



Berry Notes

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Pam Fisher, OMAFRA, Ontario, Canada
- Controlling Root and Crown Diseases in Brambles
Dr. Kerik Cox, Cornell University

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Crop Rotations and Cover Crops for Strawberries

Vern Grubinger, UVM Extension

When I started in Extension, a local fruit grower gave me a tour of his farm and some sage advice. “Anyone can grow strawberries for 10 years” he said. “Then comes the real challenge: getting good yields after all your best land has been planted to berries at least once.” Since that time I’ve heard many growers fondly recall the high production they had on ‘virgin’ fields. Clearly, bad things happen when land is planted too often to strawberries. Soil-borne diseases, insect pests, and weed populations tend to increase. Soil fertility may also suffer due to compaction and a decline in organic matter quantity and quality.

Crop rotation is essential if one wants to remain a strawberry grower. The rotation design depends on how much land a grower has to work with, how much strawberry acreage is needed to meet market demand, and what the farm’s overall crop mix is. If land on the farm is limited, a grower should consider renting or acquiring additional land, or temporarily trading land with nearby farmers that grow other crops suitable for strawberry rotation, such as forages.

Exactly what makes a good rotation for strawberries, or any small fruit, is not entirely clear, but several suggestions can be made with confidence based on research results and grower experience: 1) rotate out of berries for as long as possible between plantings, 2) avoid rotating with crops that host strawberry pests, and 3) include cover crops in the rotation.

By adding organic matter to the soil, cover crops can improve soil structure, enhance nutrient reserves, and promote the biological activity that is associated with ‘healthy’ soil. Leguminous cover crops like clovers, hairy vetch and field pea add nitrogen to the soil. Fast-growing cover crops like buckwheat, sorghum-Sudangrass and Japanese millet can suppress weeds. Growers need to select cover crops that best address their production priorities. The book *Managing Cover Crops Profitably* (1) describes the attributes and management of many cover crop species.

Marvin Pritts of Cornell, writing in the *Strawberry Production Guide* (2) advises: “Do not grow strawberries for 5 or more consecutive years on the same site without

some type of crop rotation. Plan to reserve at least 30% of your land (preferably 50 to 70%) for rotation in future years, because a minimum of 3 years should elapse between plantings on the same site. Land not planted in strawberries should be planted in soil improving cover crops or cash crops that allow for easy weed management.”

Bill Lord of the University of New Hampshire suggests a 5-year rotation at a minimum (3). For example, set the plants in year 1, fruit them in years 2 and 3, then turn the crop and weeds into the soil and start cover cropping immediately after harvest with the sowing of Sudangrass, or Japanese millet in short-season areas. Either cover crop will winter kill in northern climates, and after incorporation of residues in the spring of year 4, sow oats, followed by Sudangrass in summer. In year 5 repeat the cover crop cycle or plant sweet corn to provide income. Corn also adds a significant amount of organic matter to the soil if the stalks are chopped or flail-mowed, incorporated, and followed by fall oats once more before strawberries are planted again.

Strawberry growers are using many different rotations. Below are descriptions of the strategies employed by several growers in New England.

Grower 1 has been growing half an acre of organic strawberries in southern Vermont for over 20 years, rotating on 2 acres. He has never had a serious root disease problem, or a decline in yield (other than normal fluctuations). He uses the matted row system, fruits the

berries for just one year, then goes out of berries for 4 or 5 years after that. His rotation has varied over time depending on which pieces of land dry out and what his crop mix is. He likes to use long term cover crops like medium red clover for 2 years as a soil builder, and has had very good berry yields after that. He has also used hairy vetch mixed with rye. One limitation is that he cannot easily follow the vetch with berries because he plants berries in the spring before it’s time for the vetch plow down. He finds that legume cover crops do not suppress quack grass, which is becoming a problem on his farm. Recently he has been growing annual crops like sweet corn or cut flowers immediately before and after



Sorghum-sudangrass interseeded with oats and vetch. Photo from Cornell NorthEast Organic

the berries in order to get better perennial weed control. “If you’re looking for a firm rotation plan, I don’t have it. But I do follow some principles, like staying out of berries for several years, and preceding the berries with a crop that I can get good weed control in, so that basically the soil is bare of perennial weeds at the end of the growing season before berries. Then I go in with rye or oats as a winter cover prior to planting berries. Hopefully in 10 more years I’ll have the perfect rotation down.”

Grower 2 has been growing strawberries conventionally for 50 years in southern Vermont. He has 5 acres bearing fruit each year on 30 acres of tillable land. He plants an acre or an acre and a half of new strawberries each year. His crop mix includes about 5 acres of raspberries, too, which complicates rotation. “What I’ve concluded is: if you don’t have to, don’t plant where you’ve had strawberries before! Of course, you have to use the land you’ve got. Seventy-five years ago my uncle used to prepare a strawberry field with buckwheat, and I’m still a buckwheat believer - it does something good to the soil for berries. I pick a berry field for 2 years, so they are in for 3 years including the planting year. Then I idle the field for 3 or 4 years, and there are lots of things one can do during that time, including a legume plow down. We’re also grown raspberries to utilize the land economically, although they don’t improve the soil. There are a couple of other ingredients besides the crops themselves in a rotation; where I’ve used Sinbar several times, that stuff is murder on a re-planting of strawberries, so I try to get by with other herbicides.”

Grower 3 is a conventional grower in New Hampshire that grows 10 acres of strawberries along with about 50 acres of vegetables and cover crops. “We always seem to tie up a high percentage of our tillable acreage with annual crops, as a result we have less acreage committed to permanent sod or green manures than I would like. Over the years we have accumulated enough land so that we can rotate out of berries for 3 to 4 years, but unfortunately we have to include solanaceous crops in the rotation, which we usually try to do in the first year after berries. In the second year we grow cucurbits or what we call ‘the small stuff’ - carrots, radishes, lettuce, etc. These first 2 years of the rotation contribute to the weed seed bank of the soil so I like to plant sweet corn the next year or two, prior to planting strawberries, because the cultivations and herbicides for corn help reduce some of

that weed pressure. We winter cover crop everything and sow cover crops in the summer on land that is open. We use buckwheat as a quick weed suppression crop in the summer. Our spring cover crops include field peas plus triticale. In the fall we find that inexpensive horse oats work just fine, and you can glom them on the field at high rates in fields where small seeded or very early crops are going to go in the following spring. Hairy vetch plus winter rye are used in areas where sweet corn or crops on black plastic are going. We’ve also had success establishing Dutch white clover as a strip crop between rows of black plastic and plowing it down the following spring. We like the using clover rather than a less expensive intercrop like ryegrass because of our crabgrass problem. We are able to establish a solid mat of clover by mowing off the broadleaves and then we suppress the crabgrass by spraying a post-emergent grass herbicide over the crabgrass.



Buckwheat cover crop. Photo from Washington State Univ. Organic Farming Systems Research Program.

Grower 4 is located in northwest Vermont. “For years and years, my bread and butter rotation has been this: Year 1: July after berry harvest, quick tillage and sow sorghum-Sudangrass; September 1, flail the cover crop, till lightly, sow winter rye. Year 2: late May flail the winter rye, light tillage, sow sorghum-Sudangrass, September 1, flail, till lightly, sow winter rye. Year 3: same as year 2, then late October moldboard plow the rye. Year 4: plant strawberries. Years 5 to 7 crop the strawberries. Year 7

is the last crop, same as year 1, above. This rotation kept the organic matter up around 5 percent. With only one moldboard plowing per six years, the soil structure stayed pretty good. I stuck with grass/grain crops on the theory that they'd be more likely to break the disease/nematode cycle than legumes. This rotation kept production pretty good for 3 cycles (18 years) or so, but lately production has fallen off. I know this is pretty common experience. I have heard that applying compost and switching to a soil spader for tillage solved it for one grower. I certainly never wanted to start down the fumigation road. I'm fooling around with some currants and grapes. I'd like to plant something permanent out there -- I've done the rock picking thing for too many years. It seems odd that I'm sitting on 11 acres of fertile, tile-drained, irrigated land, with good tilth, have 20 years of farming experience, but don't know what to plant.

References:

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 (2) Pritts, M. and D. Handley (eds.) 1998. *Strawberry Production Guide for the Northeast, Midwest and Eastern*

Canada. NRAES, 152 Riley Robb Hall, Ithaca NY 14853. www.nraes.org
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 (*Source: Vermont Berry News, Feb. 2002*)

Day Neutral Strawberries: Off-Season Opportunities

David T. Handley, University of Maine Cooperative Extension

Day neutral strawberry production offers New England growers an opportunity to market fresh strawberry fruit during the late summer and fall when market demand is high and supply, especially local supply, tends to be low. Although day neutral plants don't produce a concentrated fruit set like their June-bearing counterparts, which limits their attractiveness for the pick-your-own market, they will continually set fruit over several to many weeks, stretching out the harvest season well into the fall, and providing a high value specialty item for roadside stand, farm market and restaurant sales. Growing these plants differs considerably from growing typical June-bearing strawberries in the classic matted row system. Day neutral plants are often grown as an annual crop, and are typically grown on raised beds with plastic mulch and very high planting densities. As result, the establishment costs and labor commitment tend to be quite high, and prices charged for the fruit must reflect this in order to return a reasonable profit.

Site Selection & Preparation

Selecting an appropriate planting site is critical to the success of the planting. While strawberries can tolerate a variety of soil types, they grow best in a well-drained, deep sandy loam, rich in organic matter. Do not plant strawberries in an area where tomatoes, potatoes, peppers, or eggplant have been grown in the past four years. These crops carry a root rot (*Verticillium*) which also attacks strawberries. Do not plant strawberries into recently plowed grass or sod areas. This can lead to devastating weed problems and damage by white grubs, a common turf pest, which will feed upon strawberry roots. Finally, choose a site where there is ready access to a water supply. Irrigation is important for good plant establishment and to maintain plant growth and fruit quality during dry periods. Strawberries prefer a soil pH of 5.8 to 6.2. Soil testing information is available at your Cooperative Extension office. If the organic matter level of the soil is low (less than 2%) and/or perennial weeds are a problem, a cover crop such as buckwheat, Sudan

grass or oats can be sown and plowed into the soil the year before planting. Applications of compost can also be used to increase organic matter. Fertilizer can be applied and worked into the soil prior to planting, or banded into the soil prior to applying plastic mulch and planting. Rates should be determined through soil tests taken the previous fall. In general, a rate of approximately 100 lbs. of nitrogen, 50 lbs. of phosphorus (P205) and 50 lbs. of potassium (K2O) should be incorporated into the soil prior to planting (e.g. 600 pounds/acre of 20-10-10 or its equivalent).

Beds for day neutral strawberries should be prepared as early in the spring as possible, or beds may be pre-made during the fall before planting. Raised bed heights and widths vary depending on the type of equipment and amount of land available. In general, beds should be four to twelve inches high with a one and 1/2 inch crown sloping from the center of the bed down to the edges to promote the shedding of water off of the bed surface. Bed width depends on how many rows of plants will be established on each bed, ranging from 18 inches (one plant row) to 46 inches (three to four plant rows). In New England, growers have generally found the one or two plant rows per bed are easiest to manage and



Seascape strawberries. Photo from Nourse Farms Nursery.

use a bed width of 18 to 42 inches. Having a smooth, well-packed, well-shaped bed will greatly improve the fit and performance of the plastic mulch on the bed, because good mulch to soil contact improves the ability of the mulch to warm the soil, and to shed water. Beds will form best when the soil is moist and friable. Trickle or drip irrigation lines are typically installed during bed forming at about a 4 inch depth in the bed, with either one or two lines, depending on how many plant rows there will be on a bed. They should be placed to a few inches to the side of the plant rows to prevent being punctured during the planting process. The plastic mulch should be laid tightly over the beds immediately following bed forming. Black plastic is most commonly used to promote soil warming and to provide weed control. White plastic is sometimes

used where summer temperatures can get very high and fruit tends to break down on the hot black plastic. However, white mulch keeps soil temperatures cooler and may delay plant growth. To ease the planting process, the mulch is often marked with small holes or dimples after it is laid to show where to put the plants. This can be done by fixing bolts or cleats to a wheel spaced such that they will leave a dimple at the appropriate spacing on the plastic (10 to 14 inches apart within the row). The wheel is attached to a frame and handle which can be pulled over the plastic so that the dimples will form a line at the correct row spacing and on the bed.

Planting and Pre-Harvest Care - Dormant, day neutral strawberry crowns should be planted in the spring as soon as the beds are prepared. Planting is done by hand using a simple planting tool. A piece of 1/8 inch iron flat bar about 12 inches long is bent at a 90° angle about 4 inches from one end to create a handle. This end is often wrapped in duct tape to provide a soft grip. The opposite end of the bar is notched from the edges to the middle to about a 3/4 inch depth, creating an inverted “V” at that end of the metal. The notched edge is slightly sharpened to ease penetration through the mulch and soil. To plant the crowns, the roots of the plant are laid on the plastic mulch such that about 1/2” of the ends of the roots are over the mark on the mulch for planting. The notched edge of the tool is placed over the mark so that it will “grab” the ends of the roots as the tool is pushed into the soil and draw the plant into the bed. Push the crowns straight down through the mulch with the tool and into the soil so that the soil surface comes to halfway up the crown. Gently pinch the soil around the crown as you withdraw the planting tool. Plants should be spaced 10 to 14 inches apart with a row. Planting in a double row, 24 inches apart, on 42 inch wide beds with 13 inches between plants within the rows will require about 13,400 plants per acre.

All flower blossoms that emerge during the first 4-6 week after planting should be pinched off. This encourages root growth and plant vigor and leads to better yields and fruit quality. Additionally, all runner plants that emerge during the summer should be removed. These interfere with harvest and root in planting holes and along the edge of the plastic, becoming “weeds”. While runner removal is labor intensive, studies have shown it is beneficial to both yield and fruit quality. The new planting should be irrigated after planting and regularly thereafter to insure optimum growth. One to two inches of water per week is ideal. Trickle lines can also be used to deliver soluble fertilizers to the plants. While rates of fertilizer will vary depending on the number of plants per acre, soil type, and variety, about two pounds of actual nitrogen per acre per week applied through the drip lines will typically provide good plant growth.

Harvest - Depending on the planting time, weather and variety, harvest should begin in mid to late August and continue until a hard frost kills any remaining flowers. Fruit can typically be harvested two to three times a week, but the frequency will drop as the temperatures get cooler in the fall.

Frost Protection - Flowers and fruit can be protected from frost in the fall to extend the harvest season. Fabric, “floating” row covers may be placed over the plants during the evenings when frost is predicted and removed for harvest. These lightweight fabrics create a greenhouse effect that will provide three to five degrees of additional temperature protection.

Overwintering the Planting - Day neutral strawberry beds are not usually carried over for a second year. These plants can produce an early spring crop the following year, and fruit again in the summer and fall if carried over, however fruit quality, especially size, is generally much lower in the second year and runner control becomes a major problem. If the beds are to be carried over, winter protection is required in the form of heavy weight rowcovers, applied in the fall when the plants are dormant.

Pest Management - Numerous pests can potentially cause problems in day neutral strawberry plantings. Tarnished plant bugs, spider mites, gray mold and anthracnose are common and potentially devastating pests. Consult local University Extension recommendations for the best management techniques for problems in your area.

Varieties - The most popular day neutral strawberry variety being grown in New England is ‘Seascape’, which is known for dependable performance and good fruit quality. ‘Albion’ is also being grown for its high fruit quality, but it is very late ripening. ‘Evie-2’ is grown for its earliness and high yield, but it is very soft and shy of flavor. ‘Tristar’ and ‘Tribute’ are being grown in some areas. They are hardy and disease resistant, but have small fruit size and relatively low yields. Yields from day neutral strawberries vary widely, ranging from 4000 to 12, 000 pounds per acre. The differences in production tend to be the result of management. Following good management practices, especially in regards to variety selection, plant stands, nutrient management, water management and pest management will maximize crop yield and prolong the profitable life of the planting.

For more detailed information on strawberry production, see the *Strawberry Production Guide for the Northeast, Midwest and Eastern Canada*, published by the Natural Resource, Agriculture and Engineering Service (NRAES-88), and available through your University Cooperative Extension. (*Source: 2009 New England Fruit & Vegetable Conference Proceedings*)

RASPBERRY

Raspberry Varieties for Colder Regions

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

Ontario has a wide range of climatic and growing conditions. Varieties recommended for general planting can be grown in all regions, but varieties recommended for regional planting are best suited to certain areas. Varieties recommended for trial are newer varieties with little field experience in Ontario on which to base recommendations.

Summer Red Raspberries

Prelude (NY817 x Hilton) was released in New York, in 1998. It ripens very early. It also produces a small late second crop on primocanes. The canes are vigorous with sparse but noticeable spines. The berries are medium in size with moderate firmness, round, mild flavoured, and medium to dark in colour. Prelude is not known for being especially resistant or susceptible to major pests. Its strengths are its earliness (4-5 days ahead of Boyne), however it is somewhat soft with mild flavour. Try some before planting large amounts.

Boyne (Chief x Indian Summer) is an older variety released in Manitoba, 1960. It is still a standard variety in the colder regions of Ontario. Boyne is early, and winter hardy to -36C when it is dormant. It has medium to tall canes, which are spiny with many suckers. Boyne has small to medium berries, somewhat soft flesh and soft skin. Berries are dark in colour with good flavour and good for freezing. This variety is resistant to yellow rust, tolerant of crown gall, very susceptible to anthracnose and susceptible to fire blight. Its strengths are good yields, good flavour and winter hardiness, however, the fruit is small and dark compared to newer varieties. We recommend Boyne for general planting in Ontario, especially colder regions.

Reveille ((Indian Summer x Sunrise) x September), released from Maryland, 1966. It is early, similar in season to Boyne. Canes are vigorous, upright and sucker freely. Berries are large, and bright red with an elongated cup shape. Reveille is not known for being especially resistant or susceptible to major pests. Although Reveille is productive and winter hardy, with larger fruit than Boyne, the fruit is soft. It is acceptable for PYO and roadside markets.

Nova (Southland x Boyne) released from Nova Scotia in 1981. It is early, just a day or two later than Boyne. Canes are hardy, medium-tall with few spines. In addition to the summer crop, Nova produces a small crop on the primocanes in late fall. Berries are medium in size, firm, shiny, dark red, round and uniform in shape. Nova is apparently resistant to some cane diseases and late yellow rust but susceptible to cane botrytis. Although Nova is grown because it has larger and better quality fruit than Boyne, the fruit is rather tart. Another drawback is the tendency for winter injury in eastern and northern Ontario. It is a major variety for Ontario growers, however and recommended for limited planting in central and southern Ontario.

Killarney (Chief x Indian Summer) This variety is a sister to Boyne, and was released from Manitoba in 1961. Fruit ripens about 3 days after Boyne. Canes are short to medium, hardy, spiny, with lots of suckers. Berries are medium in size, bright, light and shiny red. They have good flavour. Killarney is susceptible to anthracnose and mildew. The variety, like Boyne, is productive and winter hardy, but has better fruit quality than Boyne. However, more recently, growers have seen discouraging amounts of cane die-back in spring, apparently winter injury. It is recommended for limited/regional planting.

Titan ((Hilton x (Newburgh x September)) from New York, in 1985.

Titan is mid-late in season, about 6 days after Boyne. It has large canes with long laterals, and suckers from crown, making it slower to fill in the rows. These berries are large, firm, dull red in colour with mild flavour. Titan is resistant to raspberry aphid which spreads virus diseases, but it is very susceptible to phytophthora root rot. Growers like Titan because of its large fruit, but the weak collar causes it to settle or collapse in containers after harvest. This variety is not especially winter hardy but is grown for PYO and farm markets in southern Ontario. Recommended for limited planting using plants from tissue-cultured stock.

K81-6 ((0.67-245-01 x (Creston x Willamette)). This unnamed selection is from Nova Scotia. The harvest



season is late. The canes are tall canes with some spines. It is winter hardy except in northern Ontario. Berries are large, medium-red colour, with moderately firm fruit, conic in shape with large cavity that causes fruit to settle after harvest. K81-6 is susceptible to leaf curl virus and very susceptible to fire blight. We no longer recommend this variety because of fire blight problems.

Glen Ample comes from SCRI, Scotland, where it was released in 1998. Its complex parentage includes Glen Prosen and Meeker. It is a late variety, upright, vigorous, spine free. Berries are large, firm, fleshy, and dull red in colour and sometimes less cohesive in cold weather. Flavour is bland. This variety is resistant to raspberry aphid, a virus vector, however, it is susceptible virus. Recommended for trial in small quantities. Winter hardiness unknown.

Encore (Canby x Cherokee) from New York, 1998 This is a late variety, with vigorous, nearly spineless canes, and good winter hardiness in New York and Nova Scotia. Large sized berries are firm with good flavour. No outstanding resistance or susceptibility to pests has been noted so far, although it is apparently susceptible to fire blight. Fruit quality is better than Titan, although white drupelet disorder can be a big problem in some years. Encore is recommended for trial in Ontario.

Tulameen (Nootka x Glen Prosen) from British Columbia in 1990. This variety is very late. Plants have an open growth habit with willowy twisting canes. Berries are large, glossy medium-red, with thick fleshed fruit. Tulameen is relatively susceptible to botrytis fruit rot and spur blight, but resistant to the mosaic virus aphid vector. It has excellent flavour and fruit quality, and a long fruiting season. Unfortunately, Tulameen is very susceptible to winter injury in Ontario, and only grown where we can grow peaches. It is the variety of choice for greenhouse production.

Black and Purple Raspberries

Jewel (Bristol x Dundee) comes from New York (1973). It is the only black raspberry variety grown in Ontario. It is early, several days ahead of Boyne. It is vigorous and considered the hardiest of black raspberry varieties. It has medium sized fruit that is larger than Bristol. These berries are of excellent quality. Jewel is susceptible to botrytis fruit rot and anthracnose cane disease, and more susceptible than red raspberries to verticillium and virus diseases. Jewel is less winter hardy than red raspberries. It is recommended for trial planting in Ontario.

Royalty ((Cumberland x Newburgh) x (Newburgh x Indian Summer)) New York, 1982. Royalty is a late season variety, 11 days after Boyne. Canes are very vigorous, spiny, tall, with many suckers from the roots. Berries are large in size with a dull purple colour and cone-shaped appearance, and a sweet flavour. This variety is susceptible to crown gall, resistant to raspberry aphid.

This fruit looks overripe when harvested, and has a small following because the fruit is great for freezing, pies, jam. Royalty is somewhat susceptible to winter injury, and fruit is soft for shipping. Recommended for trial in Ontario.

Fall Bearing (a.k.a. primocane-fruiting) Raspberries

Autumn Britten comes from England, where it was released in 1995 with its sibling Autumn Bliss. It is the early, with harvest beginning in mid-late August, a good 10 days ahead of Heritage. The variety is a sparse cane producer. Fruit is large and has a consistent regular conic shape. Autumn Britten is susceptible to raspberry bushy dwarf virus but resistant to raspberry mosaic virus. The strengths of this variety are its excellent fruit quality, and early harvest compared to Heritage. However, because canes are not abundant, yield can be low. Autumn Britten should be planted at closer spacings than other varieties. Another drawback in spite of great fruit quality is that the colour darkens after harvest, giving fruit an over-ripe appearance on a grocery store shelf. Autumn Britten is recommended for general planting, and is the most commonly grown fall-fruiting variety in Ontario.

Polana (Heritage x Zeva Herbsterte), from Poland, released in 1991. This is another early fall-bearing variety, approximately 2 weeks earlier than Heritage and slightly ahead of Autumn Britten. It has shorter canes than Heritage, but is vigorous. Fruit is medium to large, glossy, cohesive, with good flavour. It seems to have no major problems with pests and diseases. Yields can be high because buds produce 2 fruiting laterals each. Fruit quality is good, although berries may split into doubles. Polana is recommended for limited/regional planting in Ontario and is doing well in eastern Ontario.

Heritage ((Milton x Cuthbert) x Durham)). The standard fall bearing variety, Heritage was released in New York in 1969. It is late, fruiting in early-mid September, which is too late in most of Ontario. Canes are tall, rugged, and thorny. Heritage produces high yields of medium sized and attractive fruit. It has some tolerance to raspberry bushy dwarf virus and raspberry mosaic virus, and is resistant to many pest problems. It is recommended for limited/regional planting in southwestern regions where it seldom freezes until mid October.

Caroline ((A. Bliss x Glen Moy) x Heritage)) from USDA Maryland, 1999. The harvest season is late, about 1 week earlier than Heritage. Vigorous canes may be variable in height, with short laterals. The fruit is large, conical, dark red but otherwise good good quality and good flavour. This variety is very susceptible to late leaf rust. Growers choose Caroline for its excellent yield potential, berry size and fruit quality, but in most of Ontario, the harvest season is too late. Recommended for trial in southwestern regions.

Newer primocane fruiting varieties for trial:

Jaelyn (OBC-fl x Caroline), released from University of Maryland. This variety is early, vigorous, erect. Fruit is large sized, firm, dark red, conical berry. It is susceptible to yellow rust. Another drawback is that the fruit is hard to pick, adhering to the core until fully ripe. Not recommended in Ontario.

Joan J (Joan Squire x Terri-Louise) released in England in 1995. This is an early variety with numerous, relatively spine free canes. The fruit is large, glossy red, conical, and of good quality. Recommended for trial.

Josephine (Amity x Glen Gerry) from University of Maryland. This is a late season variety. Canes are upright and vigorous. Fruit is large, firm cohesive, brighter red than Jaelyn. This variety is resistant to potato leafhopper and phytophthora root rot, mildew, rust, anthracnose, verticillium. It is too late for field production in Ontario but may be of interest in high tunnels.

Polka comes from Poland. Parents include open pollinated seedlings and Autumn Bliss. This is an early fall-fruiting variety, with self supporting semi vigorous canes. The berry is medium to large with excellent fruit quality. The drupelets are consistent in size and fruit is meaty. Polka has a high level of tolerance to fruit and cane botrytis. Although fruit is of excellent quality, it is no lighter in colour than Autumn Britten; both are rather dark for large wholesale markets.

Himbo Top, from Switzerland, is late, very vigorous, and requires a supportive trellis. The large bright red firm fruit, with small drupelets, easy to pick. It has a high yield potential but is not recommended in Ontario, as the fruit ripens too late for outdoor production. (*Source: 2009 New England Fruit & Vegetable Conference Proceedings*)

BLUEBERRY

Blueberries – Getting Your Planting Off to a Good Start

Kathy Demchak and John Esslinger, Penn State University

There's been a lot of interest in growing blueberries across the state, quite likely sparked by strong demand for the fruit. According to USDA-NASS Census of Agriculture reports, the number of blueberry growers and acreage in the state stayed about the same or decreased slightly from 1995 to 2000, but increased between 2000 and 2005. During this time, the number of farms in PA harvesting blueberries increased from 326 to 538, and the acreage increased from 421 to 786 acres. In order, the top 5 counties for acreage were Erie, Susquehanna, Wyoming, McKean, and York. The top 5 counties for number of growers were York, Snyder, Adams, Chester, and Lancaster. In Erie, Susquehanna, Wyoming, and McKean counties where soil is well-suited to blueberries, the average blueberry acreage is just under 5 acres per farm, but for these rest of the state, about an acre per farm is average. Clearly many growers would like to grow blueberries, but some of our soils just are not conducive to blueberry growth. Whether you have a soil where blueberries grow easily, or one where growing blueberries may be a struggle, there are some steps you can take to help with establishing the plants and encouraging their growth.

The soils where blueberries grow best are not our typical agricultural soils. Typically, blueberries grow best in soils that are fairly sandy, have a low pH, and have a high organic matter content. In nature, blueberries grow as a forest understory, or in boggy areas with very high organic matter content. Even in these boggy areas the blueberry plant's root system is above the water, and can obtain oxygen. This is much

different situation than in a water-logged agricultural soil where plant pathogenic fungi are likely to thrive. Sometimes growers expect that blueberries will do well in wetter areas of their fields, but if these areas don't drain even for brief periods of time, the blueberry plants can be killed; 48 hours of water logging is all it takes to cause blueberry plants to die. Blueberry plants are also susceptible to Phytophthora root rot, as are many other small fruit crops.

Blueberries have extremely fine roots, called hair-roots because they are similar to hair in appearance – many of their roots are only 2/1000s of an inch across. Roots that are this fine are very sensitive to high temperatures and dry conditions, so they can die off quickly during periods of moisture stress. For this reason, it is strongly recommended that irrigation is available, and this is also part of the basis for our recommendations concerning organic matter use.

Because blueberries have different requirements than most crops, it is strongly recommended that planning begin earlier than usual before planting, since significant adjustments to the soil will probably be needed. Also, blueberry plantings can live for a very long time – 50 years or more, so you'll have to live with any mistakes for a longer time than usual, too. Hence, we recommend that you begin planning early - at least a year before you plan to plant. When you're choosing your site, avoid low spots, both because of the concerns mentioned above, but also because blueberry plants bloom relatively early, and while not frequently a concern, frost can be an issue in low spots in some

years. Also, avoid planting in areas that were planted to other fruit, and if the soil was in sod, make sure it's been worked over several times to avoid problems with grubs.

Submit a soil sample a year in advance of planting, make sure you specify "blueberries" on the soil test form, and while you're at it, have the organic matter level tested, too. This is an optional test with an extra charge that you'll need to request on the soil test form if you're using Penn State's Ag Analytical Lab. When you get your soil test results back, check the pH, CEC, and calcium levels. If the pH is greater than 6.5, the CEC is greater than 18 or the soil calcium level is greater than 2000 lb/acre, it's likely that even though you may get the soil pH into the correct range, you'll have future nutrient imbalances and issues to tackle.

The soil test results will specify adjustments that will need to be made to get the soil pH into the correct range. Usually this means adding sulfur, and depending on how much sulfur is recommended, the results may recommend that you may apply all the sulfur at once, or add only half of it and retest in 6 months. Overshooting (or in this case, undershooting) on the pH can result in a whole new set of problems. Ground sulfur is recommended to adjust the pH as it will react quite quickly. Pelleted ground sulfur is easier to use than the powder. Apply the sulfur to the entire area, not just in the rows, because the pH will otherwise creep back up, and the blueberries root systems will eventually grow into the untreated area anyway.

It's a good idea to build your soil's organic matter by growing cover crops for a year (while you're waiting for the soil pH to drop). Cereal grains, grasses such as annual ryegrass, and buckwheat will tolerate a lower-than-normal pH. Just be sure to till the buckwheat under before it goes to seed. The organic matter conserves moisture, will serve as a source of nutrients when it breaks down, buffers the soil pH, improves the soil structure (this helps those itty-bitty fine roots), and seems to improve the plants tolerance of less-than-ideal soil pH conditions. Increased organic matter can also improve soil drainage during wet periods due to improved soil aggregation. Legumes are not recommended as most of them need a higher pH to grow well, and nematode populations can build on them, which can be problematic later on.

Plants are typically planted in the spring as early as possible. Two-year old dormant plants work really well. There appears to be no advantage to paying more for older plants, or paying extra for plants grown in large pots. Those grown in smaller pots or large cells establish quite well. As with other nursery stock, plants should be planted at the original depth. Soil should be removed from the planting hole, amended with moistened peat moss so that the soil, when returned to the planting hole, is half soil and half peat. We did a

study over 15 years ago looking at amending the planting hole or not amending it, and you can still see the negative effects on plant size and vigor when the planting hole wasn't amended. If peat moss cannot be obtained, rotted sawdust works also, but some studies showed more vigorous growth when peat moss was used. Spread the roots out when planting, and firm the soil.

What cultivars might you consider? Standard cultivars that do well in most of PA are Patriot (early-mid season), Bluecrop (mid-season), and either Elliott or Jersey (late season), though Elliott has a tart flavor and Jersey sometimes has some fruit set problems. Newer cultivars that we were impressed with were Sunrise (early season), Chandler and Aurora (mid-late season), and Liberty (late season). Sunrise has a nice growth habit and flavor, Chandler has huge berries, Aurora has terrific size and flavor, and Liberty produced high yields. None had any particular drawbacks, though Chandler was reluctant to send up new canes. According to folks in the Pacific Northwest who have more experience with it, Chandler needs to be pruned harder than usual to encourage new growth. Bluegold (another midseason cultivar) produced very high yields, but the harvest is very concentrated and the flavor was mild. Reka, which is also very vigorous, produced high yields, but the berry size was small. Just remember when ordering your plants to order very early – probably before the end of the year in order to get the cultivars you want.

After the plants are in the ground, remove about 50 percent of the wood by removing any low branches, removing those that are poorly-positioned, and heading back branches if need be. Some information indicates that wood does not need to be removed if the plant has a large enough root system; however, it seems that pruned plants often catch up and surpass unpruned plants, especially when conditions in the establishment years are less than ideal.

Remove any flower blossoms for the first 2 years, and half of the blossoms in the third year. Fertilize the plants only lightly in the planting year using 10 lb/acre actual nitrogen when the plants produce a second flush of growth, and another 5-10 lb/acre of actual nitrogen a month or so later, as long as it's still mid-July or earlier. Use either urea or ammonium sulfate as the nitrogen source. Keep the plants well-watered.

After planting, mulch the plants with rotted sawdust or another well-decomposed mulch (but not mushroom compost – it usually has a very high pH) 4 to 6 inches deep, and 3 to 4 feet wide. The roots will mostly grow at the soil-mulch interface. The mulch will decompose over time, so it will need to be replenished. Don't stop mulching once you start, because those roots that were at the soil-mulch interface will then be exposed, with moisture and temperature fluctuations taking a toll on

them. Some growers use half sawdust and half shredded bark with good results. There's some question as to whether black walnut sawdust is a problem (the toxic compound is primarily in the roots), but we recommend avoiding its use just to be safe. Peat moss doesn't work very well as a mulch – not only is it expensive, but it also dries out and either forms a mat that prevents water infiltration, or blows away.

Very little pruning is needed for the first 3 to 5 years – removing weak growth and branches that aren't growing where you want them is usually enough. However, with very vigorous cultivars, you may need to thin canes in the spring, selecting the best 3 to 5 new ones each year until you reach the recommended 15-20 canes per bush. Some cultivars are reluctant to send up

new canes, such as Chandler as mentioned above and Bluecrop, so you may always be on the “short side” when it comes to cane numbers.

For further information on blueberry production, consult either the Mid-Atlantic Berry Guide <http://pubs.cas.psu.edu/freepubs/MAberryGuide.htm>, or NRAES Highbush Blueberry Production Guide (www.nraes.org). The printed version of the 2010 Mid-Atlantic Berry Guide is due back from the printer around the end of the year, so if you want a printed copy, you may as well wait and get the new version then. We'll get an announcement out on how to order the guide once it becomes available. (*Source: The Vegetable & Small Fruit Gazette, Vol. 14, No. 1, Jan. 2010*)

GRAPE

Wine and Table Grape Varieties for New England

Bruce Reisch, Cornell University

In climates outside the range of typical grape growing regions of the world, grape growers are faced with challenges due to a range of climate related factors. Disease pressure may be more severe, and cold temperatures experienced either in mid-winter or just after bud break may result in catastrophic crop losses. New varieties are being developed at Cornell University with a number of goals in mind. Cold hardiness and disease resistance plus excellence in wine and table grape quality are of greatest importance. In this presentation, the role played by Cornell's new grape variety releases in expanding the spectrum of options available to growers will be reviewed. Four new varieties have been named at Cornell's New York State Agricultural Experiment Station since 2003. These and other breeding program varieties and selections are reviewed here.

White Wine Grapes:

'Valvin Muscat'TM - (formerly NY62.0122.01 - Muscat du Moulin x Muscat Ottonel) produces an excellent, high quality muscat wine, without bitterness, 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. Released in 2006 and a royalty is charged on vine sales.

Spring 2004 % live nodes following a very cold winter: 28%

Trunks: Moderately hardy. Some trunks were damaged in 2004.

'Traminette' (Joannes-Seyve 23-416 x 'Gewürztraminer') – Gaining in popularity throughout the eastern United States, 'Traminette' is a late mid-season

white wine grape, which produces wine with pronounced varietal character likened to one of its parents, 'Gewürztraminer'. It is distinguished by its superior wine quality combined with good productivity, partial resistance to several fungal diseases, and cold hardiness superior to its acclaimed parent, 'Gewürztraminer'. The balance between sugar, acidity and pH is excellent. Released in 1996 as a public domain variety for domestic use only.

NY76.0844.24 - ('Traminette' x Ravat 34) makes a top ranked floral, muscat wine. Own rooted vines have been highly productive and highly vigorous in limited testing in Geneva. Clusters are large and loose. Leaf phylloxera have been an occasional problem. Maturity is mid-season, ripening in mid-late September in Geneva.

Spring 2004 % live nodes: 81%

Trunks: Very hardy.

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. Own-rooted vines are small; therefore grafted vines were planted and added to our trials in 1999. Botrytis rot has been negligible and winter primary bud hardiness ranks better than Cayuga, and with many French- American hybrids.

Red Wine Grapes:

'Corot noir'TM - (pronounced “kor-OH nwahr”; formerly NY70.0809.10 - SV 18-307 x 'Steuben') A late-season red wine grape, suitable for either blending or the production of varietal wines. The wine has a deep red color and attractive cherry and berry fruit aromas. A distinct improvement in the red wine varietal options available to cold climate grape growers, wines are free of the hybrid aromas typical of many other red hybrid

grapes. 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. Released in 2006 and a royalty is charged on vine sales.

Spring 2004 % live nodes: 75%

Trunks: Moderately hardy. Among 13 vines, 8 had no damage, and 5 were either killed to the ground or had crown gall.

‘Noiret’™ - (pronounced “nwahr-AY”; formerly NY73.0136.17 - [(NY33277 x Chancellor) x Steuben]) The distinctive red wine is richly colored and has notes of green and black pepper along with raspberry, blackberry, and some mint aromas. A major distinguishing characteristic of this selection is the fine tannin structure. This combined with the relative freedom from hybrid aromas strongly distinguishes this selection from other red hybrid grapes. Vines have generally been highly 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- to late-season, approx. Oct. 1 in Geneva. Released in 2006 and a royalty is charged on vine sales.

Spring 2004 % live nodes: ~53% (very little fruit production)

Trunks: Expect some damage after cold winters. All 14 vines at Geneva required trunk renewal in 2004. If grafted, the graft union must be protected by hilling up in the fall.

‘GR 7’ - ("Geneva Red 7") - (Buffalo x Baco noir) Vines are 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', yet it still has a short finish. Use hot pressing, short skin contact time or some carbonic maceration. It has a place in traditional red hybrid blended wines, and has been used for a number of years in commercial wine production. Released in 2003.

Spring 2004 % live nodes: 93%

Trunks: very hardy

Future plans: - what's on the “drawing board”?

Disease Resistance Breeding: A large portion of our program focuses on breeding highly disease resistant varieties selected under “no-spray” conditions. One selection with potential for production under no-spray or minimal spray conditions is described below:

NY95.0301.01 – 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

ideal climatic conditions for 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, nice mouth feel, good structure, and blueberry fruit character. The color is dark red and the wine has little hybrid character. It has been well-received by taste panels.

Selected Seedless Varieties for the Northeast:

Marquis, a cross of Athens x Emerald Seedless released in 1996, is a white seedless grape from Geneva, with excellent, mild American flavor. The berries are large, often 3.5 to 5.0 grams/berry, with juicy, melting texture. Clusters are large and attractive, while the vines are moderately hardy, and very productive. Ripening in New York is between 15 and 30 September. Diseases must be controlled due to powdery mildew and black rot susceptibility. The vine is sensitive to gibberellic acid use, which is therefore not recommended. Well-timed cluster thinning and cane girdling can increase berry size and improve cluster compactness. Vines are moderately hardy, medium in vigor and productive.

Himrod, produced from a cross between Ontario and Thompson Seedless, is the most successful table grape released from the Cornell University grape breeding program (1952). It produces large bunches of white seedless grapes with excellent, honey-like flavor and melting, juicy texture. The clusters are loosely filled, but cane girdling, gibberellic acid treatments, or cluster thinning may be used to increase cluster compactness and improve berry size. Despite these cultural defects, Himrod is presently the most commercially important of the seedless grapes grown in New York (cluster weight = 0.36 lb., berry weight = 2.1 g).

Einset Seedless (Plant patent 6160) is a winter-hardy, red seedless grape with a unique, strawberry-like flavor. The medium sized clusters produce bright red, ovoid berries that have good storage potential until the end of November. The skin is slightly tough and adheres to the tender flesh. Cultural problems include susceptibility to fungal diseases and a seed remnant that is occasionally noticeable. Along with Vanessa, Einset Seedless probably has the most commercial promise of the red seedless varieties that can be grown successfully in New York (cluster weight = 0.32 lb., berry weight = 2.3 g).

Vanessa was developed by the Horticultural Research Institute of Ontario, Canada, and is a red dessert grape of excellent quality. The vine is moderately vigorous and among the hardiest of seedless grapes. Grafting may be desirable on many sites to increase vine size (however, vines grafted on Teleki 5C at trials in Fredonia, New York have shown poor fruit set with very small berries). The seed remnant is usually large and soft; when noticeable, it is sometimes a cause for limited marketability. Berries are medium in size on medium,

well-filled clusters. Storage potential is good. The flavor is mild and fruity, and berry texture is firm to crisp. The fruit quality is among the best of the red seedless types.

Canadice is more winter hardy than most seedless grapes, although trunk injury has occurred on some sites. It produces medium clusters with small red berries that are similar to Delaware in flavor and appearance. With cordon training systems and careful management, Canadice clusters may average 0.5 lb., and the vines can be extremely productive. Fruit rot is a problem in wet years because the clusters are excessively compact (cluster weight = 0.50 lb., berry weight = 1.6 grams).

Mars (Plant patent 5680), a release from the University of Arkansas, is a vigorous, blue seedless grape. The flavor is mildly labrusca, similar to Campbell's Early, and the berries are slipskin. Clusters are medium-sized, cylindrical, and well filled. Hardiness has been good at Geneva, New York. High vigor; has the least susceptibility to common grape diseases among the Arkansas varieties, but still requires fungicide applications for disease control; resistant to fruit cracking; occasional seed traces found in some berries in some years. Mars has been recommended in Arkansas as a home garden grape with limited potential for commercial marketing (cluster weight = 0.40 lb., berry weight = 3 grams in Arkansas)

Jupiter (Plant patent 13,309) - This early maturing blue variety has large, firm, non-slipskin berries on medium sized clusters. Fruit has a distinct muscat flavor. It's in very early stages of testing at Cornell, so hardiness is not yet determined. In Arkansas, it is rated as hardier than Einset Seedless, Himrod, and Marquis, but not as hardy as Mars and Reliance. Medium vigor; resistant to fruit cracking; moderate resistance to common fungal diseases

GENERAL INFORMATION

Organic Matter Application – Can You Apply Too Much?

Mike Orzolek, Penn State University

Fall is an excellent time to clean-up fields and plan for future crop nutrient requirements as well as increasing soil organic matter content for your farm field management program. Since most vegetable crops have already been harvested, growers should consider the broadcast application of a non-selective herbicide to 1) eliminate both perennial and difficult annual weeds in the field, 2) increase the efficiency of retrieving plastic mulch and 3) help establish a cover crop. Fall is also an excellent time to add soil amendments to increase soil organic matter. Why increase soil organic matter? High soil organic matter (greater than 3.5%) will increase the water holding capacity of soil, increase soil nutrient reserves, increase soil microbiological activity and increase soil tilth.

Organic matter has long been known to improve soil fertility and tilth, which in turn, have increased crop

but does require fungicide sprays for successful production; small, soft seed traces observed occasionally but not noticeable due to berry texture. (cluster weight = 0.40 lb., berry weight = 4 to 5 grams in Arkansas)

Testing Cornell breeding program selections: As soon as the most elite selections in the breeding program are identified, they are propagated for testing beyond our Geneva campus. We typically offer these first to University and Experiment Station cooperators, and then to grower cooperators. Vines are distributed for test purposes prior to release via two commercial nurseries:

Double A Vineyards, Fredonia, NY
(www.rakgrape.com) and

Grafted Grapevine Nursery, Clifton Springs, NY;
www.graftedgrapevines.com).

For more information:

For current information about the Grape Breeding program at Geneva:

www.nysaes.cornell.edu/hort/faculty/reisch/grapeinfo.html and
www.nysaes.cornell.edu/hort/faculty/reisch/cultivars.html

Complete bulletins describing all Cornell grape variety releases are available on the internet, or as Adobe Acrobat PDF files, at the above web sites. In addition, general reviews of options available among grape varieties are found at these three web sites:

www.nysaes.cornell.edu/hort/faculty/reisch/bulletin/wine/
www.nysaes.cornell.edu/hort/faculty/reisch/bulletin/table/
www.nysaes.cornell.edu/hort/faculty/reisch/winehandout.html

(*Source: 2009 New England Fruit & Vegetable Conference Proceedings*)

yields. "Organic matter composts", however, is a poorly defined term used for a wide variety of materials - all of which impact soils differently. Therefore, prior to recommending the use of a specific organic compost for a specific purpose it must be tested to determine the nutritive value of the material and the total maximum amount of material to apply per acre. Organic compost/manures can consist of a variety of materials including: chicken – beef – hog – sheep - horse manures, straw, leaves, sawdust, table scraps, treated sewage sludge, peatmoss, etc. Addition of organic composts to soil should take into account; soil type, affect on soil pH, nutrient content of compost, crops to be planted in rotation after addition of compost to soil, and rainfall or total water application through irrigation.

The recommended soil pH range for optimum plant growth, nutrient availability and best bacterial activity is

6.5 to 7.2. The soil pH affects nutrient availability and at a pH of 5.0 to 5.5, both iron and boron become more available to plants causing potential toxicity symptoms while phosphorus and potassium are less available to plants and may result in nutrient imbalances in the plant.

While liberal applications of organic composts (5 to 10+T/A) has been a rule of thumb for many growers in the last decade, it has led to some very difficult problems in the fields where the organic compost was applied. The most serious problem has been a large release and availability of nitrogen resulting in almost all cases of very extensive vegetative growth at the expense of reproductive growth (reduced fruit production and quality). There has been an extreme build-up of phosphorus in the soil especially with the use of animal manures at rates greater than 5 T/A; resulting in soil P levels in excess of 1000 lbs./A – potential for opening phosphorus mines in PA. Also the high P levels in soil probably contribute to the high P levels in the Susquehanna River and ultimately, the Chesapeake Bay. There also can develop an imbalance in the ratios of soil K-Mg-Ca availability which will have a profound affect on the quality for fruit produced in the field (poor color, soft tissue, blossom end rot, poor shape).

Therefore, important to a good fertility program is calculating the total nitrogen availability in the soil from all potential nitrogen sources. Nitrogen sources include; graded fertilizers (10-10-10 would contain 10% nitrogen per 100 lbs. material), legume cover crops (hairy vetch produces the equivalent of 100 lbs N/A, animal manures (need to know N-P-K analysis before field application) and organic composts (peanut hulls, straw, etc). Plants generally respond to nitrogen when there is low organic matter in the soil, soil consisting of a large percentage of

sand, and/or a cold, wet growing season (much like 1996). How much nitrogen should be applied for the crop to be grown? The crop nitrogen requirement equals the recommended rate of nitrogen application minus the contribution from the previous crop (residual N), minus the contribution from cover crops (especially legumes) planted in rotation, and minus the contribution from manure. Using this method to calculate a crop's nitrogen requirement will reduce/eliminate runoff and leaching of nitrogen and other elements from the soil.

An example of organic matter application is given below in reference to a pumpkin fertility program based on the nitrogen requirement for the crop. A grower plants pumpkins on ground that was in soybeans last year; was planted to hairy vetch after the soybeans were harvested; and 3 tons/A of chicken manure (6-4-3 analysis) was broadcast and incorporated in the spring prior to seeding pumpkins. How much nitrogen should the grower apply to the pumpkin crop? Since the recommended nitrogen application for pumpkins grown on heavy soils is 60 lbs per acre, the grower needs to subtract 25 lbs residual N produced by the soybeans, 60 lbs N produced by the vetch (killed vetch in late March) and 18 lbs N from the manure application. $[60 - (25+60+18) = \text{surplus } 43 \text{ lbs/A nitrogen}]$. The grower will not have to add any nitrogen to the pumpkin crop since he has a surplus of 43 lbs/A N over and above the required 60 lbs/A nitrogen recommended for pumpkin production.

In conclusion, a sound, well planned organic matter management program will provide; 1) optimum fertility for maximum crop yields and quality, 2) minimize runoff and leaching of water soluble elements, and 3) reduce total fertilizer costs over time. (*Source: The Vegetable & Small Fruit Gazette, Vol. 13, No. 1, Jan. 2009*)

North American Berry Research

Rich Marini, Penn State Horticulture

In October, Kathy Demchak and I attended the North Central Region Coordinating Committee 22 (NCCC-22) meeting in Ontario, Canada. Kathy attends this meeting most years, but this was a first for me. The College of Agriculture at Penn State receives federal funding to support agricultural research, and 30% of those funds must be used to support regional research. Most of these funds are actually used to pay salaries of faculty and staff because public funding is inadequate to support research activities. The NCCC-22 committee meets each year to discuss research on berry crops and there is also participation by Canadian researchers. In attendance were about 35 participants, including horticulturists and breeders from universities and the USDA, as well as from industry. The meeting started with a discussion of possible cooperative research projects. Most of the discussion centered around the possibility of obtaining external funding for coordinated variety trials, or possibly

using data from existing trials to determine the adaptability of varieties to different climatic regions of North America. No firm decisions were made to pursue funding for coordinated trials at this point, but there were a couple of interesting comments. First of all, most researchers indicated that about 20 years ago everyone had some variety trials so they could make local variety recommendations. At that time most of us had a technician supported with state or federal funds and a small research budget to conduct applied research such as variety trials. Today few researchers have technicians, most have no research budgets, and most must pay plot fees to conduct field research. Some researchers pay up to \$6,500 per acre to conduct field research on their research farms. Because there is no public support, grant funds are now required to conduct research. Since granting agencies other than grower organizations do not typically fund variety trials, most researchers feel that they can no longer

afford to conduct variety trials, which makes it impossible to develop variety recommendations. Because breeding programs are long-term and expensive, universities are also trying to recover some of the money they expend on breeding programs by patenting new varieties. Therefore, many breeders are reluctant to share their new promising selections with other researchers until they have a patent. So it is difficult to test new varieties before they are available to commercial growers. The general decline in funding for agricultural research is resulting in a lack of plant breeding programs around the country, and soon most of the plant breeding may be done by a few private breeders focused on developing varieties for the major producing areas.

The second day of the meeting was devoted to state reports, where each state summarized the research they have been conducting. I was surprised at the amount of research being conducted in high tunnels for strawberries, raspberries and blackberries. Results from a survey of berry crop acreage were discussed, and the only states with substantial acreage are California and Oregon. The high tunnels are being used to extend the season and also to enhance the shelf-life of the fruit. The yields of primocane red raspberries and blackberries are much higher in high tunnels than in the field, especially during years with high rainfall. Although the yields are very impressive, there is still little information on the economics of high tunnel berry production. In addition, no one is really sure how much demand there is for off-season berries; in other words, will consumers prefer locally-grown berries during the fall or will they prefer to buy apples and other horticultural crops that are associated with the fall season. Another area of interest in some states is production of organically-grown berries. Much of this work is being done in the arid west where they have low disease pressure. In the humid east, organic production in the field will likely be difficult, but it may be possible in high tunnels. Most of the organic research projects are relatively new and only preliminary data are available, but it will be interesting to follow these experiments over the next few years.

Dr. Bruno Mezzetti, from Italy, gave us a summary of a large project for berry crops in Europe where research efforts are being coordinated. More on this can be found at http://www.euroberry.it/pres_cost.html. The project was funded for 5 years and recently there was a symposium on berry production in changing climate conditions. There are several climate models with somewhat different predictions, but most are predicting that within the next 40 years the western U.S. will experience declining precipitation and the east will have increasing, but more variable, precipitation. The temperature will rise, especially during the winter, so there will be shorter durations of snow cover and longer growing seasons, but increased risk of spring frost. The increases in temperature and precipitation could lead to increased disease pressure and some insect pests may

become more problematic. Apparently southern Europe is already experiencing inadequate chilling for some of their crops. The Europeans feel that research is needed to breed varieties that will perform well under varying climatic conditions. They have found that even the antioxidant content of some berry varieties may differ from year to year depending on temperature near harvest.

Below is some additional information that may be of interest to Pennsylvania berry growers.

Some of the new blueberry cultivars released from Michigan State University are performing quite well. See the accompanying article on blueberry production for some information from a PA blueberry trial.

The University of Florida has released two new strawberry varieties primarily for high tunnels; 'Florida Radiance' and 'Florida Elyana'. You can read more about these varieties at <http://edis.ifas.ufl.edu/Hs400> and <http://edis.ifas.ufl.edu/HS399>, respectively. These varieties are untested in Pennsylvania.

There is interest in primocane-fruiting blackberries, especially in high tunnels. The University of Arkansas breeding program has a new cultivar, 'Prime-Ark®45' that had very good quality in high tunnels in Pennsylvania. This cultivar may produce fruit too late to ripen the entire crop in Pennsylvania unless grown in tunnels.

According to the California Strawberry Commission acreage survey, California now has about 38,600 acres of strawberries, mostly for winter fruiting. Acreage planted in the fall, which produces fruit during the traditional winter, spring, and summer seasons, increased in 2009 by 4,746 acres, or about 15%. All districts reported increases in acreage planted in 2009, but the largest increase was for Santa Maria with 3,556 acres. Acreage planted in the summer of 2009, which produces during the fall season, decreased by 50% compared to 2008, due to competition from Mexico. The leading districts, in order of importance, include Watsonville, Santa Maria, Oxnard, Orange County, and San Joaquin. The leading variety is 'Albion', which was first planted in 2005, followed by 'Selva'. You can find the complete report at http://www.calstrawberry.com/fileData/docs/2009_Acreage_Survey.pdf.

Strawberry terminology is being debated because it is inadequate and confusing. Forty years ago we recognized two types of strawberries. "June-bearers" produced runners under long days, initiated flower buds under the short days of autumn, and bloomed in the spring. "Ever-bearers" produced few runners, but initiated flower buds in the late summer which produced flowers in the fall, and they also initiated flower buds in the fall, which bloomed the following spring. This was probably an oversimplification, but the terms were widely accepted. In the mid 1970s a new type of strawberry was introduced and called "day neutral" because they initiated flowers

and also bloomed throughout the spring, summer, and fall. We now know that it is more complicated than just day length. These varieties have a critical temperature, below which they will bloom if the day length is short enough, so it is the combination of temperature and day length that is critical. The exact combination of temperature and day length required for flower bud initiation and bloom differs for different varieties. In Watsonville, California the average maximum temperature all summer is about only 73 degrees F, which is why some varieties will fruit all summer in Watsonville, whereas summer temperatures are too high in Pennsylvania for the same variety to bloom. The term

“remontant” has been suggested as a replacement for “day-neutral”, but not all experts agree that it will make the situation less confusing because these varieties need to be better described.

You can learn more about this project by visiting a guest menu at <http://nimss.umd.edu>, where it is probably easiest to search for “NCCC-22” from the search menu. Information on similar projects can also be found at this web site. It is interesting to note that in 2008 more than 50 projects were jointly conducted by members of this group. (*Source: The Vegetable & Small Fruit Gazette, Vol. 14, No. 1. Jan. 2010*)

UPCOMING MEETINGS:

January 25-27, 2010. *Empire State Fruit and Vegetable EXPO/NYS Farmer’s Direct Marketing Association Annual Conference.* OnCenter, Syracuse, NY. Mark your calendars – berry session Wednesday January 27th.

February 2-4, 2010. *Mid-Atlantic Fruit and Vegetable Convention,* Hershey Lodge, Hershey, PA. For more information visit <http://www.mafvc.org/html/>.

February 3, 2010. *NE IPM Berry Webcast Series #11: Bramble Disease Management: root and crown diseases, viruses.* More information: Laura McDermott, lmg4@cornell.edu, 518-746-2562, or go to: <http://www.fruit.cornell.edu/Berries/webinarindex.htm>.

February 4-6, 2010. *Pennsylvania Association for Sustainable Agriculture (PASA) 19th Annual Farming for the Future Conference.* Penn State Conference Center, State College, PA. For more information visit <http://www.pasafarming.org/>

Feb 5-12, 2010. *North American Farmers Direct Market Association 25th Anniversary Convention,* Lancaster PA. For more information, visit www.nafdma.com/Pennsylvania.

February 17, 2010. *NE IPM Berry Webcast Series #12: Bramble Insect Management: crown/cane borers, TBA.* More information: Laura McDermott, lmg4@cornell.edu, 518-746-2562, <http://www.fruit.cornell.edu/Berries/webinarindex.htm>.

February 24-26, 2010. *North American Raspberry & Blackberry Conference,* Monterey, California, preceded by preconference tour. More information: <http://www.raspberrylblackberry.com/>.

June 22-26, 2011. *10th International Rubus and Ribes Symposium, Zlatibor, Serbia.* For more information contact: Prof. Dr. Mihailo Nikolic, Faculty of Agriculture, University of Belgr, Belgrade, Serbia. Phone: (381)63 801 99 23. Or contact Brankica Tanovic, Pesticide & Environment Research Inst., Belgrade, Serbia. Phone: (381) 11-31-61-773.

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