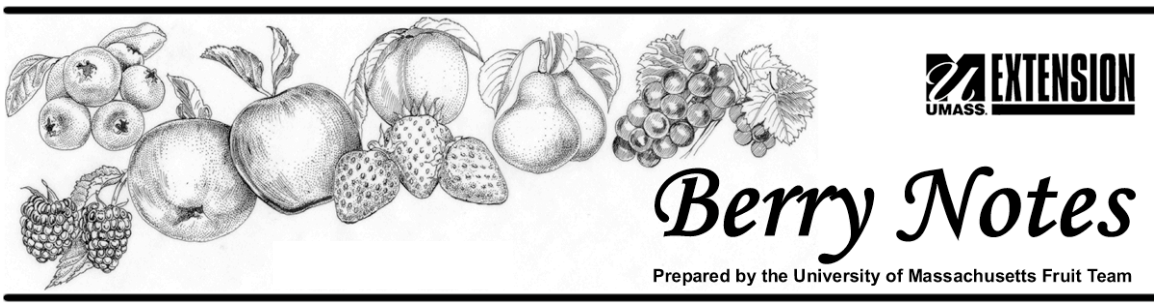


Berry Notes

Prepared by the University of Massachusetts Fruit Team

Aug. 26, 2003, Vol. 15, No. 16 Summer Issue #11
http://www.umass.edu/fruitadvisor/berrynotes/index.html

Volume 15-- 2003

Berry Notes is edited by Sonia Schloemann with articles written by other contributors with attribution; sources are cited. Publication is funded in part by the UMass Extension Agriculture and Landscape Program. Questions can be directed to Sonia Schloemann at 413-545-4347, sgs@umext.umass.edu. Please cite this source if reprinting information that originates here.

Crop Conditions:

Day Neutral Strawberries are fruiting now. Tarnished plant bug are found in high numbers and still need to be controlled to protect fruit forming now for picking in Sept. June bearing fields can be fertilized now to promote fruit bud formation for next year's yields. Weed management is still important now. Annual hill or plasticulture strawberries are planted in early September. **Highbush blueberry** harvest is winding down. This is a good time to reflect on what went well and what didn't with respect to pest and disease management, marketing, and other aspects of the production system. See below for articles looking back on the history of highbush blueberries and looking forward to new strategies and potential for organic production. **Fall raspberry** harvest is well underway. Botrytis gray mold may still be the most important challenge to fruit quality. See the last two issues of Berry Notes for more information on managing gray mold. Late leaf rust may also be found in significant amounts this year. More on this below. **Grape** clusters are at verasion (coloring) and ripening. Maintaining quality into the fall is critical. Next issue will provide information on harvest parameters. The next issue will resume the monthly distribution schedule for Berry Notes.

Environmental Data

STATE WEATHER SUMMARy For the Week Ending Sunday, August 24, 2003

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

	Sunday August 10, 2003					
	AIR TEMPERATURES				PRECIP.	
STATE	LO	HI	AVG	DFN	LO	HI
ME	39	93	68	+5	0.00	0.78
NH	24	92	68	+4	0.00	1.21
VT	32	94	68	+5	0.00	2.18
MA	42	93	71	+4	0.00	1.56
RI	47	90	73	+4	0.00	1.26
CT	45	92	72	+3	0.04	1.15

*(**Source**: New England Ag. Statistics Service, Weekly Crop Weather Report, Vol. 23, No. 18, Aug. 25, 2003)*

Strawberry

Fall Herbicide Applications for Strawberries

Bruce Bordelon, Purdue University

A number of herbicides can be used on strawberries during late summer and fall to prevent weed germination, kill emerged weeds, and provide residue control until the following spring. The key set of weeds you need to control during this period are fall germinating winter annuals such as chickweed and shepherds purse. You may also need to control wheat, oats, or rye that come from seed in the straw mulch that you apply for winter protection.

Devrinol (napropamide) is a preemergence herbicide. It can inhibit rooting of daughter plants so it should be applied after early forming daughter plants have rooted. Late forming (after late August) daughter plants do not contribute to yield and Devrinol can be applied before these plants root. Devrinol must be applied before winter annuals and small grains emerge. Devrinol provides excellent control of small grains and some winter annuals such as chickweed. Devrinol must be moved into the soil by cultivation or water after application.

Dacthal (DCPA) is a preemergent herbicide that can be used in new plantings or immediately after renovation. It provides good control of many grasses and some broadleafs such as purslane and lambsquarter. Like Devrinol, it must be applied before weeds emerge.

Sinbar (terbacil) is primarily a preemergent herbicide but it has some postemergence activity against small susceptible weeds. Fall applications of Sinbar should only be applied after the strawberries are completely dominant. If Sinbar is applied to actively growing strawberries, injury can occur. Cultivars differ in tolerance to Sinbar. In general, less vigorous cultivars have greater injury. Applications are most effective when applied to the soil and activated by rainfall or irrigation. Sinbar provides excellent control of many winter annual weeds. Fall applications of both Devrinol and Sinbar will persist to the following spring.

Poast (sethoxydim) is a postemergent, grass active herbicide. The grasses must be actively growing. Thus Poast should be applied in late summer or early fall before plants become dormant. Also make sure that you scout your fields to determine which grass weeds are present. Summer annual grasses, such as foxtails and crabgrass, will be killed by fall frosts, and do not require Poast applications for control. Poast is more effective against annual than perennial grasses. Poast can be used in the fall to suppress perennial grasses such as quackgrass; control early emerging small grains, and kill winter annual grasses such as wild oats and downy brome. Poast must be applied with a crop oil.

A systemic, postemergence broadleaf herbicide, **2,4-D**, can be applied when strawberries are dormant to control some winter annuals. 2,4-D provides good control of many mustards and shepherdspurse, but is not very effective against chickweed. The herbicide should be applied to actively growing weeds. Be careful of 2,4-D drift causing injury to non-target plants.

Gramoxone Extra (paraquat) can be applied as a directed spray between strawberry rows, using shields to prevent contact with strawberry plants. Gramoxone is a nonselective herbicide, so it will kill or severely injure strawberries it contacts. Gramoxone is a restricted use pesticide and is extremely toxic to animals including humans. It provides excellent control of annual grass and broadleaf weeds. Gramoxone does not extensively translocate in plants so it does not control perennial weeds. Weeds should be actively growing when Gramoxone is applied.

In conclusion there are a number of herbicide options that can be used on strawberries during the fall. Select herbicides that will control problem winter annuals and small grains. Herbicides such as Devrinol and Sinbar can provide residue weed control until spring. Adapted from an article in the Illinois Fruit and Vegetable News by John Masiunas (***Source**: Facts for Fancy Fruit - 02-11 August 7, 2002*)

Strawberry Plasticulture Offers Sweet Rewards

Melissa Karcher and Brad Bergefurd, Ohio State University

Excess rainfall this spring worked to the disadvantage of many Ohio farmers, with the exception of a few unique strawberry producers. Despite the rain, strawberry research plots at the Ohio State University Extension South Centers sat high and dry on a bed of plastic mulch, said Brad Bergefurd, an Ohio State Extension horticulture agent.

"Plasticulture production may be a good option for Ohio strawberry growers to increase their yields on small-acreage farms," Bergefurd said. Ohio State researchers have been working with North Carolina extension agents and specialists to test plasticulture methods for strawberries, which produce earlier and higher, more consistent yields for North Carolina growers.

"If we can get strawberries to harvest two to three weeks earlier, that will get farmers in the markets earlier and possibly increase their income," Bergefurd said. "The potential is there to double yields on a more consistent basis than with the matted row system."

The plasticulture method could increase the typical 5,000 to 6,000 pounds per acre to 10,000 to 12,000. At this point, the smallest yield for the research trials was 11,000 pounds per acre, Bergefurd said. "The work done so far looks really promising, but we only have one year under our belt and a long way to go," he said.

Traditionally, most Ohio-grown strawberries are bare-root plants planted in matted rows in the spring. In plasticulture, soil is mounded into 10-inch-high mounds and covered with a sheet of black, plastic mulch, Bergefurd said. Strawberry plant plugs are then planted in September through the mulch into the underlying mounds of soil.

Plants raised in plasticulture usually experience fewer disease problems from standing water and flooding problems because the water rests in between the mounds or rows, Bergefurd said. At the same time, the sheet of mulch conserves moisture, reduces weed growth by blocking out the sun and keeps the strawberries cleaner by keeping them out of the mud.

The black mulch also absorbs heat so that the soil stays warmer to increase plant growth, Bergefurd said. Heat absorption warms the soil earlier in the spring and later in the fall, benefiting yields. "More and more Ohio vegetables growers, especially fresh market, are using black plastic mulch because of its benefits," he said.

"The biggest drawback in plasticulture is the cost," Bergefurd said. "Over $10,000 an acre is invested in plasticulture strawberries before you ever pick your first strawberry. In addition, another $3,000 is needed to take the crop through harvest." These costs, figured by North Carolina agents and specialists, include every expense from a computer to Internet connection to a mulcher.

Piketon Researchers Cover Plasticulture Strawberry Methods

Brad Bergefurd, Ohio State University

Research at the Ohio State University South Centers is looking to improve Ohio's strawberry production through new plasticulture methods. Ohio State researchers are taking notes on North Carolina's plasticulture strawberries, which consistently produce higher yields and berries earlier in the season.

Plasticulture strawberries are planted in September as compared to the traditional March-to-May planting schedule followed by matted row growers. However, Ohio State researchers are still trying to find the "magical planting date" for plasticulture plants in September.

The "magical date" is important for planting because depending on the date planted, some plants set runners instead of budding, which results in bushy plants and little produce. Ohio's appropriate date for planting differs from North Carolina because of the differences in climate.

Researchers also compared varieties to find the most suitable for Ohio's climate. Chandler-*a desirable California variety*-was among those tested because it does not go dormant like most Ohio varieties, but grows into the winter months.

"Chandlers made it last winter, but that was not the best winter to put them to the test," Bergefurd said. "By doing different variety trials with western and eastern varieties, we hope to get good variety recommendations for interested farmers."

Along with planting dates and varieties, different types of floating row covers were tested to find the best protection from frost, freezing and winter conditions. The covers, which are made out of a spunbounded, plastic-type fiber, differ in weight and thickness, affecting the amount of sunlight received by the plants, Bergefurd said. Straw also was tested but did not fare well with this winter's warm weather. (***Source**: Ohio State University, Ohioline News, http://fusion.ag.ohio-state.edu/news/story.asp?storyid=468*)

The plasticulture strawberry growers in North Carolina replant every season to maintain high yields. Ohio matted row growers typically replant every three to four years, Bergefurd said. Despite the annual $10,000-per-acre investment, the higher, more consistent yields in plasticulture strawberries result in more income for growers than matted row acres.

Ohio State researchers are comparing notes with Maryland researchers on a two-year system that could eventually be an option. "If we could use a two-year system, it would stretch the $10,000 over a longer time period," he said.

Currently, only a few growers have made the switch to plasticulture, which is more commonly used in vegetable production, Bergefurd said. "I could see matted row growers planting an acre or two of plasticulture strawberries to kick off their season earlier and stretch their income a little longer."

"If this system takes off, we could start a whole other business," Bergefurd said. "The new system would hit greenhouses when they're not busy, allowing them to produce the strawberry plant plugs needed by the growers, so it will give them a whole new market. And earlier harvested strawberries would also allow growers to begin marketing Ohio strawberries as early as Mother's Day, which could produce an earlier income for farmers." (***Source**: Ohio State University, Ohioline News, http://fusion.ag.ohio-state.edu/news/story.asp?storyid=468*)

Blueberry

Elizabeth White

This article is an excerpt from the 1981 Unpublished Manuscript on the History of the Whitesbog Cranberry and Blueberry Plantation, Burlington County, New Jersey prepared for the New Jersey Conservation Foundation by William C. Bolger. The article has been slightly updated and modified for this out print prepared for the meeting of the National Organization of Women, Moorestown, New Jersey, March 12, 1997.

Elizabeth Coleman White, born 1871, was the oldest of the four daughters of Joseph J. And Mary A. (Fenwick) White of New Lisbon, NJ. At the age of 22 Elizabeth began working on her family's cranberry plantation at Whitesbog in the heart of the New Jersey Pine Barrens. Unlike her sisters, Elizabeth never married but spent the balance of her 83 years involved in many pursuits at Whitesbog and throughout the Pines region. One of these endeavors, the first successful attempt to cultivate blueberries, earned her a national reputation as a horticulturist and significantly modified the economy of the New Jersey Pine Barrens and other similar areas throughout the country.

Her first job at the bogs in 1893 was handing out tickets to the harvest crew in return for the boxes of cranberries that they picked by hand during the fall months. During the next 18 years, Elizabeth exhibited interest in finding ways to continue the improvement of the business at Whitesbog which was rapidly expanding into the largest cranberry operation in the state. During the first decade of the twentieth century, she collaborated with Dr. John B. Smith, a government entomologist, who studied and eliminated a type of katydid that was ruining the crops. Then, in 1911, Elizabeth read the U.S.D.A. publication entitled, "Experiments in Blueberry Culture," researched and written by Dr. Frederick V. Coville (Coville 1910). Realizing the potential value of the work, Elizabeth contacted Coville to offer him support in his work. (Hambidge 1927).

The blueberry, or *Vaccinium corymbosum* (the high bush variety) and *Vaccinium pennsylvanicum*, (the low bush variety), grows throughout the Pinelands in the same general environment that nurtures its cousin, the cranberry (*Vaccinium macrocarpus*). Like the cranberry, the blueberry thrives on the acid soil of this region. Blueberries ripen earlier than do cranberries. Their harvesting in July thus complements the cranberry harvest of the fall. Local residents traditionally set aside time in July to go to the "huckleberry" woods to have picnics and pick the fruit. (The term "huckleberry" as used in New Jersey referred both to the New England huckleberry of genus Gaylussacia as well as to the blueberry.) Many tried to cultivate the plants in their gardens but without success. In a taped interview in 1953, Elizabeth recalled her own experiences in this endeavor:

> [Father and I] had talked about the possibility of adding blueberries to our cranberry crop but we were not the fruit people to know that we had to have a uniform product. We knew the wild bushes were very, very different. We used to go around sampling these fruits and one would be too sour and one would be too flat, one would be too skinny and finally, we would come to one that father would call "peachy," but we didn't know how to propagate the plant. At that time, it was said among the farmers of New Jersey that blueberries could not be cultivated. (White 1953: personal communication)

In 1916, only five years after Elizabeth White's alliance with Dr. Coville, they had managed to cultivate and produce a blueberry crop for sale. Contributing to the effort were three parties: Coville, who offered the scientific knowledge and technique necessary to propagate and hybridize fruit; J.J. White, Inc., and particularly Elizabeth C. White, who offered financing and the Whitesbog infrastructure necessary to carry out experiments on a large scale; and, finally, the "Pineys" themselves. It was the contribution of the latter which is perhaps the most interesting. The Pineys were enlisted by Miss White to employ their woodsmen's skills as hunter-gatherers to search the Pines within a 20-mile radius of Whitesbog and locate the choicest blueberry shrubs. Elizabeth recalled the ability of these men in distinguishing the endless varieties of blueberry:

> ... As I was hunting wild blueberry bushes I learned that the old blueberry pickers that were going to the different swamps recognized a difference in the class of bushes in each swamp. For instance, in Iricks Swamp I was told that the majority of the berries were pear shaped and I was told that in Feather Bed Swamp the majority of the berries were very blue and flattened. (White 1953: personal communication).

Elizabeth devised a plan to tap this knowledge in order to locate the best possible plants in the area, in effect, to locate the one bush out of 10,000 having exceptionally fine characteristics for propagation. Pickers going into the woods for the wild berries were organized under either Jake Sooy or Alfred Stevenson and equipped with labels, bottles containing the preservative formalin, and an aluminum gauge with a 5/8-inch diameter hole. Only bushes having berries 5/8 inch or larger were sought. The effort was rewarded at $2.00 per bush plus the time required for relocating each plant and bringing it back (Hambidge 1927). In addition, the finders enjoyed the distinction of having the bushes which they found named after them. Thus it was that the last generation of the highly skilled woodsmen-gatherers gave their names to the first cultivated blueberries, as Miss White recalls:

> In getting the early bushes I tried to name every bush after the finder. And so I had the Adams bush found by Jim Adams, the Harding bush that was found by Ralph Harding, and the Dunphy bush that was found by Theodore Dunphy. When Sam Lemon found a bush I could not name it the Lemon bush so I called it the Sam. Finally, Rube Leek of Chatsworth found a bush. I did not know it was anything special at that time and I used the full name in my notes.... Coville called it the Rube which I thought was a poor name for an aristocratic bush. He finally suggested that we call it the Rubel. And the Rubel bush has really been the keystone of blueberry breeding. It is the one bush of which there are hundreds of acres planted just by divisions. It's still in cultivation [1953] and I still consider it a good bush. It also enters into the inheritance in two or three directions of all the accepted varieties of the present day. (White 1953: personal communication)

Acquiring the bushes was only the first step. The following account of their propagation was published in Success magazine in 1927:

> Next we cut up the bushes into pieces, sometimes as many as a hundred pieces to a bush. These were planted under glass in carefully prepared propagating beds. But for a long time we had very poor luck with propagation; only about ten per cent of the plants lived.... Finally we narrowed down to six varieties which seemed in every way suitable for commercial production, Rubel, Harding, Sam, Grover, Adams and Dunphy. (Hambidge 1927)

The first successful field plantings were made in 1912 at the present site of Elizabeth White's house, Suningive. The first plantings in which varieties were set in alternate rows for the purpose of cross-pollination were made just east of her home (Hambidge 1927).

The result of the blueberry research for Whitesbog was the production of a new crop, as well as the entirely new business of propagating and selling blueberry bushes. As plants were sold across the country, New Jersey bushes became established in many states.

> The plants or varieties that were selected here are grown now extensively in North Carolina and Michigan. To a great extent in Washington, Oregon, British Columbia and New England. To a lesser extent in a considerable number of other states, such as New York and Connecticut. (White 1953: personal communication)

The plants cultivated for production at Whitesbog yielded considerable profits even before the bushes were fully mature. In 1927 the 60-acre crop was estimated at 64,000 quarts, or 2,000 crates. Thus, figuring $10.00 a crate, the crop was worth $20,000 (Hambidge 1927). At its production peak, Whitesbog had 90 acres of blueberries under cultivation.

Elizabeth's interests in cultivation did not end with blueberries. Starting her own corporation apart from J.J. White, Inc., she began nurseries for cultivating the local holly tree. She was eventually recognized as one of four key horticulturists in the nation specializing in hollies. Other plants from areas similar to the Pine Barrens were also of interest. The Franklinia, a rare type of magnolia shrub found only in one part of Georgia and originally discovered by John Bartram, the eighteenth-century Philadelphia botanist, was introduced to Miss White by Coville, She propagated the Franklinia and sold it through her nursery.

In 1923 at Whitesbog, Elizabeth constructed her house, Suningive, next to Fenwick's Old Bog, the oldest cranberry bog on the farm that had been developed by her grandfather in the 1850's. Surrounding the house was a special garden of various native plants, Which Elizabeth designed to be "in harmony with its surroundings" (White 194 1 A: I 1). This garden seemed to symbolize Elizabeth's interests in the distinct and rich natural flora of the Pines as well as in using the environment harmoniously.

In addition to her interests in cultivation, Elizabeth, like her father, was involved in the marketing of Whitesbog's products. In 1927 she helped organize the New Jersey Blueberry Cooperative , Association. She was also the first woman member of the American Cranberry Association and became its first woman to receive the New Jersey Department of Agriculture's citation (White 1953: personal communication).

Miss White was also acquainted with Elizabeth Kite and the sociological research she had conducted in the Pine Barrens. This work was widely publicized and misrepresented as describing all the Pines people, leading to the popularly held belief in urban areas that all Pines residents were backward, genetically in-bred and defective. Elizabeth White supported the Kite research and became involved in raising money to build the work-training school at Four Mile near New Lisbon. As for the popular degradation of the Pines people, Elizabeth declared in 1914, "I am a piney myself " (Elizabeth White 1914: 2). (***Source**: Whitesbog Preservation Trust Website: http://www.whitesbog.org/*)

Transition to Organic Highbush Blueberry Production

Bill Sciarappa, Gary Pavlis, Nicholi Vorsa, Rutgers University

Four significant developments have occurred that amplify opportunity for growers to successfully grow organic highbush blueberry and to increase or transition acreage.

First, there is the recent USDA national organic standardization that defines organic production practices and crop labels that creates clarity and evens competition.

Second, we have the continued increase of small fruit and vegetable sales related to nutritional and human health reasons that strongly contribute in creating today's $40,000,000 highbush blueberry market in NJ. Future agribusiness gains are promising through the "organic certification" market segment. This organic designation appeals to today's consumer as an even higher market value and creates a separate market segment above the fresh market mainstream.

Third, new tools are becoming available to organic growers that reduce the risk from pest problems such as the recent organic registration of Spinosad – now known as Entrust in the organic market.

Finally, the Rutgers Blueberry Research Working group has made considerable progress in refining standard IPM practices and in helping develop new tools and holistic approaches for organic production systems. Our "Work in Progress" is establishing alternative approaches to some current agricultural practices in soil building, fertility, cultural approaches and pest management.

Perhaps 2/3's of what conventional growers do horticulturally is directly applicable to organic production. Some examples include selection for resistant varieties, pruning for canopy ventilation to reduce disease incidence, adding organic amendments in building soil such as peat and humus, mulching for weed control and water conservation, raised mounds, rogueing of infected plants and the use of natural plant protection products like Bt, Pyrethrum and Spinosad which are safe to natural enemies. In contrast to other fruits that have been introduced from other countries, the blueberry is one of the few native American fruits that has relatively good natural resistance to diseases and insects as well as an inherent vigor because it has been domesticated for less than 100 years. Thus, there is this strong historic baseline for succeeding in the return to organic production although some key risk factors remain to be solved. To achieve this comprehensive vision of an integrated organic production system, specific obstacles are being addressed by a team of collaborating specialists supported by RCE administrators Dr. Nick Vorsa of the Phil Marucci Blueberry and Cranberry Research Center and Jack Rabin of the NJ Agricultural Experiment Station as follows:

Varietal Selection – Dr. Mark Ehlenfeldt comparative work for the USDA breeding program suggests using early maturing varieties to escape later season blueberry maggot attack like Weymouth, Bluetta and Earlyblue. Mark continues research with new and better varieties resistant to pathogens that are essential in initiating any organic enterprise.

Fertility – Dr. Gary Pavlis has demonstrated the importance of pH in maximizing plant health through the enhanced availability and uptake of nutrients as the ammonium nitrogen form. Gary has also demonstrated the water conservation benefits of trickle irrigation. Dr. Joe Heckman points to a listing of organic based fertilizers to include nitrogen, phosphorus and potassium sources such as rock phosphate, greensand, bone meal, fish meal, and composted manures to restore depleted soils. Check out recent and previous editions of the Rutgers Extension newsletter - Blueberry Bulletin.

Mulching – Dr. Barbara Rogers is researching the impacts of organically approved mulches for soil benefits and weed control. Barbara's investigations with Dr. Uta Krogmann include the recycling of composted cranberry fruit and leaves, municipal leaf blends with available manures, wood chips and plastic mulch.

IPM Scouting – Our state fruit IPM specialist Dean Polk has provided timely pest population data that is GIS positioned within a blueberry field to allow spot spraying as needed based upon economic thresholds. Dean's extensive scouting program utilizes direct pest assessment, pheromone trapping systems and colored sticky boards for decision making.

Entomological Research – Dr. Sridhar Polavarapu has emphasized pruning of old cane to reduce scale infestation, clean cultivation to suppress cranberry weevil and plum curculio and using OMRI approved insecticides as Bacillus thuringiensis (Bt), azadirachtin (neem plant extract), rotenone, pyrethrum and spinosad. Spinosad should handle the difficult to control caterpillar complex and other economically important insect pests. Sridhar's research on baited toxicant sphere attractant traps for blueberry maggot and pheromone trapping approaches for oriental beetle are quite promising for commercialization.

Phytopathology Research – Dr. Peter Oudemans has stressed the importance of sanitation in the field to minimize pathogen entry and spread, use of certified free nursery stock, rogueing of virally diseased plants, pruning of bacterial or fungal infected stems and the promotion of rapid drying of leaf and fruit surfaces. OMRI certified fungicides as oxidate are part of his efficacy evaluation program as have been the natural minerals sulfur, lime and copper and bordeau mixture, kaolin clay and urea. Mechanical cultivation and new biological controls appear promising for Mummyberry suppression in the soil.

Weed Control – Dr. Brad Majek provides weed species identification and essential information as to the life cycle of these annual, biennial or perennial grass and broadleaf weeds. Brad's advice helps plan for a weed control program, which includes trying various mulching practices and treatments.

Commercial Organic Grower – John Marchese, Emery's Berry Farm. John's progressive approaches to planting, weed control and fertility from an organic underpinning have been extremely helpful in establishing commercial utility. His comparative use of the Weed Badger rotary hoe, flaming, cover cropping, mulching and alleyway establishment and other methods are pointing out some ways for economically solving problems specific to large-scale organic production.

Commercial Conventional Grower – Bobby Galletta, Atlantic Blueberry. Bobby and his family continue to share their legendary experiences and extensive knowledge in blueberry production in efforts to expand the industry and maintain profitability.

Certification & OMRI Information – Karen Anderson - Erich Bremer – NOFA-NJ. The Northeast Organic Farming Association of NJ has been actively involved in certifying acreage for organic production and in explaining to growers the approved practices and materials that are essential to maintaining compliance. Through NOFA, growers can connect with other growers as to successful farming practices and can gather current information on plant protection materials and fertilizers through OMRI: Organic Materials Resource Inventory. Call 609-737-6848.

Final Comments – Currently, about 7,500 acres of blueberries are grown in New Jersey with less than 2% (approximately 110 acres) produced organically. Considerable undeveloped potential exists in Pennsylvania as well. The author believes that the agribusiness situation is that of an advanced market ahead of agricultural research; demand ahead of supply. The price of a flat of organic blueberries has ranged from $18 to $28 over the last three years while conventional production prices have generally ranged between $8 to $14 per flat. Any northeastern growers interested in transitioning to organic blueberries may feel free to contact the author for advice and connection to the team of leading experts referred to in this article. 732-431-7260 or e-mail sciarappa@aesop.rutgers.edu. (***Source**: Vegetable & Small Fruit Gazette, Vol. 7, No. 5*)

Brambles

Late Leaf Rust of Raspberry

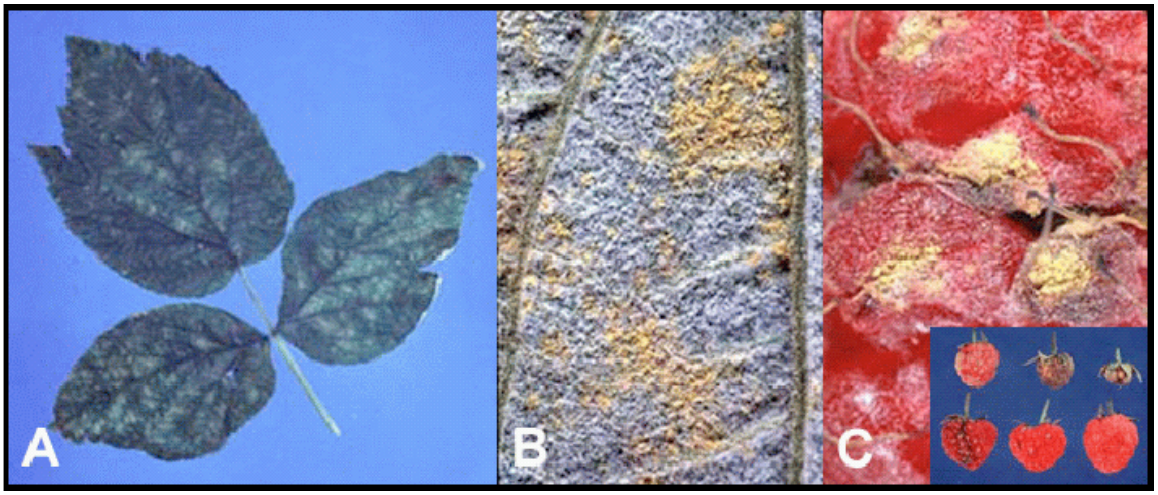
Michael A. Ellis and Omer Erincik, Ohio Agricultual Research and Development Center

Late leaf rust is a potentially serious disease of red raspberries. Late leaf rust does not affect black raspberries or blackberries. The disease can affect leaves, canes, petioles, and fruit. Economic losses occur from fruit infection and premature defoliation. Because it usually appears late in the season, and only occasionally in a severe form, some consider it to be a minor disease. However, losses due to fruit infection have reached 30% in some commercial red raspberry plantings in Ohio. The wild red raspberry, *Rubus strigosus*, in the eastern United States is very susceptible to this disease. A number of cultivated varieties originating from this species also are highly susceptible. While late leaf rust occurs throughout the northern half of the United States and southern Canada, it is more common east of the

Mississippi River. In recent years, its occurrence has increased in the northern areas of the Midwest, and it has caused significant losses.

On mature leaves, small chlorotic, or yellow, areas initially form on the upper surface of infected leaves (Figure 1A). These spots may eventually turn brown before leaves die in the fall. Unless the disease is severe, foliar infections may be difficult to see. Small pustules filled with yellow to orange powdery spores (not waxy like the spores of orange rust) are formed on the underside of infected leaves (Figure 1B). Badly infected leaves may drop prematurely, and in years when the disease is severe, canes may be bare by September. Flower calyces, petioles, and fruit at all stages of development may be attacked.

On fruit, pustules develop on individual drupelets, producing yellow a masses of spores, which make the berries unattractive and unacceptable for fresh market sales (Figure 1C). Infections may also occur on leaf petioles and canes.



Disease Development

Late leaf rust is caused by the fungus *Pucciniastrum americanum*. Unlike the fungus that causes orange rust (a common disease on black raspberry and blackberry), the late leaf rust fungus is *not* systemic. The fungus is heteroecious, meaning that it attacks two different hosts at different stages of its life cycle. The rust fungus produces two types of spores (urediniospores and teliospores) only on red raspberries. The alternate host for the rust is white spruce (*Picea americanum*), on which another type of spore (aeciospore) is produced.

Aeciospores are released from infected white spruce in mid_June to early July and are capable of infecting raspberry during this period. In early July, urediniospores (powdery_yellow to orange spores) start to form on the underside of infected raspberry leaves or flower parts. These urediniospores can continue to cause infections on raspberry leaves and fruit throughout the growing season.

Another type of spore (teliospore) develops on infected leaves in the fall and serves as the overwintering form of the fungus. In the following year, the teliospores germinate and form yet another type of spore (basidiospore), which infects white spruce needles during rainy periods from mid_May to early June.

Several recent studies indicate that the fungus apparently does not need the aeciospore stage to survive on raspberries, because the disease is found year after year in regions remote from any spruce trees. It is probable that the fungus overwinters on infected raspberry canes as urediniospores or teliospores that serve as the source of primary inoculum for new infections the following season.

Disease Management

1. *Use healthy, disease_free planting stock*. One of the best ways to avoid the disease is to start the planting with healthy planting stock. Since the fungus can be carried in or on planting material, inspection of the planting materials before planting is recommended.

2. *Site selection*. Select a site with good air movement and full sun exposure. Never plant raspberries in shaded areas. Good air movement and sunlight help the foliage and fruit to dry off quickly after a rain or heavy dew. Rapid drying will reduce the incidence of fruit and leaf diseases in general.

3. *Canopy management*. Keep row width between 1 and 2 feet in order to encourage air movement and faster drying. Cane density should not exceed three or four canes per square foot. Always select large, healthy canes when thinning. Control timing and the amount of nitrogen fertilizer to prevent excessive growth.

4. *Control weeds*. Good weed control within and between the rows is essential. Weeds in the planting prevent air circulation and increase drying time, resulting in wet fruit and foliage for longer periods.

5. *Sanitation*. Remove and destroy infected and old fruited canes. Previously infected plant parts serve as a source of inoculum for the disease. Removing and destroying old fruited and infected primocanes greatly reduces the amount of disease inoculum in the planting.

6. *Eradication of alternative and wild hosts*. As previously mentioned, the late leaf rust fungus requires white spruce trees as an alternate host to complete its full life cycle. Eradication of white spruce trees interrupts the life cycle of the fungus and should aid in disease control. Eradication of nearby wild red raspberries that serve as a reservoir for disease is also beneficial for control of the disease.

7. *Use of disease resistance*. Black raspberries and blackberries are immune to the disease. Unfortunately, there are no commonly grown red raspberry varieties that are resistant to the disease.

8. *Fungicide use*. Fungicides that are effective for control of late leaf rust are currently available and are commonly used in commercial plantings.

[***Editor's note:*** Nova 40W is the most effective fungicide labeled against rust. Where there is a history of rust and the alternative host is present (see #6), applications could begin in mid_June to early July when the aeciospores are beginning to infect raspberry and continue through harvest if symptoms are apparent on leaves. Applications after mid-July target the second spore stage (i.e., the uredinospores). Thus, applications after mid-July should be limited to periods when conditions favor disease development in plantings where the disease is present. However, more research is needed to learn how to manage this disease when urediniospores serve as the source of inoculum.] (***Source****: Ohio State University Fact Sheet SeriesHYG_3210_02 (http://ohioline.osu.edu/ hyg_fact/3000/index.html by way of New York Berry News, Volume 02, Number 08, August 16, 2003*).

The Healthy Attributes of Red Raspberries

David Ropa, Consultant to the Washington Red Raspberry Commission

The red raspberry (Rubus idaeus) is indigenous to Asia Minor and North America. Today, the leading producing regions for red raspberries in the U.S. are Washington, Oregon and California. However, Washington accounts for nearly 60% of the U.S. production of red raspberries, at nearly 70,000,000 pounds per year.

The world market for red raspberries has grown tremendously in recent years, primarily because of the numerous healthful compounds that are present in red raspberries. The following is a brief overview of the compounds found in red raspberries and the nutraceutical functions to which they contribute.

Ellagic Acid

Ellagic acid is a phenolic compound that has become a known as a potent anti-carcinogenic/anti-mutagenic compound. It also has anti-bacterial and antiviral properties. Ellagic acid itself is not thought to be naturally present in plants. It is the ellagitannins that are present in red raspberries which are converted naturally to ellagic acid. The concentration of ellagic acid is highest in the Meeker variety of red raspberries, at 8.40 ug/g of dry weight.

Ellagic acid acts as a scavenger to “bind” cancer-causing chemicals, making them inactive. It inhibits the ability of other chemicals to cause mutations in bacteria. In addition, ellagic acid from red raspberries prevents binding of carcinogens to DNA, and reduces the incidence of cancer in cultured human cells exposed to carcinogens.

Antioxidants

Anthocyanins, which act as pigment to give berries their deep color, are a major component of the phenolic/flavonoid class. Recent research shows that anthocyanins act as antioxidants, providing many potential healthy benefits. Researchers are currently linking anthocyanin activity to improving vision, controlling diabetes, improving circulation, preventing cancer, and retarding the effects of aging, particularly loss of memory and motor skills. The anthocyanins in red raspberries, present at a level of 20-65 mg/100g, help reduce the risk of heart disease.

Recently published research investigated the activity of the anthocyanins found in red raspberries. Researchers analyzed the ability of the fruit to inhibit cyclooxygenase and act as antioxidants to destroy free radicals. Researchers discovered that the antioxidant activity of anthocyanins from red raspberries was superior to vitamin E at a test concentration of 125

ug/ml. The COX inhibitory activities of anthocyanins from red raspberries were comparable to those of ibuprofen and naproxen at 10 uM concentrations.

Salicylic Acid

Salicylic acid is found in red raspberries and is suspected of having the same protective effect against heart disease as aspirin. Aspirin is a closely related compound known to pharmacists as salicylic acid acetate. The therapeutic successes of small daily doses of aspirin to inhibit atherosclerosis suggest the possibility that salicylic acid consumed in foods may provide a similar benefit. A 100-gram serving (about 3/4 cup) of red raspberries contains around 5 milligrams of salicylic acid.

Quercetin is a flavonol that works as an anti-carcinogen and an antioxidant. Quercetin has also been shown to reduce the release of histamine and may be effective against allergies. The quercetin content of red raspberries is 12mg/100g of juice.

Catechins

Catechins are flavonols that support the antioxidant defense system. Catechins found in red raspberries may contribute to cancer prevention. The catechins content found in red raspberries is 0.83 milligrams per 100 grams. (***Source**: Ohio Berry Symposium Proceedings, Nov. 12-13, 2002*).

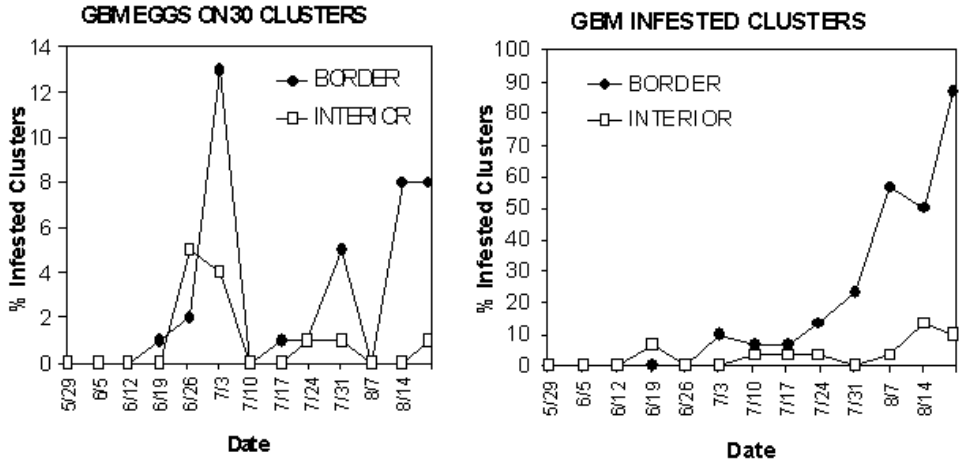
Grape

Scout Now to Detect Continued Berry Moth Activity

Rufus Isaacs and Paul Jenkins, Michigan State University

As many Southwest Michigan grape growers start to focus on the coming harvest, it is tempting to shift focus away from crop protection while the crop ripens. However, recent monitoring in vineyards in Southwest Michigan indicates that grape berry moth is still increasing in some sites. From our scouting, this seems to be happening most at sites where this pest was a problem last year and where the vineyard is next to woods. In these vineyards that would be classified as being at intermediate or high risk from grape berry moth, we are seeing increased captures of moths in traps and continued egglaying on clusters. Stung berries are also visible. These signs should indicate that grape berry moth has the potential to continue egglaying as it did in 2001 and 2002. Infestation will not be high in every vineyard, and it's important to get out and take a close look at the clusters (perhaps using your pocket scouting guide as a reference) to see whether your vineyard is infested.

The pest pressure is most evident at the edge of vineyards, with the number of infested clusters dropping off as you get further into the vineyard. Growers should scout now and in the coming weeks to check their medium- and high-risk sites to see whether additional management of grape berry moth is required this season. Our scouting numbers shown in the graphs accompanying this article are from one representative vineyard in Lawton taken throughout the 2003 season, though this situation can be found across Southwest Michigan in sites with high pest pressure. The graphs show that egglaying from the first generation occurred around bloom and is now increasing again at the vineyard borders. This follows patterns in 2001 and 2002 when egglaying increased around the time of veraison and continued into September. The level of infested clusters has reached over 90 percent at some vineyard borders, while remaining low inside the vineyard. In situations such as this, border sprays should be considered to target insecticides only in the areas where the pest is laying eggs.



Figures 1 and 2. Grape berry moth eggs and infested clusters found from weekly scouting of grape clusters, 2003

Weekly checking of areas with a history of grape berry moth will be cheap insurance against the sudden detection of a problem area just before harvest. The current growing degree day accumulations that we have seen this season does not suggest a strong third generation, but there is a long time until harvest and depending on the weather in the next six weeks, there could still be some egglaying and larvae late in the season. Remaining vigilant against late-season pest increases will pay dividends in the form of only having to spend money on vineyards that require berry moth control and by knowing that the risk of late-season surprises will be lower. (***Source**: Michigan Fruit Crop Advisory Team Alert, Vol. 18, No. 16, August 26, 2003*)

Botrytis Bunch Rot Control in Grapes

Annemiek Schilder, Michigan State University

This year may prove a challenging one for control of Botrytis bunch rot in grapes, which is caused by the fungus Botrytis cinerea. This fungus may also blight blossoms, leaves, and shoots. The bunch rot phase of the disease can cause severe economic losses, particularly on tight-clustered French hybrid and Vitis vinifera cultivars. Tight clusters don't dry off as well as open clusters, providing a conducive environment for fungal growth. The pressure within tight clusters can also result in split berries. While ripe berries are subject to direct attack, damaged berries and berries previously infected by powdery mildew are more susceptible to invasion by Botrytis. Direct infection of the berry causes a rot, while infection of the berry stem can cause berries to wither. Infection can spread rapidly throughout the cluster and gray masses of spores are often visible. Insect damage, specifically by the grape berry moth, will also predispose the berries to infection by Botrytis and sour rot organisms (bacteria and yeasts). Sour rot can be distinguished from Botrytis bunch rot by the vinegary odor emanating from rotting berries.

Botrytis cinerea overwinters in debris on the vineyard floor or on the vine. Although the fungus produces spores throughout the season, spore numbers increase after veraison. Production of spores and subsequent infection are favored by prolonged periods of wetness or high humidity and moderate temperatures (60-75ºF). When wet conditions prevail during the bloom period, withering flower parts may become infected by the fungus and lead to latent infections of the young berries. Such infections become active as the berries ripen.

Control of Botrytis is best accomplished through a combination of cultural and chemical methods. Practices that promote air circulation and reduce humidity include site selection to avoid fog pockets and heavily wooded areas, avoiding excessive nitrogen, and pruning and selective leaf removal around the clusters. Well-timed sprays of an effective fungicide (Rovral, Vangard, or Elevate) are also important if weather is relatively wet between bunch closing and harvest. Veraison is usually a critical time for a spray and further sprays can be applied thereafter depending on the weather conditions. In most years, fungicide sprays during bloom are not likely to significantly enhance control of Botrytis bunch rot, unless the weather is particularly wet during bloom. Direct the spray towards the fruit and use a minimum of 100 gal/A to ensure thorough coverage. Read fungicide labels for use directions and restrictions. (***Source**: Michigan Fruit Crop Advisory Team Alert, Vol. 18, No. 16, August 26, 2003*)

Leaf Roll Virus in Grapes

Alice Wise, Cornell University

This is the time of year that leaf roll infection can be seen in vineyards. The decision to keep infected vines or not should be based on vine performance. If vine size and fruit quality are satisfactory, then keep the vines. If yields are down significantly and fruit quality is poor, remove the vines as soon as practical. In either case, infected vines should be tagged so that they can either be followed in the coming year or removed in the fall.

Recently, transmission of leaf roll virus from vine to vine has been shown to occur via several species of mealybugs.1 Prior to these studies done in CA, there was no known vector of leaf roll. While mealybugs are not usually considered a significant pest species in local vineyards, they can be found (note that the local mealybug species have not been determined, hence they may or may not be potential vectors). The infrequent occurrence of leaf roll virus on LI, and the lack of a disease "epidemic", suggests that the risk of transmission via mealybugs is not high. However, spread does remain a theoretical possibility, and we should keep our eyes out for any indications of its occurrence. In years past, leaf roll was much more common. Now, thanks to the widespread use of certified vines (see below) as well as vineyard manager vigilance, it is much less common.

When removing vines, take out as much of the root system as possible. The bacteria causing crown gall can persist on pieces of root left behind in the soil. It raises the possibility that the various virus strains that cause leaf roll could persist in root pieces as well.

White varieties infected with leaf roll have pale green leaves, stunted shoots and leaves that curl or roll downward. Red varieties are far more conspicuous due to the interveinal reddening that develops; major veins often remain green. The downward curling does not always occur in reds. In the research vineyard, leaf roll virus has been expressed in one set of Cab vines as very blotchy and dark red in color with little actual leaf rolling. In a new selection of Cab, a two year old, the vine is very stunted, pale and displays interveinal reddening but again no downward cupping.

The varying expression of leaf roll virus is linked to the particular strain causing symptoms, the variety, the quantity of virus in the vine, the general vine health and the environment in which the vine is grown. One private lab tests for five different strains of the virus.

Certified plant material is the best strategy against the viral diseases. Certification means the vine is true to type and free from known viruses; it is done primarily by a foundation in California called Foundation Plant Materials Service (FPMS). FPMS conducts virus testing, brings in ampelographers to assure a variety's true-to-typeness and, if a vine passes all the hurdles, maintains the selection in a mother block. This is a great service to the grape and other fruit industries in the U.S. Nursery operators in CA have the opportunity to plant and maintain an official increase block; budwood for this block comes from FPMS. They can then sell budwood to other nurserymen including those in the eastern U.S. This is a very boiled down description of the system. While certification programs have contributed much toward cleaning up infected plant material, they are not infallible. Unlike Vitis vinifera, many grape species used for breeding rootstocks show no symptoms when they are infected with leafroll virus, hence rootstocks can easily serve as symptomless carriers of this disease. Clean, certified budwood grafted onto such a rootstock will produce an infected vine, so it is important that propagators protect against this source as well.

If interested in having vines tested, contact Alice for laboratory information. Testing is much more advanced now than in years past. Labs now have antibodies to at least five strains of the virus. Also, note that the success of a test depends on the time of year the sample is taken (higher virus counts later in the season). Reference: Golino, D.A, Sim, S.T., Gill, R., Rowhani, A. California mealybugs can spread grapevine leafroll disease. (***Source**: LI Fruit & Vegetable Update, No. 23, August 22, 2003*)

Currants and Gooseberries

Research on Controlled Atmosphere Storage for Ribes

Steven McKay, Cornell Cooperative Extension of Columbia County

Gooseberries and currants (Ribes) have been rapidly earning their place on fruit farms as a crop for diversification. Cultivars have been developed that are quite disease resistant, and in some cases completely eliminate the need for sprays. As such, the crops are relatively low_input, and an alternative that can produce an additional profitable crop. Prices this year have ranged from twenty to twenty_eight dollars wholesale price to the grower. With this kind of incentive, growers are increasing plantings. Our recommendations are to plant only to satisfy confirmed market demand [see article below]. At the same time, over_planting usually does take place among eager farmers.

In light of the potential for over_planting, and a need to spread the marketing season over more months, we have begun to research the alternatives available using CA (controlled atmosphere) storage. I have been able to hold gooseberries and red currants at 32 F for as long as three months with no special provisions for CA. The Dutch have been holding red currants for as long as eight months using traditional CA techniques. This is a special advantage of Ribes, since such long storage periods are not achieved with more common berries such as strawberries and raspberries. CA storage could become a very useful tool for Ribes growers and marketers if, 1. there is an excess of supply at harvest time, or 2. if marketers would like to hold a portion of the crop until a holiday season when prices are high, and berries are in demand.

The method currently used for CA of red currants involves palletizing quart containers of fruit, covering the fruit with a huge plastic bag, (sealed at the bottom by placing the pallet in a tray of water), and connecting the bag to a manifold system which regulates gas concentrations (lowering oxygen, and raising carbon dioxide concentrations). These pallets are placed in a 32 F room, and can be taken out, repacked and sold according to market demand. Gooseberries can be held similarly, but they have a ripening sequence different from red currants which requires that they be placed in storage at a "green mature" stage, or the stage just as natural ripening on the bush would take place. Red currants, on the other hand can be placed in storage when ripe.

The research being done this year is a cooperative project between local Northeast farmers, Dutch farmers, and Cornell Cooperative Extension. The research has been sponsored by Northeast SARE through a Partnership Grant for Agricultural Professionals, which has the purpose of supporting agriculture that is profitable, environmentally sound, and beneficial to the community. The grant is being used for two main projects. One is to find the ideal stage to harvest gooseberries for optimal storage life. The other is to improve methods of storage of red currants and explore an economical method of storage using self_conditioning reuseable plastic CA bags. The system to regulate the atmosphere in the Dutch storage chambers is costly, and involves a complicated computerized system to regulate gases. We are hoping to avoid this investment by replacing the system with simple plastic bags that fit over each box of fruit.

Research is taking place this year and next, and final results of the project are expected in 2005. If you would like more information on this project or on Ribes in general, please contact me (Steve McKay) at 518_828_3346. (***Source**: New York Berry News, Volume 02, Number 08, August 16, 2003*)

General Information

Growing for Profit - Managing Crop Mix According to the Market

Wen-fei Uva, Cornell University

There are no magic answers for running a profitable horticulture business. Everything you do in business must start with a "marketing philosophy" to MEET YOUR CUSTOMERS' NEEDS, not merely to sell products. Making cropping decisions plays an important role in carrying out this marketing philosophy, and you should not be simply growing what you grew last year. Your crop mix is the primary vehicle by which to transform your marketing opportunity into customer loyalty, growth in sales and, most importantly, profits. However, the process can be complex. There are more varieties than ever for growers to choose from. Today, growers can find more than 30 varieties of tomatoes in seed catalogs and choose from more than 80 poinsettia varieties in many shades and patterns. The key is to keep focus on the opportunities, select new products and be willing to change your product lines to develop the sales and profits these opportunities offer.

Knowing the Trends

Knowing industry trends is the first step to identifying opportunities in the market. The market for horticultural products is becoming more diversified. Increasingly consumers are buying more of their basics from discount merchandisers for the competitive prices. Nonetheless, more consumers are also willing to pay higher prices for desired services and product features _ quality, uniqueness, convenience, locally grown, organic, etc. For instance, while competition from mass marketers is intense, sales of more expensive options, such as bigger perennials, potted annuals, antique or unusual fruit and vegetable varieties, or branded products, are stronger than ever with independent garden centers and farm markets. Knowing market trends will help you segment your customer base and decide how to satisfy their needs and wants.

Develop a Process

What does all this mean to growers when selecting crops to grow for the coming season? Selling customers what they want to buy is an easier task than selling customers what you grow. Your production plan, what you plant, when you grow, and how you merchandise must be a process of identifying: (1) who your customers are (discount chains, independent retailers, or consumers); (2) your customers' needs; (3) an intuitive understanding of what your customers might need and buy if it were available to them; plus (4) which of the identified crops you can grow. This is an entirely different marketing philosophy than growing what you like or what you prefer to grow and trying to sell them.

The Product Portfolio

Your product mix is like an investment portfolio. As you study your investments and the return they bring, you often transfer one investment to another, or you increase the amount of investments by adding new investments to manage the portfolio for optimum return. The same principles apply to managing your product mix. One solution to guarantee profitability is to know your costs and be able to set the selling price to generate a profit. However, today's growers are often faced with the reverse in some market sectors. The large retail chain buyers often set a price they'll pay, and growers must figure out how to produce the product at that price for a profit.

Moreover, growers often need to carry a broad product line including some unprofitable products to remain an attractive supplier to big chain buyers or to become a destination site for retail shoppers. Therefore, if a low_margin product that is important to the product mix, it needs to be evaluated to see if it can be purchased less expensively than you can grow it.

If so, that might be a good option for you. It is important to know the profit margin of each product and to optimize your return by selecting a good balance between low_margin or unprofitable but highly desirable crops and high_margin crops to satisfy your customers' needs. You should not carry the product mix if you cannot sell it at a reasonable margin. Remember, sales generating zero margins cannot offer you any profit no matter how much more you sell.

Knowing the Competition

Finally, it is becoming more important to keep tabs on your competition to stay ahead. If you offer only what your competitor offers, there is little reason for a customer to deal with you unless you have the lowest price. In today's economy, positioning your business as the low_price leader is a vulnerable competitive position. As you plan your crop mix for the coming season, remember that you can't carry everything for everybody. Knowing what your target market wants and providing a mix of crops and services that will differentiate you from your competitors will ensure that you are growing for profit. (***Source****: Smart Marketing, August 2003 by way of New York Berry News, Volume 02, Number 08, August 16, 2003*)

Meetings

Massachusetts Association of Roadside Stands and Pick-Your-Own Fall Twilight Meetings

September Twilight Meeting

Randall's Farm

Wednesday, September 10, 2003

Flower, vegetable and ice cream stand is a new building that is 10,000 square feet and open year-round. Karen Randall is on the Flower Growers' Board. Family owned, diversified, friendly atmosphere, locally grown, quality products, knowledgeable staff. Tina Smith from the UMass Floriculture Team will be speaking about Pest Management in Retail Greenhouses for an hour including discussion. 1 contact hour has been requested for pesticide re-certification for private category 26. Contact Tina Smith (413) 545-5306 or Karen Randall (413) 589-7071 if there are any questions.

Directions: Travel Route 90 (Mass. Pike) to Exit 7 (Ludlow Exit). Turn right off ramp onto Route 21 North. Travel approximately 2 miles, Randall's Farm and Garden Center are on the left.

October Twilight Meeting

Cider Hill Farm

Thursday, October 23, 2003 4:00pm

Glenn and Karen Cook are the owners of Cider Hill Farm. Their farm provides orchard tours, hayrides, cider pressing, animals and pick your own. There will be a talk on the variety of apples that are grown on the farm and about storage of pesticides. One pesticide credit will be given foe attending the meeting. Jon Clements Umass Extension Tree Fruit Specialist will be on hand. For questions or more information call Jon Clements at (413) 323-4208 or email clements@umext.umass.edu

For directions visit www.ciderhill.com

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.