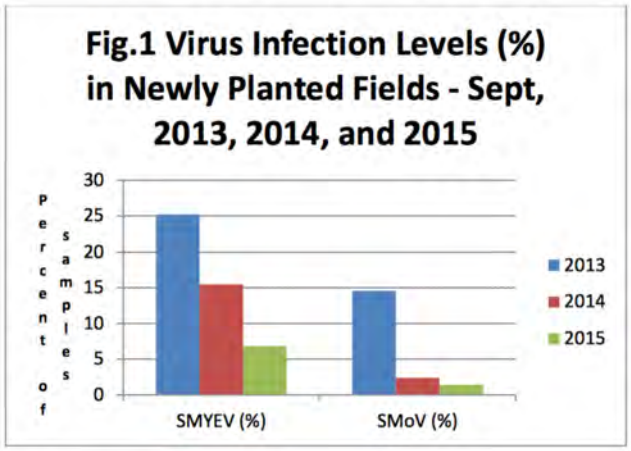
Pest management on day neutrals can be complicated. Weekly scouting, together with a good understanding of the biology of major pests, is important for good pest management. (***Source:*** *2015 New England Vegetable & Fruit Conference Proceedings. http://www.newenglandvfc.org/2015conference/164Fisher.pdf*)

Strawberry Viruses: Why Worry?

John C. Lewis, Perennia Food and Agriculture Inc., Nova Scotia, Canada

An outbreak of two aphid vectored viruses in Nova Scotia strawberry fields in 2012-2013 caused significant losses to both nursery and commercial fruiting operations. The overall loss to the sector was nearly 50% of the combined $19 million crop value. Recovery efforts focused on three strategies: 1) inoculum reduction facilitated by a federal/provincial disaster assistance "replant" program, 2) production of clean nursery stock facilitated by third party virus testing, and 3) optimum vector management facilitated by a province wide aphid monitoring program.

More than half of the commercial fruit crop was lost in 2013 and about 25% in 2014 due to the effects of the viruses. However, the 2015 crop was a bumper one and most growers attribute this to declining virus levels (Figure 1).



The two problem viruses, strawberry mild yellow edge virus (SMYEV) and strawberry mottle virus (SMoV), are among the most common viruses to be found in strawberries and are reported around the world. Individually, they do not appear to cause problems for strawberries but in mixed infections can cause decline symptoms and severe yield reduction. A third previously unknown virus, named strawberry polerovirus 1 (SPV1), was discovered in symptomatic plants collected in 2013 and may also add to the synergistic effects of the primary viruses identified above.

SMYEV and SMoV are both spread primarily by the strawberry aphid, *Chaetosiphon fragaefolii*, so monitoring and management of this aphid is critical for controlling the spread and impact of the decline phenomena observed in Nova Scotia in 2012/2013. In Nova Scotia, this aphid species overwinters as shiny black, football shaped eggs on the underside of old leaves lying close to the ground. Monitoring should begin immediately after mulch removal in the spring with the assumption that the majority of eggs found are of the strawberry aphid. If significant numbers are found, plans should be made to apply a control shortly after hatch which will be within 2 weeks of mulch removal. Newly hatched strawberry aphid nymphs prefer young succulent leaves so monitoring is facilitated by collecting 60 random immature trifoliate leaves on a weekly basis from each field block and examining for nymphs on the underside of the leaves. The strawberry aphid nymphs are wingless and easy to identify although growers will require either trained scouting services or magnifying equipment greater than 20x for verification. No thresholds for treatment have been established but our experience in Nova Scotia has shown that even low numbers of nymphs will increase rapidly and a treatment should be applied when monitoring counts exceed 15 nymphs per 60 leaf sample.

Fig.2 "Wingless" strawberry aphid

Left untreated, strawberry aphid colonies will eventually become crowded and adult aphids will quickly grow wings to allow dispersal to new areas. This marks the beginning of the high-risk flight period where winged strawberry aphids can spread viruses from infected plants throughout a field and potentially downwind to a neighbor's fields. Monitoring for the initiation of the strawberry aphid flight period is critical for minimizing virus spread and we are using yellow

sticky traps for this purpose. Ten traps per field block are deployed at canopy height in mid to late May in Nova Scotia and examined on a weekly basis to establish the beginning of the flight period and upon first catch in a given area growers are informed by a "virus alert" email. Once again, no thresholds for treatment have been established for winged aphid catches but it is important to know that the yellow sticky traps are extremely conservative and even with zero counts in a field, there can be new infections. As such, in the midst of an epidemic such as experienced in Nova Scotia in 2012-2013, it is advisable to guide your spray decisions based on the overall monitoring report (eg. virus alert) rather than your individual field counts. In contrast, a threshold of 1 winged strawberry aphid per 10 trap set is likely a satisfactory threshold to warrant a spray in a low virus pressure situation.

Fig.3 "Winged" strawberry aphid

The strawberry aphid flight period lasts 6-8 weeks in Nova Scotia and upon completion growers may breathe a sigh of relief; however, fields should be monitored by leaf sampling in mid-fall to assess the need for a clean-up spray to minimize egg laying.

Strawberry viruses are a very real threat that caused a serious crop failure in Nova Scotia in 2012-2013. These viruses and others causing decline symptoms in northeastern North America in recent years have been primarily aphid vectored and effective control can be achieved by timely removal of fields, replanting with virus tested stock, and effective monitoring and management of the strawberry aphid. (***Source:*** *2015 New England Vegetable & Fruit Conference Proceedings. http://www.newenglandvfc.org/2015conference/183Lewis.pdf*)

RASPBERRIES/BLACKBERRIES

Primocane-Fruiting Blackberries

Bernadine Strik, Oregon State University

Primocane-fruiting blackberry is a relatively new crop, with the first commercial cultivars, 'Prime-Jan®' and 'Prime-Jim®' (Univ. Arkansas, Fayetteville), released in 2004. Since then, 'Prime-Ark®45' (2011), 'Prime-Ark® Freedom' (2014) and 'Prime-Ark® Traveler' (2015) have been released for commercial production.

The amount of research done on this type of blackberry in addition to grower experience is relatively little compared to the more typical, floricane-fruiting types. Here, I will present a summary of the up-to-date research information (see list at the end of this article), particularly as it relates to crop management, along with some recommendations based on my experience seeing the performance of this crop in various production regions.

Primocane-fruiting, erect blackberries can be grown for a double-crop (floricane in early summer plus primocane in late-summer through autumn) or a single-crop (primocane only). Whether plantings are managed for a double crop depends on the quality and fruiting-season or the potential market of the floricane crop relative to other floricane-fruiting cultivars that are available. Management of the primocane crop, particularly related to modifying the fruiting season (see below), is limited when double-cropping (as the floricanes are present). Also, cost of primocane tipping may be higher when double cropping and yield of the primocane crop may be lower when double cropping than when managing for a primocane crop only.

Primocane crop only

Yield: Primocane yield of the most commonly grown commercial cultivars to date has been limited in many production regions of the USA by their late fruiting season – canes do not have much time to fruit prior to the first frost or heavy rains in autumn. Reported yield in open, field- grown plantings has thus been low in many regions (e.g., 2-3 tons/acre in Oregon; 2-4 tons/acre in Arkansas). Yield can be increased in some of these regions by planting earlier-fruiting cultivars (e.g., 'Prime-Ark® Traveler' has a primocane harvest date 12 days earlier than 'PrimeArk® 45) or by advancing the growth of primocanes using spun-bound polypropylene row covers placed over the row from late winter through early tipping. In Michigan, plants grown only for a primocane crop in a tunnel (plastic sheeted from May through November) still did not produce an economical yield (0.5 to 1.5 tons/acre) from early August to mid-October. Yields in Oregon in a tunnel have ranged from 2 to 8.5 tons/acre depending on pruning method. In these cooler regions, it is clear that yield is limited by the weather – plants have many buds and flowers present on the first frost date. In the central coastal area of California, primocane yield of 'PrimeArk®45' has ranged from 9 to 10 tons/acre when double-tipping.

Pruning: Our early research quickly showed that this type of blackberry has much greater yield on primocanes when they are soft-tipped (removing ~ 2 inches) during the growing season. Soft-tipping primocanes once to about 3 ft tall increased yield 2- to 3-fold compared to untipped canes through increasing branch number per cane and flower number. When we looked at alternative tipping heights of 1.5 ft and 5 ft as compared to 3 ft, we found that yields were similar at the 1.5 and 3 ft soft-tipping height, but tipping later (at 5 ft) reduced branch number, branch length, and yield in our climate. In a tunnel, we showed that double tipping (soft-tipping canes to 1.5 ft

and then soft-tipping the branches to 1.5 ft) increased yield compared to a single tip at 1.5

ft and led to a more compact plant growth and uniform presentation of fruit, increasing picking efficiency. Double-tipping did not reduce fruit size – in fact we found larger fruit when compared to a single tip. Also, a single or double tip has had little impact on bloom date or harvest date in our climate – no impact of tipping vs. no tipping and a single tip vs. a double tip.

A single tip quickly became the standard for research and production in other areas, while a double tip was consistently used in the central coast of California. Growers go through a field on several occasions during the growing season to soft-tip primocanes, by hand, to the desired height and, in some cases, to tip the branches (double-tip). It is important to not tip canes or branches that have flower buds present as this will reduce yield. Late-emerging primocanes will not be tipped (and will likely not fruit as they will be too late).

When we compared soft-tipping canes (removing ~5 inches) to hard tipping canes (removing ~ 1.5 ft) to a height of 3 ft, canes that were hard-tipped produced more branches and had more fruit than soft-tipped canes. However, tipping as early as possible was also an important factor for high yield. When canes were hard-tipped early in the season (June 22-27 in Oregon), the number of fruit was increased three-fold compared to soft-tipping canes early. This supported our hypothesis that tipping to older growth and more mature buds improves branching and yield.

We then studied whether mechanical hedging can be used to provide an economic alternative to hand-tipping of primocanes. While hedging shows potential for reducing labor costs, growers must use caution when hedging to ensure that there are not too many canes in the row that have already formed a flower bud and to hedge as early as possible. Performing a hard-hedge early in the season, by cutting canes back to a shorter height than 3 ft, shows promise in this crop for maximizing economic returns.

We have shown that the primocane crop can be delayed one month by re-cutting the primocanes back to ground level once they reach a height of 1.5 ft (then tip/prune as per usual). Of course, this is only an advantage in a warm climate. In a cooler climate (shorter growing season), the primocane crop may be advanced using spun-bound polypropylene row covers placed over the row from late winter through early tipping or by growing plants in a tunnel with plastic on all season.

Double-cropping

The floricanes are most economically pruned in winter by hedging to a height estimated to be below the region of fruit production the prior fall. Yield of the floricane crop is dependent on the cultivar grown, the vigor of the stand (number of floricanes/length of row), how the canes were managed when they were primocanes, winter pruning method, and growing region. The chilling requirement for the recently released cultivars is estimated at 300 hours. Yield in some warmer regions may be limited by insufficient chilling and in colder regions by winter damage, depending on the year. Yield of floricanes was 2 to 3 tons/acre in Oregon, but has been reported as 3 to 11 tons/acre in smaller, research plots and 3 to 4 tons/acre in commercial fields in the coastal region of California. The fruiting season of 'PrimeArk® Traveler' and 'PrimeArk® 45' is similar to 'Natchez'.

The floricanes would either need to be removed by hand from the row after summer fruiting or be left in the row (dead canes) – some growers might do this to reduce labor costs (e.g., rotate between double cropping and single cropping to reduce pruning costs).

In Oregon, producing a floricane crop reduced the number of primocanes per foot of row and thus would be expected to reduce yield relative to a primocane-only crop. One would also expect primocane pruning (tipping once or twice) to be more labor intensive in a double-cropped system. However, double cropping is common in the coastal region of California.

Nutrient management

Current recommendations are to apply N fertilizer in spring and again near primocane bloom (if using a granular) or to fertigate from spring through early fruit set (primocanes). Application of other nutrients should be based on soil fertility and leaf tissue analysis. Our research in Oregon has shown that leaf samples for tissue analysis should be collected at the early green fruit stage (on primocanes), sampling leaves from primocane branches. If leaves are sampled on this crop during the commonly recommended time of late July to early August, the tissue levels for most nutrients are highly variable making interpretation and monitoring changes over the years difficult.

Published research on primocane-fruiting blackberry (most-recent to oldest)

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(***Source:*** *2015 New England Vegetable & Fruit Conference Proceedings.* *http://www.newenglandvfc.org/2015conference/75Strik.pdf*)

BLUEBERRY

Finding Revenue in your Blueberry Business

Daniel L. Welch, Cornell University

The Dyson School of Applied Economics and Management at Cornell University has a long history of compiling business summaries for different agricultural sectors in New York with the assistance of Cornell Cooperative Extension. Notable examples of these summaries are the Dairy Farm Business Summary and the Fruit Farm Business Summary (FFBS). Gerald White, Dyson School professor emeritus says that the FFBS "identifies the business and financial information they (growers) need and provides a framework for use in identifying and evaluating the strengths and weaknesses of the farm business." Experience with tree fruit growers using FFBS shows they quickly identify practices that are more costly than state benchmarks and address why their individual costs are higher. In 2013, Cornell launched a new effort to analyze the financial condition of berry farms in the state through a Berry Farm Business Summary. Led by faculty and staff from the Department of Horticulture, and the Dyson School of Applied Economics and Management, a team of extension educators worked with eight berry farmers across the state to complete farm business summaries. Each farm provided descriptive information on their farm, and income, expense, labor, and capital records.

Eight farms participated in 2013, the first year of the project. Six of the farms had berries as a primary enterprise on the farm, and are smaller farms. Two of the farms primarily grow tree fruit, with berries as an important secondary enterprise. These two farms were larger, making it difficult to draw general conclusions between them and the six smaller farms. One area for further study and possible benchmarking did emerge in the difference between average yields on the farms. For the six farms, average yield of blueberries was 1,985 pounds per acre. When the other two farms are added, the yield increased by 2,312 pounds/acres to 4,297. A more detailed analysis of production practices and management

strategies at the enterprise level could show opportunities for higher production rates of berries in New York.

Table 1: *Size of Business and Yields*

Size of Business	*8 Farms*	*6 Farms*
Bearing Fruit acres	45.60	5.93
Total berry production (lbs.)	41,927.13	15,266.17
Worker equivalent	8.02	2.12
Rates of Production (lbs./acre)		
Blueberries, pounds per bearing acre	4,297.21	1,985.05

In addition to the business summary, an enterprise budget was developed based on input costs and labor costs that were broken down by tasks in a typical high bush blueberry system. Members of the New York State Berry Growers Association then verified the assumptions in the enterprise budgets. Each budget includes cost of production expenses for the pre-plant year, establishment year, and an early production year. Not surprisingly, labor was the most costly component of production expenses, as illustrated by the production year where labor for wholesale or retail berries was 80% of the total expenses. Using information from the business summary, this is also an area that showed differences between the 2 relatively larger farms and the other six farms in the completed analysis. On the 6 farms the average worker could cover 3.44 acres, and when the two other farms are added the average worker handled 4.48 acres. Labor certainly requires careful management for efficiency and maximum profit potential.

Using data from the 2012 NYS Berry Pricing Survey, and the expenses from the enterprise budget, a breakeven analysis was developed based on different yield and price assumptions. Establishment costs were pro-rated over 10 years for the planting. Also, operator labor was included as an expense. In this analysis it showed that farms that are producing 1,876 lbs./acre of blueberries would have to charge $9.00/pound just to cover their costs. On the other hand a farm growing 4,221 lbs./acre would only to need charge $4.00/lbs.

Table 2: *Returns to Risk and Management for Wholesale Blueberries, NY 2014*

	Yield (lbs./acre)			
Price ($/lb.)	**2,000**	**3,000**	**4,000**	**5,000**
$2.00	$4,000.00	$6,000.00	$8,000.00	$10,000.00
$3.00	$6,000.00	$9,000.00	$12,000.00	$15,000.00
$4.00	$8,000.00	$12,000.00	$16,000.00	**$20,000.00**
$5.00	$10,000.00	$15,000.00	**$20,000.00**	$25,000.00
$6.00	$12,000.00	**$18,000.00**	$24,000.00	$30,000.00
$7.00	$14,000.00	$21,000.00	$28,000.00	$35,000.00
$8.00	$16,000.00	$24,000.00	$32,000.00	$40,000.00
$9.00	**$18,000.00**	$27,000.00	$36,000.00	$45,000.00
Breakeven price	$8.44	$5.63	$4.22	$3.38

For a grower to find additional revenue from their blueberry business, they need to understand their cost of production, pricing, and breakeven yields and prices. Additional production challenges from a changing climate and increasing pest pressure from invasive species can result in higher costs making it even harder to find adequate revenue from blueberries. Growers that have more complete financial information about their business and overall berry economics should be able to better plan to meet their financial goals.

(***Source:*** *2015 New England Vegetable & Fruit Conference Proceedings. http://www.newenglandvfc.org/2015conference/12Welch.pdf*)

GRAPE

Horticulture and Disease Management of Cold Climate Grapes in Vermont

Terence Bradshaw, University of Vermont

Winegrape production is relatively new to New England, especially in colder regions away from the coast, due to the breeding of cold-hardy cultivars that has enabled this industry to be successful. In the great wine regions of the world, cultivar adaptation to sites evolved over decades if not centuries. The comparatively young New England winegrape industry must likewise adapt cultivar choice and management to ensure profitable production of high-quality wines that consumers want and purchase.

Evaluation of winegrape cultivar performance has been conducted at the UVM Horticulture Research and Education Center in South Burlington, VT (USDA hardiness zone 5a) since 2007. The farm is located on Windsor-Adams loamy sand soil with low organic matter and good soil drainage. Eight winegrape

cultivars were planted in a randomized complete block design of six blocks with four-vine plots of each cultivar per block: ‘Corot Noir’, ‘Frontenac’, ‘La Crescent’, ‘Marquette’, ‘Prairie Star’, ‘St. Croix’, ‘Traminette’, and ‘Vignoles’. Vines were trained from two trunks per vine to a five-foot high-wire bilateral cordon system at a density of 726 vines/acre.

Assessed horticultural parameters included: vine vigor (pruning weight); indirect cold hardiness measurements (primary winter bud survival, cordon length); yield, and juice quality parameters. In addition, incidence of disease on fruit and foliage was evaluated. ‘Frontenac’, ‘La Crescent’, ‘Marquette’, ‘Prairie Star, and ‘St Croix’ rated well for measurements of cold hardiness and vine vigor. Those cultivars also had among the highest crop yield in most years, except ‘Prairie Star’ which rated among the lowest in all years. ‘Corot Noir’ had among the best crop yield through 2013, but suffered from substantial winter damage in the cold 2013-2014 and 2014-2015 winters. ‘Frontenac’, ‘La Crescent’, ‘Marquette’, and 'Vignoles' generally produced juice with higher titratable acidity (TA) and soluble solids than other cultivars, and ‘Corot Noir’ and ‘St Croix’ juices ranked lower for those variables. ‘Traminette’ and ‘Vignoles’ performed poorly in most measures of cold hardiness, vine vigor and crop yield compared to other cultivars in this trial, and were removed from the planting after 2011.

Diseases that were assessed included: powdery mildew; downy mildew; black rot; Phomopsis leaf spot and fruit rot; angular leaf scorch; and anthracnose (data not shown). Complete assessment was conducted in 2010-2012. Later assessments have been conducted as the vines have matured but data were not analyzed by the time of this publication. Powdery mildew was the most prevalent disease and was observed on the foliage of all cultivars in each year. 'Frontenac' or 'Prairie Star' ranked the highest numerically in percent leaves infected but were not significantly different from some of the other cultivars. No powdery mildew was observed on any fruit in any year. Downy mildew was also observed only on foliage and not on any fruit over the three years of the study. In 2010 and 2011, the highest foliar incidence was observed on 'Vignoles'; in 2012, the highest foliar incidence was observed on 'La Crescent' vines after 'Vignoles' vines (and 'Traminette' vines) were removed from the planting after 2011. Phomopsis foliar symptoms were not observed in any year but fruit rot symptoms were observed in 2010 and 2012. In 2012, 'Frontenac' had the highest

incidence and severity, followed by 'Marquette'. Black rot, angular leaf scorch and anthracnose were either not observed or at very low incidence during the three growing seasons. In summary, differences in disease incidence and severity among the cultivars were observed for some diseases. Future research which allows for comparison of multiple fungicide programs during a growing season is needed to determine the innate disease resistance/susceptibility of these cultivars and how best to incorporate this knowledge into effective disease management programs that address economic, health, and environmental concerns.

Acknowledgements

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UVM NE-1020 Winegrape Evaluation Vineyard: Harvested crop yield tons/acre.

Cultivar	Cumulative	2009	2010	2011	2012	2013	2014	2015
Corot Noir	28.80a[z]	1.87ab	3.75abc	9.20a	5.16a	5.61	1.72c	11.49c
Frontenac	29.97a	2.29a	3.84ab	6.33a	4.10ab	6.00	4.06a	3.34ab
LaCrescent	24.81a	1.80ab	4.69ab	6.46a	2.75bc	5.31	2.57bc	1.21c
Marquette	26.67a	1.17abc	4.79ab	6.24a	2.51c	6.91	2.89abc	2.34abc
Prairie Star	21.06a	1.45abc	2.68bc	2.66b	1.77c	5.28	3.74ab	3.47a
St. Croix	29.30a	1.93a	5.79a	7.91a	2.59c	5.65	3.39ab	2.04bc
Traminette[y]	5.01*	0.26c	2.14bc	2.62b	-	-	-	-
Vignoles[y]	1.59*	0.66bc	0.92c	-	-	-	-	-

Mean performance parameters 2009-2015

Cultivar	Cordon length (m)	Pruning weight (kg)[w]	% Live nodes in spring	Cluster weight (g)	°Brix[x]	pH[x]	TA[x]
Corot Noir	1.61ab	0.45bc	65.5b	133.3a	16.5d	3.14b	0.89d
Frontenac	1.72a	0.68ab	86.0ab	107.2b	23.5ab	3.16b	1.64a
LaCrescent	1.72a	0.69ab	87.2ab	92.1bc	21.8bc	3.05bc	1.52ab
Marquette	1.61ab	0.72ab	83.9bc	87.9bc	24.4bc	3.08b	1.39ab
Prairie Star	1.65ab	0.56b	73.9b	77.2c	20.8b	3.32a	1.10c
St. Croix	1.71ab	0.80a	88.9a	97.5c	18.7c	3.13b	0.88d
Traminette[y]	1.63ab	0.39bc	64.7b	73.2c	21.5bc	2.86c	1.15c
Vignoles[y]	1.50b	0.23c	63.4b	53.8c	22.0bc	2.95c	1.53a

[z]*Values represent the mean from 6 replicate four-vine plots per cultivar of 20 leaves or 10 clusters per plot. Means followed by the same letters within columns are not significantly different according to Tukey's Studentized Range (HSD) Tes (p≤0.05).*
[y]*Traminette and Vignoles were removed after the 2011 season due to poor cold hardiness, yield, and disease sensitivity.*
[x]*Parametersmeasured on extracted juice samples.*
[w]*Pruning weight represents mean weight of canewood removed per vine each year.*

Relative Disease Ratings for Wine Grape Varieties Grown in Vermont
Lorraine P. Berkett, Professor Emeritus, University of Vermont
http://www.uvm.edu/~fruit/grapes/gripm/RelativeRatingsOfDiseaseMay2011.pdf

Ratings: *+ slightly susceptible; ++ moderately susceptible; +++ highly susceptible*

	Black Rot	Powdery Mildew	Downy Mildew	Botrytis	Angular Leaf Scorch	Phomopsis	Anthracnose
Baco Noir	+++	++	+	+++	++	+	?
Cayuga White	+	+	++	+	++	+	?
Frontenac	+++	+++	+	++	++	+	+
Frontenac Gris	++	+++	+	++	?	+	+
LaCrescent	+++	+++	+++	+	++	+	+++
LaCrosse	+++	++	+++	+++	?	++	+
Leon Millot	+	+++	+++	+	+	+	+
Louise Swenson	+	+	+	+	++	?	++
Marechal Foch	++	++	+	+	+	+	++
Marquette	+++	+++	+	+	+	?	+++
Prairie Star	++	+	+++	+++	++	?	++
Riesling	+++	+++	+++	+++	+	++	?
Sabrevois	+	+	+	+	?	?	?
St. Croix	+++	++	++	++	++	?	+
St. Pepin	+	+++	++	++	+	?	?
Seyval	++	+++	++	+++	++	++	?
Swenson Red	+	++	+++	++	++	?	?
Swenson White	+	++	++	+	+++	+	+++
Traminette	++	+	+++	+	+	?	+
Vidal	++	+++	+++	+	+	+	+++
Vignoles	+	+++	+++	+++	++	++	+++

*****Resources****: Midwest Grape Production Guide, Bulletin 919, OSU, 2005; New York and Pennsylvania Pest Management Guidelines for Grapes: 2006; "Characteristics of Cold Hardy Grape Cultivars", Dr. Paul Domoto, Iowa State University, 2007; and observations from Vermont vineyards. Note: Where there were differing ratings, the more susceptible rating was used.*
(**Source**: 2015 New England Vegetable & Fruit Conference Proceedings, www.newenglandvfc.org/2015conference/231Bradshaw.pdf)

Nutrient Runoff and Cover Crops

Jude Boucher, University of Connecticut

Photo- DZT machine with tank for placing liquid N below seeding depth at planting.

There were a couple of great articles in the November 'Farm Journal' that were brought to my attention by Nelson Cecarelli of Cecarelli Farm in Northford, CT. The first concerned how farmers should avoid future regulations concerning nutrient runoff which may be implemented because of problems such as the dead zone in the Gulf of Mexico (and even L.I. Sound), Des Moines suing its upstream tile-drained neighbors over N in drinking water, and the EPA trying to expand its jurisdiction over more "Waters of the United States". You've heard me talk about these issues before in tile drainage, soil health and reduced-tillage articles.

The first article was about the research of Jason Krutz and Martin Locke, irrigation and soil specialists in Mississippi, who have been working with large simulated rainfall plots for years to see what combination of practices will reduce surface runoff. They found that reduced tillage systems (think deep zone tillage!) combined with a rye cover crop substantially reduces surface crusting com-pared with conventional tillage and can reduce runoff as much as

Photo - Three-layered cover crop mix that winter kills: sun hemp (top), oats (middle) and tillage radishes (bottom).

a no-till system. Reduced-till systems reduced the amount of water leaving the field by 67% compared with conventional tillage, and that reduced losses of both nitrogen and phosphorus. Next they plan to investigate cover crops that winter kill in combination with deep-tillage in their quest for a profitable and environmentally sound system. Some CT growers, like Nelson, who has used a combination of sun hemp, oats and tillage radishes which die before early spring cash crops, have already implemented these practices.

The second article dealt with maintaining crop yields by investigating different aspects of cover crop management. It cited three different studies where they compared annual and winter rye cover crops killed at different heights, changing N timing and placement, and using row cleaners to sweep high-carbon residues aside so they don't tie up nutrients early in the crop growth cycle or inhibit plant growth through allelopathic effects. They noted that while using cover crops is a great practice, they can compete with the cash crop, especially early in the corn life cycle, and produce yield reductions from which the crop never recovers. They found that letting winter rye grow taller reduces corn yields and recommended it be killed early in the spring. Also, that you can counter some of the adverse effects of larger rye by supplementing broadcast applications with the placement of a small amount of N in the furrow and more in bands at planting, and the rest at sidedressing time. This produced better yields than using the same total amount of N applied broadcast and sidedressed only. Finally, they noted how by using row cleaners, or even by producing a clean tilled strip for planting (think DZT again!), you could get much higher yields by avoiding most of the competitive effects of the rye residue.

Most of the suggestions from both articles are incorporated in the deep zone tillage system. The DZT reduced-till system protects most of the surface from crusting with a cover crop, slows the speed of water on a slope, allows in-creased volumes of water to enter the soil profile by ripping through compacted layers with a deep shank, and uses row cleaners or residue managers and a narrow seed bed (strip) to move rye residue away from the young crop plants. A couple of CT growers are even placing liquid N below the row at planting while most band some of their N at planting. We now have about 20 growers in CT, including Nelson, using DZT to plant corn and lots of other vegetables. All these folks have reduced the amount of

runoff leaving their farms, reduced their fertilizer and fuel bills, increased their yields, and made their crops less susceptible to droughts and flooding. They are doing their part to help stop future regulations concerning runoff. How about you? (***Source**: UConn Crop Talk, December 2015*)

Over-Wintering Pesticides

Mary Concklin, University of Connecticut

Plan to protect any materials left over from this past season so they will be effective next year. The storage area should be well ventilated and dry.

1. Make sure the original label is still attached to the container. If a small amount is left in the container and you want to keep it for next season, DO NOT put it in another container. Always leave the material in the original con-tainer to avoid mistakes the next season.
2. All non-liquid materials should be stored where they will remain dry throughout the winter. If they are in bags, lift them off the floor to avoid absorbing moisture.
3. Liquid materials should be stored where they will not freeze. Read the label for specific temperature require-ments.
4. To avoid contamination, herbicides should never be stored above or next to non-herbicides. Likewise all liquid materials should be stored below non-liquid materials.
5. Fertilizers should be stored in a separate room when possible or at least well away from the pesticides.
6. Storage information is found on the label under the 'Storage and Disposal' section as well as in Section 7 on the Safety Data Sheet (SDS, formally called the MSDS). Check the label and/or SDS for your specific material for stor-age information. Some examples from labels of commonly used materials are:

   ⇒ Þ _**Indar 2F**: Store in a cool dry well-ventilated area, but not below 32°F (0°C)

   ⇒ Þ _**Actinovate AG**: Store in a dry, cool place out of direct sunlight and away from heat sources. Keep from overheating or freezing. Optimum storage temperature is 40° F to 85° F

   ⇒ Þ _**Voliam Xpress**: Store in original containers only. Keep container closed when not in use. Do not store near food or feed. In case of spill or leak on floor or paved surfaces, soak up with sand, earth, or synthetic absorbent. Remove to chemical waste area. DO NOT ALLOW PRODUCT TO FREEZE

   ⇒ Þ _**Stinger**: Store above 28ºF or warm to 40ºF and agitate before use

7. Inventory what is left to make life easier as you plan for the upcoming season. And finally,
8. Lock the storage.

(***Source**: UConn Crop Talk, December 2015*)

UPCOMING MEETINGS:

January 16, 2016 – *NOFA – Mass Winter Conference*. Worcester State University. You can learn more about the conference and register at www.nofamass.org/events/wc.

January 22-24, 2016 – *NOFA-NY Winter Conference***.** Saratoga Hilton and City Center, Saratoga Springs, NY. For more info see www.nofany.org.

Jan. 25, 2016 - *Vermont Vegetable and Berry Growers Assn Annual Meeting*, Fairlee, VT. For registration information see: http://www.uvm.edu/vtvegandberry/?Page=meetlist.html.

Feb. 6, 2016 – *New England Vegetable & Berry Grower's 591st Meeting*. Hudson Portugese Club, 13 Port St. Hudson, MA. For more information or to register go to http://nevbga.org/ or contact Lisa McKeag at (917) 573-5558 or secretary@nevbga.org.

Feb. 13-15, 2016 - *NOFA-VT Winter Conference*, Burlington, VT. For registration information see: http://www.uvm.edu/vtvegandberry/?Page=meetlist.html.

Feb. 16, 2016 – UMass Extension Plant Nutrition for Greenhouse Crops: On-site Media Testing - 12:30pm – 4:00pm. Publick House, Sturbridge MA. $30. See more at: https://ag.umass.edu/events/plant-nutrition-for-greenhouse-crops-on-site-media-testing#sthash.pgWug7zG.dpuf.

Feb. 28, 2016 – *Southeast Mass Ag Partnership (SEMAP) Ag & Food Conference*. 9:00am – 5:00pm. Bristol County Agricultural High School, 135 Center St, Dighton, MA. For more information go to: http://semaponline.org/programs/ag-food-conference/.

March 1-4, 2016 - *North American Raspberry & Blackberry Conference*, Williamsburg, Virginia. All-day tour on March 2, educational sessions and trade show on March 3-4. For more information, visit www.raspberryblackberry.com.