



Berry Notes

Prepared by the University of Massachusetts Fruit Team

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Crop Conditions:

Strawberry fields are fairly quiet at this time of year. Now is a good time to make some notes about variety performance so you'll be able to refer to them when planning your order for next year's plants. A couple of articles below should help, too. Late summer and early fall is a good time to fertilize both new and established strawberry fields. Leaf tissue analysis can help guide fertilizer amounts but typically strawberries will need 20 – 50 pounds of nitrogen at this time of year. Amounts depend on how much was applied at renovation and the organic matter content of the soil. Growers planning to establish fall planted plasticulture or annual beds should be preparing their sites. The best time for planting is the first week of September. More on this next week. **Highbush blueberry** harvest is moving into late- season with some reports of anthracnose or alternaria on these berries. Heavy rains have contributed to the high incidence of these diseases. Leaf tissue analysis should help with fall applications of non-nitrogen fertilizer amendments. Also, now is a good time to get control of weeds in the planting. **Summer raspberry** harvest is finished and **fall raspberry** harvest has begun. As with the summer bearing varieties, check for signs of Botrytis infections that may cause post harvest deterioration of the fruit. Switch fungicide is labeled for use against Botrytis in raspberries and is an effective tool for managing this disease. A copy of the supplemental label is available on the fruitadvisor website (www.umass.edu/fruitadvisor). Also, there is a formulation of Captan (Captan 80 WDG from Micro Flo) is newly labeled for use on Bramble Fruit. This is very helpful for the management of resistance to some of the more narrowly targeted fungicides. A copy of the label is available at www.umass.edu/fruitadvisor. **Grape** clusters are at or approaching veraison (coloring). Some early table varieties on inland sites are ripening. Wet weather has challenged grape growers almost continually this year. Disease management is still important as is late season nutrition management.

Environmental Data

STATE WEATHER SUMMARIES For the Weeks Ending Sunday, August 10 and 17, 2003

Prepared by AWIS, Inc. (available at <http://www.nass.usda.gov/weather/cpcurr/new-eng-crop-weather>)

STATE	Sunday August 10, 2003						Sunday August 17, 2003					
	AIR TEMPERATURES				PRECIP.		AIR TEMPERATURES				PRECIP.	
	LO	HI	AVG	DFN	LO	HI	LO	HI	AVG	DFN	LO	HI
ME	56	88	71	+5	0.50	3.39	47	91	71	+6	0.01	2.45
NH	49	86	73	+7	0.88	6.80	43	92	72	+7	0.19	3.53
VT	56	92	74	+8	1.25	3.20	52	93	73	+8	0.00	2.54
MA	55	88	75	+6	1.32	5.73	59	90	76	+7	0.13	2.81
RI	63	86	76	+5	2.43	3.55	65	88	77	+7	0.50	0.74
CT	61	87	76	+5	1.79	4.89	60	90	77	+7	0.02	1.27

(Source: New England Ag. Statistics Service, Weekly Crop Weather Reports, Vol. 23, Nos. 16 & 17, Aug. 11 & 18, 2003)

Strawberry

A New Option for Aphid Control in Strawberry

Rufus Isaacs, Michigan State University

Some reports of aphids in strawberry have been reported recently across the state, and potato leafhopper numbers remain unusually high. Scouting your fields in this time of the year can be time well spent, to determine whether these insects are present. This will also provide a chance to determine whether two-spotted spider mite numbers are building. Unchecked, these pests can lead to poor development of leaves after renovation, or poor growth of new plants during the establishment year. Regular scouting of fields can provide information on whether these pests are present, whether treatment is required, and whether a treatment has been effective. For some mobile pests, such as potato leafhopper, re-infestation of a planting can happen as they move from field to field, and a regular scouting program can detect this.

While Diazinon remains one of the most effective insecticides for aphids if good coverage is achieved, there is a new option for control of this pest. Provado 1.6F is labeled at 3.75 oz in strawberry for aphids, whiteflies and spittlebugs. Good coverage is also required for control with this product, and a spray adjuvant should be used to achieve the required spread of the compound across the lower leaf surfaces. A copy of the label is available at: http://www.ipm.msu.edu/CAT03_frt/pdf/7-29provado.pdf [and <http://www.umass.edu/fruitadvisor>].

For fields under renovation, the new growth that may develop quickly after the spray is applied will not be protected. However, in fields that are establishing this year, where most of the growth will be done already, this product is expected to be an effective alternative option for aphid control. (*Source: Michigan State Crop Advisory Team Alert, Vol. 18, No. 14, July 29, 2003*)

Strawberry Cultivars For Ohio Berry Growers

Richard C. Funt, Ohio State University

Strawberries are an important fruit crop and can be grown in every Ohio county. Cultivar selection is an important management decision for production, marketing, and profitability. Most cultivars grown in Ohio are suited for the matted row system and for pick-your-own and ready picked (hand harvested) markets. These systems must have root, fruit, and leaf disease resistance to be successful under the cold, wet spring and hot, dry summer conditions of Ohio.

Fruit size, firmness, and flavor are largely genetic characteristics and vary among cultivars. Fruit size is an important economic factor because labor efficiency increases as fruit size increases. Pick-your-own customers are impressed by large sized berries and many customers will only have a short time for a farm visit. Fruit firmness is a factor in transporting fruit to retail or wholesale markets.

A comparison of several new strawberry cultivars was conducted in 2002 and 2003 in central and north central Ohio. Plants were obtained from New Jersey, North Carolina, and the United States Department of Agriculture (USDA) Small Fruit Breeding Programs and were compared with the standard early ripening Earliglow and mid-season ripening Allstar cultivars.

All plants were set into black plastic on raised beds with trickle irrigation in August/September of 2001 at a 12-inch spacing. Soil tests indicated that zinc was low and both locations added zinc to the soil. Amazingly, the two soils were close in fertility test results. Growers applied nitrogen, either as fertigation or foliar, and fungicides, herbicides, and insecticides according to the needs in their location. No runners were allowed to set (black plastic covered the row in 2002) and runners were chemically burned off at renovation. This project was completed in July 2003.

Avalon, Earliglow, NC 95-08, Allstar, and B440 were compared. In early 2003, B440 was named Ovation by USDA-ARS in Beltsville, Maryland.

Avalon ripens several days before Earliglow. It had a yield similar to Earliglow in 2002 (Table 1.). Avalon's berry size was larger than Earliglow in both years. Generally, Avalon had 1.5 to 3.0 times greater yield than Earliglow. Earliglow is still one of the best flavored berries, but Avalon has good flavor under wet and dry soil conditions. It has a good outside red color.

Earliglow ripens after Avalon and has been the standard berry in central Ohio for over 20 years. It has outstanding fruit color, fruit rot resistance, and excellent fresh and frozen flavor. It has been the berry of choice. It had the smallest average

fruit size of all cultivars tested (Table 1.). Generally, it had a lower percent of culls than most cultivars except for Allstar. It compares to NC 95-08 in yield.

NC 95-08 ripens after Earliglow with good fruit size, but yields tend to be low. It tended to have a higher percentage of culls, which could be an issue of berry firmness. Flavor and color are good.

Allstar is a mid-season standard cultivar in Ohio known for root and leaf disease resistance, firmness, good interior color, fruit size, and yield. Interior color can be reddish orange, but can be enhanced by low nitrogen (more sunlight) and harvesting one day after developing full color. For the two-year period, Allstar produced 1.2 pounds per linear foot of row while Avalon produced 1.25 pounds.

B440 (Ovation) is a large, red, and attractive berry with good flavor when planted at the proper spacing and provided minimal nitrogen. The plant is vigorous, and was the tallest plant of all cultivars. Its berry size and flavor is comparable to Allstar. It has a deeper red color than Allstar. It ripens about 10 days after Allstar, or when 50% of the Allstar berries have been harvested. It makes an outstanding berry for the very late season on or about June 20th. Ovation has size, color, firmness, and flavor for an outstanding late season market when grown properly.

Conclusions: Two cultivars were tested and compared to the early season standard Earliglow cultivar. Both had larger berry size than Earliglow and acceptable flavor. Ohio growers should try Avalon for the very early season, just before Earliglow. NC 9508 ripens after Earliglow and has good fruit size, flavor, and color.

B440 (Ovation) was the very latest ripening cultivar. It ripened several days later than Allstar, a standard mid-season strawberry. Ohio growers should try Ovation, as it is a very large, red, good tasting, and late season berry. It must be grown properly to achieve its best performance.

Appreciation is extended to the Ohio Small Fruit and Vegetable Research and Development Fund for their support of this research.

Table 1. Strawberry cultivar total weight, average weight per berry, and grams per foot of row, central Ohio, 2002 and 2003.

Cultivar ¹	Total Weight Grams	Average Berry Weight	Average % Culls	Grams/Foot of Row
First Year				
Avalon	2679	13.3	6.9	179
Earliglow ²	2775	10.8	6.5	111
95-08	2715	15.5	8.6	108
Allstar	5492	13.9	5.5	225
B440	4663	15.3	8.2	187
Second Year³				
Avalon	5793	15.3	10.3	386
Earliglow	3060	10.4	7.1	122
95-08	2942	14.4	9.4	118
Allstar	7925	18.5	6.1	316
B440 ⁴	5605	18.1	8.4	224

¹ We are grateful to the Ohio Small Fruit and Vegetable Research and Development Fund and to Circle S Farm for their financial support. In order of ripening.

² Most plots 25 ft. Avalon is 15 ft.

³ 2003 provided larger berries than 2002 due to cool wet weather. Second harvest year with black plastic, raised bed and microirrigation; 12 inch plant spacing, no runners.

⁴ B440 named Ovation by USDA-ARS, Beltsville.

(Source: Ohio State University Fruit ICM News, Volume 7, No. 29, July 31, 2003)

2002 Strawberry Taste Tests

Dr. Jennifer DeEll – Ontario Ministry of Agriculture and Food

During the 2002 strawberry season, taste tests were conducted on 17 varieties and new selections. Berries were harvested twice from commercial growers in Southwestern Ontario. Berry appearance, flavor, and texture were ranked by 12 evaluators for the first test on July 3rd, and by nine evaluators for the second test during the following week.

In the first taste test (Table 1), 'L'Authentique Orléans', 'Mesabi', and 'St-Pierre' had the most favorable appearance and texture. 'Mesabi' also had the most favorable flavor, whereas 'L'Authentique Orléans' and 'St-Pierre' were considered to

have only mediocre flavor. 'K93-20' and 'Sable' also had high flavor ratings, but both had low appearance ratings. 'L'Acadie' and 'Yamaska' had the least favorable appearance, flavor, and texture.

In the second taste test (Table 2), 'LSJ1', 'L'Authentique Orléans', and 'St-Pierre' had the most favorable appearance and texture. 'St-Pierre' also had a high flavor rating, whereas 'LSJ1' and 'L'Authentique Orléans' were considered to have only mediocre flavor. It is interesting to note that although 'Mesabi' had the most favorable characteristics in the first taste test, it had the least favorable appearance, flavor, and texture in the second test. 'Sable' and 'Yamaska' both had higher appearance ratings in the second test, compared to the first taste test. 'Mira' had the least favorable flavor, while 'L'Acadie' continued to have a low flavor rating.

Table 1. Appearance, flavor, and texture ratings from the first strawberry taste test, July 3rd.

Cultivar	Appearance ¹	Flavor ¹	Texture ¹
Cabot	3.2	3.2	3.6
K93-20	3.1	3.7	3.7
K96-1	3.2	3.3	3.5
Kent	3.8	2.9	3.6
LSJ1	3.7	2.8	3.4
L'Acadie	3.1	2.3	2.7
Latestar	3.5	2.5	2.9
L'Authentique Orléans	4.2	3.1	3.6
Mesabi	4.0	3.7	3.6
Mira	3.9	3.3	3.4
Sable	2.8	3.7	3.1
Sapphire	3.5	3.3	3.3
Seneca	3.3	2.8	3.0
St-Pierre	4.1	3.3	3.8
Yamaska	2.6	2.4	2.9
Significance ²	***	**	NS

Table 2. Appearance, flavor, and texture ratings from the second strawberry taste test, July 10th.

Cultivar	Appearance ¹	Flavor ¹	Texture ¹
Brunswick	3.2	3.0	3.0
Cabot	2.9	2.8	3.7
K93-20	3.2	3.8	3.6
Kent	3.2	3.6	3.4
LSJ1	4.3	3.2	3.8
L'Acadie	3.0	2.6	3.1
Latestar	3.4	2.8	3.2
L'Authentique Orléans	4.6	2.7	3.7
Mesabi	2.7	2.8	2.8
Mira	3.6	2.4	3.7
Sable	3.8	3.4	2.9
Sapphire	3.0	3.1	3.6
Seneca	3.4	3.4	3.6
St-Pierre	4.0	3.6	4.2
Winona	3.3	2.7	3.1
Yamaska	3.7	3.0	3.4
Significance ²	***	NS	NS

¹ Appearance, flavor and texture rated on a 1 to 5 scale: 1 = strongly dislike, very unacceptable; 2 = dislike, unacceptable; 3 = ok, just acceptable; 4 = like, acceptable; 5 = strongly like, very acceptable.

² NS, **, *** = not significant or significant at P<0.01 and P<0.001, respectively.

(Source: *The Ontario Berry Grower*, Volume #7, July 2003)

Crop Rotations and Cover Crops for Strawberries

Vern Grubinger, University of Vermont 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 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 replanting 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 tritcale. 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.”

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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(Source: Vermont Vegetable and Berry Web Page; On-line fact sheets.

www.uvm.edu/vtbegandberry/factsheets/welcome.html)

Blueberry

Blueberry Herbicides

Gary C. Pavlis, *Rutgers University*

A grower asked a very good question this week regarding the use of Roundup. I've mentioned that July and August is an excellent time to eliminate problem weeds because now is the time when there is movement of plant substrates down to the roots. That means Roundup will move to the root and kill weeds more efficiently. The grower asked if the dosage of Roundup should be changed if mulch or woodchips are used in the blueberry field and if soil type would have an effect on efficacy or possible damage.

I'm sure this question was asked because an increase in organic matter due to mulching does effect herbicide efficacy. So does soil type. An increase in organic matter and/or an increase in soil weight (sandy -> clay) requires higher rates of pre-emergent herbicides. This is not so with Roundup because the material is sprayed directly on the weed. I talked to Monsanto, the maker of Roundup and they agree with the information above. A 2% solution, i.e. 22/3 oz. of Roundup, 41% a.i./gallon will kill most problem weeds.

Growers should be aware of problems observed in numerous fields concerning the use of Solicam. This herbicide has been used more and more recently with excellent results, however there may be a potential for problems.

I stated in an earlier newsletter that I had seen plant leaves with yellow-white veins, and stems that were yellow-white. These symptoms are definitely due to Solicam. Affected plants were usually in the poorest part of a block. Additionally, it should be noted that the symptoms probably are water related because extensive irrigation moved the chemical down into the root zone. This chemical remains in the soil for a longer time than most other herbicides used in blueberries and thus has the potential to build up. My feeling at present is to recommend that anyone using Solicam should consider rotating an alternate herbicide in the coming year. This is especially true if you saw the symptoms described. Remember that leaves with green veins and yellow interveinal areas are not due to a herbicide but most probably iron deficiency due to a high pH. (Source: *The Blueberry Bulletin*, Vol. 19, No. 18, August 14, 2003)

Brambles

Fall Bearing Red Raspberry Production in Maryland Tunnels

Bryan Butler and David Lankford, University of Maryland

Bramble Preamble

Along with Kathy Demchak at Penn State, we have been attempting to adapt primocane, fall bearing red

raspberry culture to tunnel culture in the Mid Atlantic States. See the following article regarding the general tunnel definition and experiences we have had using tunnels. We

have, until recently, been focusing on stretching the season into November and December. Our experience has been that in Carroll County (North Central MD), unheated houses have protected the fruit until mid November twice and into mid December once. We have used the MD/VA/NJ/WI cooperative breeding program super sized, late fall, selection: ND-f1 (avg. 6 gm) to extend the season. We are now experimenting with raspberry potting systems to increase the opportunity to use the tunnels for other crops in the summer, for example day neutral strawberries.

Recently, Harry Jan Swartz gave us a new early fall selection to try, QEG-f1 (see it on www.fiveacesbreeding.com). He said he thought it was early, it was. On the middle eastern shore, in unheated tunnel, potted plants were producing fruit in late May -- on primocanes. In Carroll County, the "fall crop started in early July. Fruit has been coming off at 1/2 to 3/4 ton/acre rates since at both locations (the plantings are small so this is a gross extrapolation). Fruit size outdoors at The Berry Farm in Matawan NJ, where production started the week of the 20th of July, has averaged 3.4 grams/fruit (its probably higher in the tunnels). Now, consider that temperatures have been very hot, in the 90's most days in July at all locations. Fruit quality at indoor and out has been excellent, especially flavor in the tunnels. QEG-f1 flavor has been the best of all selections tried, including Anne. Anne and Caroline are a 2-3 weeks later than QEG-f1 and Anne has good to excellent flavor and size as does its more productive seedling, OAY-f1 (both golden raspberries). Other selections are not as promising, but we are just now trying Caroline and Josephine, two other cultivars from the program. Although new fruiting canes are being produced by QEG-f1 to extend the fall crop season, we are trying pruning to extend the production of individual canes once they have stopped.

Yes, Tiny Tim, we'll have raspberries for Christmas, and "fall bearers" for the 4th of July!

The Basic High Tunnel

A high tunnel is a simple inexpensive structure similar to a greenhouse that provides a great deal of season extension versatility. High tunnels offer the opportunity for the grower to get a crop in early in the season, to stay in production later in the season, and, possibly to produce a crop such as greens through the winter. High tunnels also provide protection from rain and hail and can reduce disease and pest pressure. In Maryland, the seasonal weather patterns vary greatly from one year to the next and even with these unheated tunnels it is difficult to confirm exactly the best timing and choice of crops. However, with good planning, variety selection, and close management, this low cost system

can add another dimension to a vegetable or small fruit operation.

In a high tunnel system, the tunnel is large enough for the grower to plant, monitor and harvest the crop from inside the structure. The standard tunnel is 14 feet wide, 96 feet long, and 7 feet 6 inches tall at the center. Tunnels should be no wider than 30 feet, for good cross ventilation and reduction of snow accumulation on the roof in the winter. The Quonset frame consists of metal bows made by bending steel pipe or tubing and potential stresses caused by the weight of snow or heavy wind must be considered.

Metal pipes are driven into the ground approximately 2 feet deep and set every 4 feet of the high tunnel length, providing support for the Quonset frame. The bows fit into the ground pipes and are attached by bolts. The ends of the structure can be plastic or wood on a wood stud frame, but should be removable to allow access for tillage equipment and to increase ventilation in the summer. The structure is typically covered with a single layer of 6-mil polyethylene with provisions for rolling up the sidewalls. The poly is secured onto a batten board on each side of the high tunnel about 3.5 feet above the soil line. A vertical sidewall helps to keep rain out of the tunnel and when rolled up, provides ventilation. A pipe is then attached to the loose bottom end of the plastic along the length of the structure. A "T" handle on the end of the pipe is used to roll the plastic onto the pipe to open the sides. Cross ventilation is assisted by wind and has proven to be very efficient.

The key to successful use of the high tunnel is to spend the time laying out and preparing the site for construction. The better the tunnel is constructed, the easier the roll-up sides will work and the easier it will be to ventilate. During periods of cold weather the sides are lowered in the afternoon to hold heat and then raised in the morning to vent before temperatures inside get too high. The floor of the structure is covered with a layer of 6-mil black plastic. This helps to raise the temperature inside the house, control weeds, and prevent evaporation of soil moisture. Excess moisture will raise humidity in the tunnel and may lead to disease problems. Humidity of the air will increase at night as the air cools down. Venting in the morning will allow drying of any condensed water.

High tunnels can actually reduce the incidence of some diseases, particularly if trickle-irrigation tubing is used underneath the black plastic mulch. No water (rain or irrigation) gets onto the foliage to transport spores or otherwise encourage disease development.

Benefits for Production

The use of high tunnels for crop production creates a microclimate that provides the opportunity to increase quality. Since the plants are grown in a structure covered with one layer of plastic, the foliage, flowers, and fruit do not get wet. This can reduce the incidence of many diseases.

The soil does not become excessively wet since the only water supply to the plants in the tunnel is trickle irrigation. Proper water management will also help to reduce the incidence of certain root rotting diseases. The single layer of plastic only reduces light levels about 10% as compared to growing outside. Therefore photosynthesis is not reduced except in shaded parts of the plant canopy. Temperatures inside the tunnel are usually warmer than outside temperatures, providing the environment for season extension. The floor in the house will not freeze during most winters. This allows work to be done with soil amendment incorporation or the growing of a cover crop during the coldest part of the winter. Since the floor receives no rainfall, if irrigation is done carefully the area between the beds becomes too dry for weeds to germinate. The roll up sides that truly make the structure a high tunnel provide passive ventilation to cool the structure and to dry the foliage, again helping to reduce disease incidence. These sides can be lowered in the evening to hold in heat and can protect cut tender plants from blustery conditions. The structure will also provide a foundation for the use of plastic netting for support, shade cloth, and row covers for increased plant protection on cold nights.

Potential Problems

The use of high tunnels does require an increase in both the level and the amount of management required to grow the crop. The sides must be raised and lowered to regulate temperature and humidity. Plants must be irrigated regularly and fertigated as needed. Plants can be grown on raised beds covered with plastic or landscape fabric with the rows in between bare dirt, or the entire floor can be covered with landscape fabric.

Unless supplemental heat is provided the tunnel may not be able to provide adequate protection to the plants after the November/ December time frame depending on the year.

Disease problems may occur in the protected environment; management of the environment is critical. Ventilation to avoid high temperatures or high humidity is very important. Maryland’s unpredictable weather in spring and fall will make management intensive. Powdery Mildew is one disease that may be favored by the high tunnel climate and should be monitored for closely.

Insects will find the microclimate created for the plants to be favorable to their growth also. Without a doubt, integrated pest management (IPM) scouting must begin when the plants are set out. The use of beneficials may be the most practical way to deal with some insect and mite problems. However, season extenders can actually be used as physical barriers to keep insects off the plants. For example, screening the sides to exclude insects, and the use of floating row covers that have the edges secured will prevent many insects from reaching the crop.

Pollination for many crops such as raspberries, strawberries and tomatoes is provided to a large extent by the large amount of air movement from side to side. However, bumble bees or honeybees may be required to maximize production in the early and late part of the season when the sides are rolled up less often. Maryland researchers are currently examining the use of a honeybee hive placed at the end of a tunnel with the opposite end open during the day. The bees flying in and out will stop off on the various flowers on their way in and out each day, which should provide adequate pollination. Further research regarding the use of bees is being planned.... (Source: *The Bramble, Vol. 18, Issue 2, Summer 2002*)

Grape

Grape Insect Update

Rufus Isaacs, Michigan State University

The 2003 growing season is proving to be a slow year for some insects as well as for the vines. Insect development is driven by temperature, and we are seeing a relatively slow start to the second generation of grape berry moth compared to the recent warm years. This is expected by the relatively slow development of growing degree days (base 50) seen across the Fruit Belt this year (Table 1). We are currently 300 to 400 GDD slower this year than in the last two years.

Table 1. Growing degree days (base 50) for late July-early August, 2001-2003

	August 5, 2001	August 1, 2002	July 27, 2003
Benton Harbor	1823	1890	1418
Lawton	1805	1946	1527
Fennville	1676	1687	1217

In 2001 and 2002, moths of the second generation started egg laying in earnest in early August and continued all the way to harvest. This long period of egg laying made it difficult to maintain protection of clusters, and many of the larvae that hatched caused significant problems late in the season. Scouting of vineyards at high risk from grape berry moth in the

last week has shown clusters with larvae of all ages, and these are likely to mature at different times, which is likely to create an extended period of moth activity in the latter period of August this year.

The potential for continued activity of grape berry moth with a stretched out second generation means that growers should scout their vineyard borders and interiors using the scouting protocol described in the July 29, 2003 issue. Looking on the clusters is the only way to accurately determine how this pest is developing. Finding new “stings” would provide evidence of larvae hatching and moving into the fruit, and given the unpredictability of pest development in this slow year, weekly checking of hot-spots would be time well spent in the next month to keep track of whether infestation by this pest is increasing. There are already large differences in berry moth infestation from vineyard to vineyard, and the decision of whether to apply an insecticide should be made on a vineyard-by-vineyard basis.

If a decision is made to manage mid-season generations of grape berry moth with insecticide, applications need to be made in sufficient water to achieve thorough cluster coverage. Spraying every row, driving slow enough and targeting the fruit zone will help to cover the clusters sufficiently to allow contact between berry moth and the residues.

Vineyard monitoring is the only way to determine what is happening from site to site and the only way to evaluate whether a spray program is successful. Regular checking of clusters and leaves under the canopy can reveal the level of grape berry moth, leafhoppers and diseases present on the clusters and leaves.

Leafhoppers and Japanese beetles continue to be active in some vineyards, and these can be scouted at the same time as the berry moth. With the heavy crop and late growing season, maintaining a canopy of healthy leaves will be particularly important this year to ensure that the vine is able to ripen the crop and gather reserves for the next growing season. With 1 to 2 months until harvest of juice grapes, depending on the site and variety, maintaining a regular scouting program will help growers focus management in areas where it is needed to produce a clean, ripe crop. (*Source: Michigan State Fruit Advisory Team Alert, Vol. 18, No. 15, August 12, 2003*)

Start Thinking About Nutrition

Hans Walter-Peterson, Cornell University

I know there have been a lot of things on growers' minds this year between crop thinning, managing diseases, and rainfall of seemingly biblical proportions, but it's also getting to be the time to year to be thinking about your vineyard nutrient program, especially if you are going to be taking petiole samples.

The nutrient standards that we use in New York and Pennsylvania are based on petiole samples taken at around 70 days after bloom. This year, 70 days after bloom falls on September 3rd, based on our bloom date here at the Fredonia Lab of June 25th. Fortunately, nutrient levels are not rapidly changing in the vines at this point in the season, so you don't have to hit that exact date when collecting your samples - any time within the following 2 weeks or so should still be OK.

There are two main uses for petiole sampling. The first is to monitor nutrient levels in your vines on an ongoing basis. This allows you to provide optimum nutrition to the vine, and avoid spending money on excess materials that you don't need. It can also alert you to small deficiencies that can be easily corrected, before they become more problematic. If you haven't done any petiole sampling in a particular block or vineyard for more than 3-4 years, I would suggest taking samples there.

The second reason is to determine if an area that is exhibiting some symptoms of stress such as poor

growth, leaf discoloration or scorching are due to a nutritional deficiency. In this case, it is important that a sample be taken not only in the portion of the vineyard exhibiting the problem, but also in a nearby area (with the same variety, same soil type, same topography, etc.) that is not exhibiting the symptoms, in order for a comparison to be done. For example, with all of the rainfall we have had this year, there is plenty of soil moisture to enable the vines to take up potassium. This could possibly lead to some vineyards exhibiting signs of magnesium deficiency, due to the competition for uptake between those two nutrients by the vine (see picture). While visual symptoms can be very good clues sometimes, the presence of a deficiency and its extent should be confirmed by petiole testing.

Start giving some thought to your sampling plan this year, and look through your vineyards as you are finishing up your thinning work or putting on that next spray to look for any deficiency symptoms that may be showing up. If you have any questions or concerns about where or how to sample your vineyards, feel free to get in touch with me.

Sampling kit price increase:

On a related note, the prices for petiole sample kits from Cornell have been bumped up a bit due to the current budget problems. The new prices for the sample kits are:

Petiole sample without nitrogen - \$23.00/kit
Petiole sample with nitrogen - \$28.00/kit

We haven't received any notice of the price for soil samples going up at this point, so the price at this point is still \$15. (*Source: Lake Erie Regional Grape Program Crop Update, August 7, 2003*)

European Red Mite in Grapes

Alice Wise, Cornell University

ERM has exploded in some blocks. Control options are Kelthane, Vendex, Agrimek, JMS Stylet Oil, Danitol and Acramite. Check labels for specifics and for days to harvest. Kelthane has the reputation of being less efficacious either due to resistant mite populations or fast generation times (eggs are not killed). Vendex, a restricted use material, has worked for some growers and not others. Agrimek, also restricted use, is known (at least in apples) to work best on younger foliage. At this point in the season, the high rate would be necessary meaning it will be expensive. With excellent coverage, a 1.5% Stylet Oil will knock back but generally not completely control mites. Stylet Oil cannot be applied in hot weather nor on drought stressed vines due to the risk of phytotoxicity (see label for specifics on those plus incompatible materials). Also, some studies have linked late season Stylet Oil use to a slight reduction in Brix. One advantage to using Stylet Oil would be some late season powdery mildew control. Danitol, known better as a restricted use insecticide, also has European red mite on the label. Read the Danitol label thoroughly as EC formulations can be tricky. Tank mixes are not recommended due to the risk of phytotoxicity unless the compatible material is listed on the label. Finally, the newly labeled Acramite is best used on building populations, not raging infestations. It targets eggs and immatures and will not control adults. For this reason, it may take a week before mite populations plunge in a treated block. Like Agri-Mek, Acramite is expensive. (*Source: LI Fruit & Vegetable Update, No 22, August 15, 2003*)

General Information

Organic Farming Website Launched

The OrganicAgInfo Working Group, Organic Farm Research Foundation, June 2003

The Organic Farming Research Foundation has announced an exciting new resource on organic agriculture: <http://www.organicaginfo.org>. OrganicAgInfo.org is an on-line database of research reports, farmer-to-farmer information, outreach publications, and more. The database can be searched by keywords, region, crop or livestock type. All information on this website can be accessed free of charge. Best of all, if you have information on organic agriculture that you think would be useful to others, you can upload it to the site yourself. To add your (or your organization's) work to the web site, please click where it says "We encourage submissions to the site" on the home page. You will need to create a user name and password during your initial visit. Any information submitted on-line will be reviewed by their reviewers before being posted. This unique feature will allow the information in the database to grow through participation of the community it serves.

Those using the site also can rate and comment on information already posted on the site.

OrganicAgInfo.org, which is being hosted by North Carolina State University, was funded by a grant to the Scientific Congress on Organic Agricultural Research (SCOAR) and the Organic Agricultural Consortium (OAC) from the Initiative for Future Agriculture and Food Systems (IFAFS) through the USDA CSREES. If you have any questions or concerns, please contact Kathy Bielek of the Organic Agriculture Consortium at oac@osu.edu, or Brise Tencer of the Organic Farming Research Foundation at Brise@ofrf.org, (831) 426-6606.

We urge you to help expand the public knowledge base for organic farming systems by submitting your materials to OrganicAgInfo.org. We look forward to receiving your valuable contributions. (*Source: Vegetable Notes, Vol. 14, No. 13, August 14, 2003*)

Effect of Rain on Fungicide Wash-Off

J. W. Travis, Plant Pathologist,

If you are using protectant fungicides you need to consider the effect of rain on wash-off of the materials. The Strobilurin (Sovran, Flint) and sterol inhibitor (Nova, Procure, Rubigan) fungicides are absorbed into the leaf and fruit tissue after application (once the residue has dried) and are not affected by rain wash-off. The protectant (Dithane, Manzate, Penncozeb, Captan, Ziram, Thiram, Polyram) fungicide residues can be affected by rain.

A general rule-of-thumb for the effect of rain on washing-off protectant fungicides follows:

1. Less than one inch of rain since the last spray will not significantly affect residues.
2. One to two inches of rain will reduce the residue by one half. Reduce the number of days until the next spray by one half.
3. Over two inches of rain since the last spray will remove most of the spray residue. Renew the fungicide deposit as soon as possible.

This rule has been used for many years to provide growers with general guidance. Newer protectant fungicide materials may be less subject to wash-off, but information is limited. (Source: PennState, Fruit Times Newsletter Vol. 21, No.7)

Protect Your Hearing

Craig Hollingsworth, UMass Extension - Adapted from University of California, Davis

Farmworkers are often exposed to the loud noises of farm machinery for prolonged periods of time. This can eventually lead to hearing damage. In fact, hearing loss is considered a major occupational health issue for farmers. Prolonged exposure to any noise, from the intensity of a shotgun blast to a properly muffled tractor pulling a baler, can lead to permanent hearing loss.

To give some perspective on sounds and their noise levels, refer to the chart below. Noise that is 85 decibels or greater can affect your hearing if you work around it more than 8 hours a day.

Decibel (Noise) Level / Sound Source

15 /Threshold of hearing

50_60 / Normal conversation, background music

75_80 / Road traffic, vacuum cleaner

80_85 / Average interior of modern tractor cab

90+ / Danger level

90_100 /ATVs, tractors, combines with no soundproof cabs

115_120 / Chain saw, squealing pigs, loud rock music

Ironically, noise-induced hearing loss starts silently. By the time those around you notice you can't hear as well, the damage may be irreversible. There are two actions you can take to avoid damaging your hearing: (1) try to control the sound around you, and (2) reduce your exposure to sounds.

Controlling the sound environment -- Make sure that machine parts are well lubricated. Repair or replace worn, loose, or unbalanced chains, belts, and other parts. Replace faulty mufflers, using replacements that meet or exceed the manufacturer's recommendations. Whenever possible, use machines that have cabs and keep the cab windows closed.

Reducing exposure to sounds -- Earmuffs and earplugs block dangerous sounds but still allow you to hear. Whichever form of hearing protection you choose, look for a noise reduction rating of 25 or higher. Also, read the label and be sure to follow the directions for proper use.

How can you tell if the noise you are exposed to is hurting you? You may have a problem if you hear ringing or other noises in your ears, if you cannot hear high-pitched or soft sounds, or if you have difficulty hearing people when they talk to you. If you experience any of these problems, have your hearing tested.

Meetings

FRUIT EXPLORERS WORKSHOPS IN NH AUGUST 22

The North American Fruit Explorers will meet at the Holiday Inn, Manchester NH on Friday morning Aug. 22, followed by orchard tours Friday afternoon and Saturday. Workshop speakers are top notch and topics include: Apple and Pear Rootstocks, Stone Fruit Rootstocks, History of Apples in New England, Storing and Processing Fruit, Origin of the Highbush Blueberry, Uncommon Fruits, Espalier Pruning, Holistic Disease Management of Fruit Trees, Medicinal Uses of Fruit Plants, Breeding Grapes for Cold Climates, Strawberry Plasticulture for the Northern Grower and Growing Nuts in the North. For information contact Victoria Caron at vicaron@gis.net or go to www.nafex.org/

Sun. August 31 GROWING SUPER-HARDY GRAPES IN VERMONT

2-4pm Granstrom Farm, New Haven, VT

Come and learn about a series of new, hardy grape varieties perfect for the Vermont growing season with growers, Chris Granstrom and Ray Knutsen. They will talk about varieties available, planting, soil and site preparation, training, pruning, and trellising which will get you prepared to start your own grape production!

Directions: Take Rte. 7, 3 miles north from Middlebury. Turn right on River Rd (sign says “New Haven Mills”). Farmstand is on right side of River Rd, just 200 yards from Rt. 7.

Thurs. Sept. 18 CUT FLOWER PRODUCTION MANAGEMENT AND MARKETING

5-7pm Lilac Ridge Farm, West Brattleboro, VT

Tour Lilac Ridge Farm, winner of the 2002 Sustainable Farm of the Year Award, with grower Amanda Thurber. With 1 ? acres in organic cut flowers, Amandamarkets her flowers at farmers’ market, wholesale and for weddings. She will share her tips on marketing and cover the important aspects of growing such as production techniques, planting, bed layout, weed control and post-harvest handling.

Directions: Off Interstate 91, take Brattleboro exit 2. Take a Right off the ramp, which puts you on Rte. 9, traveling west. In 5 miles, take a Left off Greenleaf St. (There will be a 7-11 laundry mat on the corner). Follow for 2.5 miles. You’ll see a farmstand with a large painted mural on left. Go straight. That is Ames Hill Rd. 1/4 mile from the farmstand is Lilac Ridge Farm on the left. There is a large dairy barn, veggie fields and greenhouse out front. Please park in the farmyard.

Sun. October 5 SEED CLEANING

10am-5pm High Mowing Seeds, North Wolcott, VT

*Please pre-register with the NOFA office to ensure a spot for yourself at this workshop! This workshop is free to NOFA members. Come and learn how to improve your efficiency in the challenging joy of seed cleaning! Tour High Mowing Seeds and their new seed cleaning facility with grower, Tom Stearns. Tom will share his magical hand seed cleaning techniques and specialized seed cleaning equipment. This workshop is geared toward those interested in commercial seed production as opposed to home gardeners.

Directions: From the east: Take Rte. 15 thru Hardwick. Travel approximately 7 miles and turn right on North Wolcott Rd. (continue below*) From the west: take Rte. 15 thru Hyde Park. Travel 7 miles and take a left on North Wolcott Rd. *In 4 miles, you’ll see the North Wolcott general store. ? mile past the store, turn left. Immediately there will be a fork in the road, stay right. This is Brook Rd. .9 miles on left there is a sign for High Mowing Seeds. Take the driveway to the seed building which is about 300 yards down.

Massachusetts Berry Notes is a publication of the University of Massachusetts Extension Fruit Program which provides research based information on integrated management of soils, crops, pests and marketing on Massachusetts Farms. No product endorsements over like products are intended or implied.