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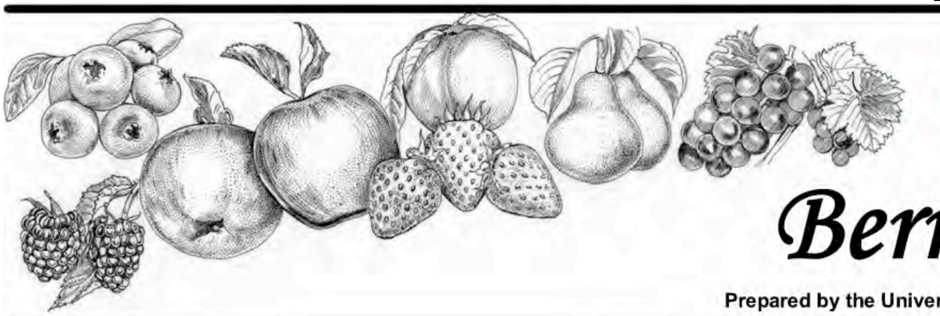

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Prepared by the University of Massachusetts Fruit Team

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IN THIS ISSUE:

Message from the Editor:

Time to renew: Once again we've come to subscription renewal time for Massachusetts Berry Notes. Subscription costs remain at $10 per year thanks to the generous underwriting by Nourse Farms. However, this year we're asking if you might add a contribution in support of UMass Extension's Fruit Program to your annual subscription renewal. A donation to the UMass Extension Fruit Program will support quality research and educational programming. Examples of some current initiatives include:

- research on new opportunities for blackberry production in New England using new fall bearing varieties Prime Jim® and Prime Jan® in high tunnels (demonstration planting planned for UMass Cold Spring Orchard in Belchertown, MA)
- research on the use of growth regulators for runner suppression in strawberries to save labor and increase yields (preliminary research trial at Nourse Farms, Whately MA)
- educational programs to inform growers about new methods for insect and disease management using reduced risk materials (twilight meetings and workshops statewide)
- educational publications to inform growers about recommended best management practices for fruit production in New England (various guides, fact sheets and UMass Fruitadvisor website)

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STRAWBERRY

Evaluation of New Cultivation Tools to Reduce Labor Requirements in Matted Row Strawberries

Mary Jo Kelly, Marvin P. Pritts and Robin R. Bellinder, Cornell University

Three new cultivation tools were compared with a traditional between-row cultivator, an herbicide control, and the conventional herbicide-plus-cultivator weed management program used in a first-year strawberry (*Fragaria* x*ananassa* Duch.) planting. The new implements were 1) a Rabe Werk flex-tine harrow, 2) a Buddingh finger weeder, and 3) a Bärtschi brush hoe, and the traditional implement was a double-headed multivator.

The flex-tine harrow performed poorly. Its use appeared to stimulate germination of weed seeds as end-of-season weed biomass was high and yield the following year was low. It was also the most labor-intensive treatment to maintain.

The finger weeder reduced in-row weed growth dramatically, and productivity of this treatment was high, but its use required additional between-row cultivation with another implement.

The brush hoe, while classified as a between-row weeder, reduced in-row weed growth as well, and yields for brushed plots were also high.

Cultivation with a multivator resulted in good weed control between rows and high yields, but hand weeding requirements within the row were high. Weed growth and yields were unacceptable when the herbicide was used alone, but an earlyseason pre-emergent herbicide application, followed by a single late-season hand weeding and cultivation, resulted in a dramatic reduction in weeds at the end of the year and a notable increase in yield the following year.

The conventional herbicide-plus-cultivation weed management program, used in the establishment year by growers who plant in the perennial matted row system, continues to be a good choice if labor is both plentiful and affordable; however, the finger weeder and brush hoe are viable alternatives for situations in which labor is scarce. Organic growers, and growers who plant in non-traditional annual systems, may benefit from their use as well.

To read the full research article, see HortTechnology January-March 2007 17(1). (***Source****: New York Berry News, Vol. 5, No. 11, December 2006*)

Strawberry -- Red Stele

Jay W. Pscheidt, Oregon State University Extension

Cause: *Phytophthora fragariae* var. *fragariae*, a soil-infesting funguslike microorganism that may live many years in fields. It is active in cool, wet weather. It attacks roots soon after fall rains begin and remains active through winter, spreading most rapidly where drainage is poor or in heavier soils. Well-drained fields are less often attacked, but low areas often show typical red stele infection.

Note that a few roots near the center of the picture have been cut in half to show the light color of outer cortex and brick-red central core or stele.

Several races of the funguslike microorganism have been reported. A cultivar resistant in one field may be susceptible in another due to the presence of different races. Of the seven races described, five have been reported from Oregon and Washington. Cultivars used to determine races include 'Aberdeen', 'Climax', 'Stelemaster', 'Sure-crop', 'Tennessee Beauty', 'MD-683', and a clone of *F. chiloensis* 'Del Norte'.

Symptoms: The core or stele of diseased roots in winter and spring has a reddish-pink tinge gradually turning a cinnamon-brown while the root's outer cortex stays white. Ultimately the diseased core turns black. Most of the plant's main roots show the symptom, but after May it is difficult to see. Cut roots lengthwise to expose the core. Lateral roots are quickly destroyed, giving main roots a "rat tail" appearance. As the disease progresses and active spring growth begins, infected plants are undernourished. Aboveground symptoms depend on the extent of root damage. Slightly diseased plants show few, if any. Severely diseased plants are stunted, and under certain conditions the youngest leaves take on a bluish green tinge and lack normal glossiness. Older leaves generally turn red, orange, or yellow. Such plants eventually wilt and die.

Note that a few roots near the center of the picture have been cut in half to show the light color of outer cortex and brick-red central core or stele.

Cultural control:

1. Use certified plants only.
2. Set new plants in well-drained soil (no standing water in winter) where red stele has not been known.
3. Plant on beds raised 8 to 10 inches to improve drainage, or use drain furrows. In home gardens or small plantings, raise the bed 15 inches.
4. Preplant soil solarization has been helpful in western Oregon. Place clear plastic on rototilled ground, which has been irrigated to near field capacity, from mid-July to mid-September. Use in combination with other techniques.
5. Do not plant in draws or swales where surface water flows after heavy rains.
6. Chisel or subsoil 18 to 20 inches deep between rows in late fall to increase drainage.
7. Clean soil from equipment before using it in other fields.
8. Resistant cultivars such as 'Olympus', 'Hood', 'Totem', 'Rainier', and 'Shuksan' are available, but even these are infected sometimes if virulent races of the pathogen are in soil.

Chemical control: Research data are based on chemical programs initiated at planting. Curative treatments may give some benefit but are not recommended. Alternate between chemicals with different modes of action to prevent or delay building up resistant microorganism . Red stele microorganism resistant to Ridomil have been detected in the major strawberry-growing areas of the Willamette Valley of Oregon.

1. Agri-Fos at 1.25 to 2.5 qt/A. 4-hour reentry.
2. Aliette WDG at 2.5 to 5 lb/A. Apply when plants resume growth in spring; continue at 30- to 60-day intervals. Apply no more than twice in spring and twice in fall. Can be applied on day of harvest but with a 12 hour PHI. Do not apply within 30 days of harvest in British Columbia. 12-hr reentry.
3. Fosphite at 1 to 2 quarts/A. Do not use copper products within 10 to 20 days of treatment and do not use spray adjuvants. 4-hr reentry.
4. Phostrol at 2.5 to 5 pint/A. 4-hr reentry.
5. Ridomil Gold EC at 1 pt/A. Do not use more than 1.5 quarts/A/year. Apply once at planting and again in spring as plants begin to grow. Apply again in fall after harvest but before fall rains. Only the fall application is allowed in British Columbia, before November 30. 12-hr reentry.

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Pinkerton, J.N., K.L. Ivors, P.W. Reeser, P.R. Bristow, and G.E. Windom. 2002. The use of soil solarization for the management of soilborne plant pathogens in strawberry and red raspberry production. Plant Disease 86:645-651.

(***Source**: Oregon State University Online Guide to Plant Disease Control; http://plant-disease.ippc.orst.edu/*)

RASPBERRY

Raspberry – Spur Blight

Jay W. Pscheidt, Oregon State University Extension

Cause: *Didymella applanata*, a fungus. The disease is found in western Oregon and Washington on red raspberry, 'Loganberry', and 'Youngberry'. The 'Willamette' cultivar of red raspberry is readily infected by spur blight but also is tolerant and can produce a satisfactory crop even if disease incidence is high.

From early April, mature black fruiting bodies (perithecia) can be found in the gray affected areas of cane tissue. Perithecia discharge ascospores in favorable (wet) weather, continuing perhaps until the end of June. Ascospores infect leaves on fruiting-cane laterals and on emerging primocanes. Under very favorable conditions, the fungus may infect laterals and pedicels directly.

Symptoms: Numerous brown necrotic spots (centered on veins) form on fruiting-cane leaves when rainy weather persists into late spring. Infected leaves become chlorotic and drop prematurely when the disease is severe. In contrast, infected primocane leaves develop brown V-shape lesions. The fungus then grows through the petiole to the cane and invades cane tissue around the bud, producing a brown-purple diseased area. Buds also may be reduced in size even if the fungus has not grown through the petiole. Buds on infected canes are more susceptible to winter injury, and fruiting laterals may be stunted. If the disease spreads along the canes (as in the Ashland, OR district) young canes turn brown up to 20 inches from the ground. Infected areas tend to turn gray in winter.

During the winter, infected canes turn gray.

Cultural control:

1. Remove and destroy old fruiting canes after harvest.
2. Keep plant rows narrow.
3. Practice good weed control.
4. Control early primocane growth.
5. Plant resistant or tolerant cultivars.

Chemical control:

1 Late dormant or delayed dormant application.

a. Lime sulfur (29%) at 10 to 12 gal/100 gal water. Polysul, Lily Miller Dormant Spray for Disease, and Bonide Lime Sulfur Spray are registered for home use. 48-hr reentry.

2 Spray at bloom or when new shoots are 8 to 10 inches long. Repeat 2 weeks later and after harvest. A combination of both Captan and iprodione has been very effective in western Washington.

a. Abound at 6.2 to 15.4 fl oz/A. Do not apply more than 2 sequential applications or more than 6 applications per year. May be applied on the day of harvest. 4-hr reentry.

b. Cabrio EG at 14 oz/A. Do not apply more than twice sequentially or more than four times per year. May be used at harvest. 24-hr reentry.

c. Captan 80 WDG at 2.5 lb/A. Do not apply within 3 days of harvest. 72-hr reentry.

d. CaptEvate 68 WDG at 3.5 lb/A Do not apply more than 2 consecutive application, within 3 days of harvest or more than 17.5 lb/A/season. 72-hr reentry.

e. Elevate 50 WDG at 1.5 lb/A can be used even though pest is not on the label. Do not use more than 6 lb/A/season. Can be used up to and including the day of harvest. 12-hr reentry.

f. Iprodione-based products plus another fungicide with a different mode of activity. Can apply the day of harvest. Tank-mix with other registered fungicides and limit to two (2) applications per year. 24-hr reentry.

- Iprodione 4L AG at 1 to 2 pint/A.
- Rovral 4 Flowable at 1 to 2 pint/A.

g. Pristine at 18.5 to 23 oz/A. Do not use more than 2 consecutive applications or more than 4 times/year. Can be used day of harvest. 24-hr reentry.

(***Source***: *Oregon State University Online Guide to Plant Disease Control; http://plant-disease.ippc.orst.edu/*)

BLUEBERRY

Highbush Blueberry – Incorrect soil pH

Wei Qiang Yang, Oregon State University Extension

Cause: A soil pH of 4.5 to 5.5 is optimum for blueberry production. Soil pH values significantly outside of this range are associated with a variety of problems. Surveys indicate this as one of the more important problems throughout the blueberry industry. Iron deficiency symptoms are common since iron is less available for plant uptake at high soil pH. High soil pH may occur when a new blueberry field follows other crops that have required the addition of agricultural lime. Some research indicates iron deficiency occurs when urea is applied in limed soil, resulting in an increase in rhizosphere pH. Using lime-containing materials, such as some livestock manures, for blueberry production can also induce high soil pH.

In areas west of the Cascade Mountains, the native soil pH is usually acidic. Low soil pH, however, can also be a problem. At low soil pH, soil aluminum becomes more available, which impedes plant uptake of nitrogen and phosphorus, and possibly iron uptake as well. Low soil pH is often a result of soil acidification caused by nitrogen fertilizer application over time. The overdose of sulfur during soil acidification can also yield low soil pH.

Symptoms: Iron deficiency symptoms include stunned plant growth and interveinal chlorosis of leaves. (Leaves turn yellow between the veins.) Plants exhibit general decline in growth with yellow to pale leaves, low vigor and low yield. Other non-specific nutrient or disease problems may occur due to improper soil pH.

Cultural control: It is important to monitor and keep a record of soil pH on a yearly basis and take corrective actions if necessary.

1. Locate new blueberry plantings on soil that is near or within the correct pH range of 4.5 to 5.5.
2. Adjust soil pH before planting with lime or sulfur-based on soil test results.
   a. Sulfur at 1 ton/A would be needed to lower a pH 6 clay loam soil to 4.5. Although this rate is fine before planting, once blueberries have been planted, use no more than 200 to 400 lb/A at any one time. Changes in soil pH will be slow and may take up to a year for results to show in soil tests.
   b. Use ground limestone if soil pH is below 4.0.
3. Use ammonium sulfate as a nitrogen source especially if soil pH is on the high side. Repeated use can lower soil pH below the optimum range.
4. Use urea instead of ammonia sulfate under low soil pH.
5. Increase soil organic matter to reduce free soil aluminum under low soil pH.

(***Source****: Oregon State University Online Guide to Plant Disease Control;* http://plant-disease.ippc.orst.edu/)

GRAPE

A Preliminary Investigation of Molybdenum in Grape Petioles and its Involvement with Poor Fruit Set in Virginia Vineyards

Fritz Westover, Virginia Tech

The 2006 season offered its score of challenges to grape ripening, especially for red varieties in many areas of the state where late season rains persisted. In general, the growers I have interacted with this year have been most concerned with seasonal conditions after veraison and leading into harvest, such as rain, diseases, or fruit chemistry imbalances. Yet another influx of inquiries occurred much earlier in the season, regarding poor fruit set in many red *vinifera* varieties; most notably in Merlot, Cabernet Franc and Cabernet Sauvignon, and in some cases, with the white hybrid Traminette.

Poor fruit set may affect not only yields, but also the uniformity of ripening in grape clusters if variability is introduced. Millerandage or "Hens and Chicks" is a condition recognized as small, "shot" berries borne on the same cluster with normal-sized berries as well as unfertilized swollen green ovaries (3). Many factors can affect fruit set in the vineyard, including cool, wet, or windy conditions during bloom, crop load, water, heat and other stresses from the previous season, and nutritional deficiencies. A survey of those factors was initiated during the 2006 season to determine the potential causes or commonalities of poor fruit set in Virginia on a case-by-case basis. Our inquiries with growers indicated that some of the poor fruit set may have occurred due to hot, dry weather during bloom, while others may have been the result of limited carbohydrate reserves in vines resulting, perhaps, from a dry 2005 season followed by dry conditions in spring of 2006. Still, other vineyards did not report excessive temperatures or rain during bloom, nor did plant tissue analysis (petioles) at bloom show deficiencies in boron or zinc, both of which are known to affect fruit set and occurrence of millerandage. Our research group was made aware of investigations of the role of molybdenum (Mo) on fruit set in Australian studies during a visit by Dr. Peter Dry of the University of Adelaide in spring of 2006. Although this problem (referred to in Australia as the "Merlot problem") is most prevalent on own-rooted Merlot vines, we decided this was a good opportunity to investigate the levels of Mo in Virginia vineyards. This article discusses some of the factors that affect Mo uptake by grapevines and summarizes the results of our preliminary survey of Mo content in grape petioles.

Why is Mo important? Molybdenum is a trace element found in soils and is necessary for the growth and development of plants. In grapevines, Mo has been associated with the development of functional seeds and is thus considered to be important for pollination and/or fertilization (4). Several factors can influence Mo uptake by grapevines. Availability in soil is dependent upon soil pH. The molybdate anion (MoO_4^{2-}) is more available in alkaline soil and uptake is greatly reduced at pH 5.5 or lower, with maximum adsorption onto positive charged metal oxides occurring at pH 4.0 to 5.0 (1). Molybdate is generally more available in soils with higher organic matter and can be leached in sandy, low organic matter soils. Mo uptake is also affected by iron and aluminum oxides in soil and by competition from sulfate (SO_4^{2-}) anions. Other data shows that Mo is involved in phosphorus (P) transport in roots.

Low P transport into roots may facilitate molybdate accumulation in roots, suggesting that low soil P may inhibit Mo uptake into foliage (1). Additionally, Mo deficiencies in Australia were predominantly found in own-rooted vines. Those planted on American rootstocks Schwarzman (*Vitis riparia* x *V. rupestris*) and 140 Ruggeri (*V. rupestris* x *V. berlandieri*) were not as greatly affected, implying a genotypic difference in uptake efficiency. Other factors that will reduce nutrient uptake into roots, such as wet or cool soil conditions, may also reduce uptake of Mo. A good example of this is the yellowing of young shoots during cool, overcast spring weather, associated with low uptake of nitrogen and potassium.

In Virginia soils, organic matter is not typically limiting, however, low pH, and additions of sulfate via gypsum or Epsom salt would theoretically predispose vines to reduced Mo uptake. The likelihood of inducing Mo deficiency by of all of those factors would be more the exception than the norm in a well-managed vineyard and the use of American rootstocks further limits concerns for Mo deficiency in our region. Nonetheless, all factors must be considered when poor fruit set occurs without explanation.

Methods

The survey included a total of 14 Virginia vineyards, comprising varieties of various age, rootstock, and soil conditions. Varieties were chosen to represent those most affected by poor fruit set in 2006 including Merlot (M), Cabernet Sauvignon (CS), Cabernet Franc (CF), Petit Verdot (PV), Carmenere (CM), and Traminette (TM). Controls were included from vineyards not having fruit set problems. Boron (B) and zinc (Zn) were also analyzed to determine if other micronutrient deficiencies were involved in poor fruit set. Samples were collected between 30 May and 28 July of 2006. A modified version of the Mo analysis by Williams et al. (4) was performed by two independent laboratories to detect Mo levels in 36 grape petiole samples.

Results

Levels of Mo ranged from 0.10 to 1.50 ppm from Lab A and 0.10 to 0.48 ppm from Lab B (Table 1). The two laboratory results were similar for 7 of the 13 samples (<0.14 ppm difference) and differences ranged from 0.18 to 1.24 ppm in the other 6 samples. According to standards for Mo in grape established by work in Australia and using the upper level of ≤0.14 ppm as the deficiency range, only 1 of the 13 samples tested by both labs was considered deficient: CS from Fauquier Co. Lab B's results suggested that 3 additional samples were deficient in Mo: M from Pittsylvania Co., CM from Fauquier Co., and own rooted TM from Frederick Co. All of the above samples, except for TM, were from vines that showed symptoms of poor fruit set. Samples containing Mo within the range of 0.14 to ≤ 0.20 ppm included CF from Albemarle Co. (Labs A & B), CF from Rappahannock Co. which both had symptoms of poor fruit set, and CF Frederick Co. and TM on rootstock C-3309, Frederick Co. (Lab B only), which did not show poor fruit set. The mean Mo levels were 0.45 (n = 36) and 0.22 ppm (n = 13) for labs A and B respectively. Boron fell within or above adequate ranges (27 to 54 ppm: recommended is 25 to 30 ppm) in all of the sites tested, as did zinc (36 to 192 ppm: recommended is 30 to 50 ppm).

Discussion

Other than nickel, the requirement for Mo is lower than any other essential plant nutrient (2). Recent research with Merlot in Australia proposed that vines are deficient in Mo when levels are <0.09 ppm at bloom and <0.14 ppm at veraison, having no significant yield effects when foliar Mo was applied to vines containing >0.14 ppm Mo (4). The challenge with determining crucial levels of Mo lies in the difficulty of accurately detecting such low levels. To add to the complexity, the typical laboratory that provides plant nutrient analyses may not be equipped to detect the low levels of Mo critical for assessing deficiencies.

Levels of Mo in petiole samples varied considerably in 2006. Although a few of the sites appeared to have deficient levels, only one site was confirmed to be deficient by both laboratories. The varieties that were labeled as having deficient Mo levels (≤0.14 ppm) by at least one of the labs were also reported as showing symptoms of poor fruit set in 2006, except for those in Frederick Co. In contrast, many other sites that reported poor fruit set were not deficient in Mo. Other sites reporting fruit set problems had Mo levels in the range of 0.3 to 0.9 ppm as well as sufficient levels of B and Zn, suggesting that factors other than mineral nutrition may have been responsible for poor fruit set. Research by Williams et al. (4) showed that foliar applications of molybdenum did not improve fruit set when petiole values were greater than 0.14 ppm, therefore we <u>do not</u> promote the use of Mo fertilizer in vineyards that test above 0.14 ppm unless future research shows improvements for grafted vines in the Mid-Atlantic region.

In the event that future work in the Mid-Atlantic shows that Mo is the primary cause of recurring fruit set problems, there are practical methods to increase Mo content in vines. Foliar sprays are effective because Mo is mobile in both the xylem and phloem. Mo sprays on Merlot in the Australian study did not significantly affect uptake of other nutrients, such as B, Zn, and had no effect on vegetative growth of vines (4). Additionally, the two sprays per season (bloom, veraison) at a rate of 0.64 lbs/acre molybdate and applied in about 300 gal/acre of water did not cause phytotoxicity in vines. Future research will be needed to determine critical levels for Mo in Virginia vineyards before we have reason to expect that different levels are needed. Some trace mineral products that are currently being used in vineyards in the Mid-Atlantic to apply B and Zn, also contain Mo, but it is difficult to distinguish if improvements in fruit set are due to the Mo component. The effects of Mo application have yet to be determined in a controlled study in this region.

Acknowledgments:
We thank A&L Eastern Laboratories, Richmond Virginia and Agri Analysis Inc., Leola Pennsylvania and all of the growers who participated in this study.

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(***Source****: Virginia Vititculture Notes, November - December 2006*)

Table 1. Sample data showing site location, grape variety, rootstock, age and nutrient content of petioles for fruit set disorder survey in Virginia, 2006

							Lab/Nutrient (ppm)			
ID	County	Date	Variety	Rootstock	Vine Age	Poor Fruit Set	A Mo	B Mo	A B	A Zn
1	Frederick	27-Jul	TM*	3309-C	–	no	0.20	0.18	36	53
2		27-Jul	TM	own	–	no	0.80	0.10	27	56
3		27-Jul	CF	–	–	no	1.00	0.18	28	67
4		27-Jul	CF	–	–	no	0.70	–	29	63
5	Rappahannock	29-Jul	CF	–	–	yes	0.60	–	40	94
6		29-Jul	CF	–	3	yes	0.50	0.19	35	67
7	Mecklenburg	31-May	PV	–	–	–	0.30	–	51	62
8		31-May	CF	–	–	–	0.30	–	54	81
9		31-May	M	–	–	–	0.30	0.35	47	96
10	Kinsale	6-Jun	M	–	–	–	0.40	0.48	41	101
11		6-Jun	CF	–	–	–	0.30	–	42	95
12		6-Jun	CS	–	–	–	0.30	–	41	80
13	Amherst	9-Jun	CS	–	–	–	0.40	–	35	36
14	Loudoun	23-Jun	CF	–	–	–	0.40	–	46	81
15		23-Jun	PV	–	–	–	0.40	–	43	67
16		23-Jun	M	–	–	–	0.30	–	40	82
17		23-Jun	?	–	–	–	0.30	–	47	68
18	Pittsylvania	27-Jul	M	–	–	yes	0.40	0.14	–	–
19		27-Jul	CF	–	–	yes	0.50	0.37	–	–
20		27-Jul	CS	–	–	yes	0.50	–	–	–
21		27-Jul	VN	–	–	no	0.40	–	–	–
22		27-Jul	CH	–	–	no	0.50	–	–	–
23	Albemarle	8-Jul	CF	–	4	yes	0.20	0.18	36	79
24		8-Jul	CF	–	8	–	1.50	0.26	39	73
25	Nelson	14-Jul	PV	–	–	yes	0.90	–	50	52
26		14-Jul	TM	–	–	yes	0.50	–	30	53
27	James City	11-Jul	TM	–	–	yes	0.30	–	–	–
28	Campbell	29-Jul	TM	–	–	yes	0.30	0.23	51	105
29		29-Jul	CF	–	–	yes	0.50	–	34	192
30	Washington	29-Jul	CF	–	–	yes	0.30	–	–	–
31		29-Jul	TM	–	–	–	0.40	–	–	–
32		29-Jul	TM	–	–	–	0.30	–	–	–
33	Fauquier	23-Jun	CS	–	21	yes	0.10	0.13	37	39
34		29-Jul	CM	–	1	yes	0.30	0.12	30	63
35	Fauquier	–	CF	–	–	yes	0.40	–	–	–
36		–	CF	–	–	yes	0.30	–	–	–
						Mean	**0.45**	**0.22**	**40**	**76**
						Median	**0.40**	**0.18**	**40**	**68**
						Max	**1.50**	**0.48**	**54**	**192**
						Min	**0.10**	**0.10**	**27**	**36**

*Grape Variety Key: CF = Cabernet Franc, CH = Chardonnay, CM = Carmenere, CS = Cabernet Sauvignon, M = Merlot, PV = Petit Verdot, TM = Traminette, VN = Viognier,

Currants and Gooseberries

Improved Fresh Fruit Quality of Gooseberries and Red Currants with the Cordon Training System

Steven A. McKay Cornell Cooperative Extension

Cordon training of Ribes plants whose fruit is intended for the fresh market is standard practice for growers in Holland. The practice has also been popular in England for hobby and display gardens (with some differences from the Dutch system) but, the basic idea of cordon systems is that one to three trunks (vertical cordons) per plant are grown and tied vertically to stakes. Pruning removes old and excess wood in order to renew the fruiting structures of the plant. Plants are opened up to provide better access to fruit, and better ventilation, light, and spray penetration. Quality and size of fruit is improved, and labor for picking is reduced.

Red Currants

In Holland, red currants are planted about 1/2 meter apart. Three branches are selected as cordons and trained up bamboo stakes spaced at the center of the plant and about fifteen centimeters on each side. The cordons are encouraged to grow to a height of five to six feet. A spare branch is left at the base of the plant each year as an insurance measure in case any of the cordons die and needs replacement. During the same year, right after fruiting, the 1-year-old branches that have borne fruit are removed. Very small branches and misplaced or crowding branches are removed, leaving mediumsized branches that will bear fruit the next season. In this manner, a plant is completely renewed (except the cordon) on an annual basis. One additional and beneficial pruning step during the growing season could be to head the most vigorously growing lateral branches to keep them shorter and more fruitful.

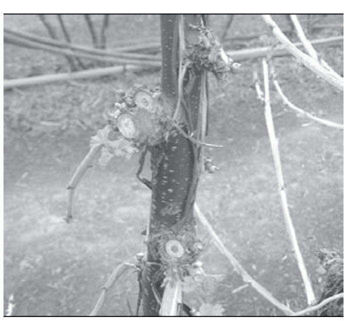
This work was sponsored by a research grant from NE SARE. This article is based on observations made while in Europe on visits between 2002 and 2004, and on much appreciated discussions with Adri van Eck, DLV in Holland, and Jim Arbury, RHS Wisley Gardens in England.

As the production of fresh gooseberries and currants increases, growers will need to pay closer attention to fruit quality. Cordon training systems have proven to produce the highest quality fruit in Europe, and to make it easier to harvest fruit, especially thorny gooseberries.

In England, semi-permanent branches are selected evenly spaced along the cordon. In late June each year, poorly placed and crowding branches are removed leaving five to seven bud branches for the rest of the growing season. The five bud branches are shortened to two bud fruiting spurs during the dormant season pruning.

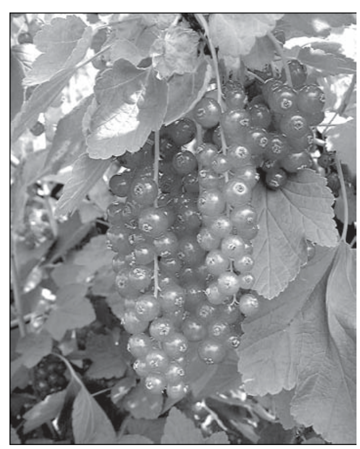
Gooseberries

Gooseberries can be very difficult to harvest if they are of a thorny variety. Cordon training offers the advantage of opening up the plant and leaving the fruit accessible. In Holland, a single branch is selected and trained up a stake to a height of five to six feet. Only new, well spaced, medium-sized branches are left at the end of the growing season. Poorly spaced, small branches, and branches that bore fruit, are removed. In England, cordoned gooseberries are trained in the same manner they train cordoned red currants.



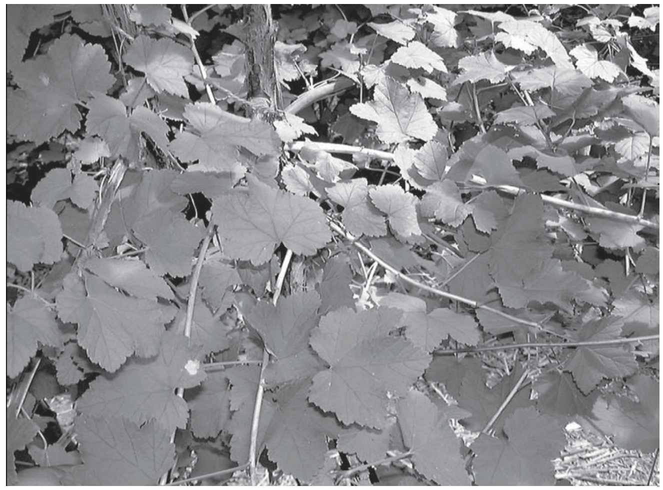
Medium-sized one-year branches are spaced radially around the cordon.

Mature cordon-trained red currants in a Dutch greenhouse for early fruit production.



Well-formed strigs of red currants from cordon-trained plants.

Heavy crop of gooseberries on cordon-trained plant.



One-year branches chosen to be left on the cordon after harvest. All of the wood that fruited this year has been removed.

Trellising System

Conduit used for training apples to the vertical axis system work well for a Ribes trellis. Ideally, posts would be about two plus meters long with about thirty centimeters pounded into the ground, and a hole drilled about four centimeters from the top. (An alternative to drilling is to use commercial wire clips since holes can weaken posts making them more susceptible to breakage or bending in wind or rusting. The clips available through orchard supply houses.) The posts could be spaced six to eight feet apart, with a number fourteen or twelve wire passed through the holes at the top of the stakes. At each end of the trellis, a conduit anchor post can be driven in, and the wire attached through a hole drilled near the top of the post. Six-‘foot bamboo posts are then spaced as needed along the wire, pushed into the ground a couple of inches, and tied at the top. Green horticultural tape can be used to tie trunks to the posts.

Bamboo poles are susceptible to degradation, and when in contact with the soil, can rot out a lot faster. I have tried running two wires along the row, with the bottom wire about a foot off the ground, and the second wire a few inches below the top of the post (and at a distance from the bottom wire that allows a four to five foot bamboo pole to fit between the wires). The bamboo is attached to the two wires, and is kept off the ground. As the plants grow up the posts, they are tied on with tie-tape.

Fertilizer

A very critical observation was made in a commercial planting in Germantown, NY. Red currant plants (one year old) started out the season green and vigorous, but after about a month of growing began to show yellowing and a

One-year red currant plants being established.

Cordon-trained gooseberries.

Harvesting cordon-trained gooseberries.

Cordon-trained, spur-pruned gooseberries in England.

lack of vigor. Fifty pounds of actual nitrogen per acre were applied (injected through the irrigation system) in May of two consecutive years, When no significant change in vigor or yellowing occurred, this was followed up with two additional 50 pound applications, one in June and one in July. The plants greened up and put on 1-2 feet of nicely branched, new shoot growth. No branching occurred in the first year.

The approach for the first year was to be conservative with fertilizer applications because a soil test on the site showed that nutrients were plentiful. If the plants were to be grown as bushes for mechanical harvesting, this approach might have been useful as a way to check excess plant vigor. Mistakenly, it was thought that restricting growth to a few branches would invigorate them sufficiently. But this was not the case. In a consultation with Adri Van Eck, he stressed that a heavy fertilization program in the first years when plants are established is important. It is also important not to set fruit during the first one to two growing seasons as the plants become established.

Pest Control

In a plot with some new cordons at Hudson, NY, there was a minor problem with currant aphids at the beginning of the season. We hoped that natural predators would control of the infestation. By August, a combination of aphids and leaf spot had defoliated the plants. This seriously stunted the plants in that season and the following growing season. The demonstration was a good illustration of the benefit of good pest control in the early years of cordon establishment when rapid, healthy growth is needed.

Conversion of Bushes to Cordons

Bushes can easily be converted to cordons by selecting three young to medium-aged branches (one in the case of gooseberries) to become cordons. If spacing is too wide between plants, cuttings can be taken and stuck between older plants (best done Sept.15-Oct. 15 in the Northeast US) to develop new plants. Older plants will become adapted within one growing season.

Advantages and Disadvantages Summarized

Advantages:

• Plants are opened up for better air circulation, spray coverage, and harvesting.

Replacement wood for new trunks is maintained at the base of the plant.

Young cordon-trained Dutch gooseberry plants.

• Fruit quality is improved in terms of size, color, and lack of rubbing and puncture injury.

• Pruning is simplified over bush systems because one can easily see what to cut.

• The plant's cordon or support system does not constantly need to be renewed as with the bush system. (The trunk, or cordon, is relatively permanent, while branches in bush plants are renewed every three to five years.

Disadvantages:
• The system is more costly to establish.
• Cordons can die out and need replacement.

(***Source****: New York Fruit Quarterly, Volume 13, No. 2, 2005*)

Upcoming Meetings:

Getting Started in Organic Farming (NOFA-CT)
January 13, 2007 8:30-4:00
Connecticut Agricultural Experiment Station, New Haven
For more information go to http://www.ctnofa.org/events/GettingStarted.php

National Bramble Conference
January 15-17, 2007
The annual conference of the North American Bramble Growers Association will be in Columbus, Ohio, this year, in association with the Ohio Fruit and Vegetable Congress. Sessions include an intensive "Bramble ABCs" workshop for novice growers. For more information, email nabga@mindspring.com .

Ohio Fruit and Vegetable Growers Congress, Ohio Direct Agricultural Marketing Conference, Mid American Human Resource Conference and National Bramble Conference
January 15-17, 2007
Greater Columbus Convention Center. Columbus Ohio. For more information email klutz@ofbf.org

Massachusetts Fruit Growers' Association Annual Meeting and UMass Extension Winter Fruit Program
January 17, 2007
UMass Cold Spring Orchard, Belchertown, MA
For more information contact Jon Clements at clements@umext.umass.edu or go to
http://www.massfruitgrowers.org/2007/mfga2007annualmtg.html

Connecticut Vegetable & Small Fruit Growers Conference
January 18, 2007
Tolland County Agricultural Center, 24 Hyde Avenue (Route 30), Vernon, CT
For more information contact Jude Boucher at jude.boucher@uconn.edu or visit
http://www.hort.uconn.edu/Ipm/veg/htms/2007vegconf.htm

20th Annual Northeast Organic Farmers Association Winter Conference
Saturday, January 20th, 2007
Bancroft School in Worcester, MA
For more information contact Winter Conference Coordinator, Jassy Bratko, jassyhighmeadow@yahoo.com or 978-928-5646 or visit http://www.nofamass.org/conferences/w2007/index.php

Mid-Atlantic Fruit & Vegetable Convention
January 30-February 1,2007
Hershey Lodge &. Convention Center, Hershey PA. For more information and registration go to:
http://gloucester.rcre.rutgers.edu/midatlantic/

NH Farm and Forest Expo
Feb. 2-3, 2007
Radisson Hotel Manchester, Manchester, NH
For more info go to http://www.nhfarmandforestexpo.org/

NEV&BGA February Winter Meeting
February 3, 2007
Eastern Massachusetts Extension Center, 240 Beaver St. Waltham, MA
For more information contact: John Howell at howell@umext.umass.edu

North American Strawberry Growers Association Strawberry Symposium
February 9-12, 2007.
Crowne Plaza Hotel, Ventura, California.
For more information http://www.nasga.org/ .

NOFA-VT Winter Conference
Feb 10, 2007
Vermont Technical College, Randolph Center, VT.
For more information go to http://www.nofavt.org/event.php?e_id=602

Community Farming Conference (co-sponsored by Connecticut Agricultural Experiment Station, CT NOFA and the Mercy Center)
February 10, 2007 - 8:30 am - 3:00 pm

Mercy Center, 167 Neck Road, Madison, CT
More information at: http://www.ctnofa.org/events/CommunityFarming.php

2007 Empire State Fruit and Vegetable Expo
February 14-15, 2007
Onodaga Convention Center, Syracuse, NY.
For more information go to: http://www.nysaes.cornell.edu/hort/expo/

North American Farmers' Direct Marketing Conference and Trade Show
February 16-17,2007. Hyatt Regency Hotel, Calgary, Alberta, Canada. For more information http://www.nafdma.com .

Vermont Vegetable and Berry Growers Annual Meeting
February 26, 2007
Capital Plaza Hotel, 100 State Street, Montpelier.
(802) 223-5252 www.capitolplaza.com. Sponsored in part by USDA Risk Management
for more information contact Vern Grubinger at (802) 257-7967 ext.13, vernon.grubinger@uvm.edu

Cultivating an Organic Connecticut Conference
March 10, 2007, 8:30AM - 4:45PM
Windsor High School, Windsor, CT
More info at: http://www.ctnofa.org/events/CaOC.php

New England Greenhouse Tomato School
March 14, 2007.
DoubleTree Hotel, Burlington, Vermont.
for more information contact Vern Grubinger at (802) 257-7967 ext.13, vernon.grubinger@uvm.edu