



The Berry Basket

Newsletter for Missouri Small Fruit and Vegetable Growers

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From the Editors

by Marilyn Odneal

John Avery records the weather information at Mountain Grove for the National Weather Service. He informed me this morning (January 23) that we reached our low temperature of the season so far at -2 degrees Fahrenheit. Hopefully that is as low as it will go. To best weather this cold spell, I suggest that you fix a mug of hot cocoa, curl up in a comfy chair, wrap yourself in a nice, soft blanket, read this newsletter, and make plans for the coming growing season.

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The Fate of Nitrogen

by Ben Fuqua

Nitrogen (N) is required in relatively large amounts by highbush blueberry plants for growth and production. Applications of 60 to 120 pounds of actual N per acre are routinely recommended for blueberry plantings in Missouri. Plant roots absorb nitrogen as either the ammonium (NH_4^+) or nitrate (NO_3^-) form. While NH_4^+ -nitrogen has long been reported to be the preferred form of nitrogen for blueberries, fertilizers containing both NH_4^+ and NO_3^- forms have been used in several plantings in Missouri without any adverse affects. The key to good nitrogen utilization by blueberry plants is to provide adequate, but not excessive, amounts of nitrogen to plants when needed for berry formation, fruit ripening, bud set, and new cane growth.

Nitrogen has many functions within the plant, such as the formation of amino acids, proteins, nucleic acids, and several enzymes. Nitrogen influences carbohydrate utilization by the plant and is also an integral part of the chlorophyll molecule. Leaf nitrogen contents of 1.5-2.1% N appear to be adequate for mature, producing blueberry plants in Missouri.

Blueberry plants lacking adequate nitrogen are usually stunted, yellow (chlorotic) in color, with very thin, weak new growth. Nitrogen deficiencies in blueberries can occur at any time during the growing season, with chlorosis first appearing on older leaves. As the deficiency becomes more severe, the entire plant may become chlorotic. Leaves may eventually turn a reddish color, and then brown if the deficiency is not corrected.

Nitrogen Sources: The ultimate source of all nitrogen used by plants is the atmosphere (78% N₂ gas). The N₂ gas is not useable directly by plants and must be changed to plant available nitrogen by one of the following processes: 1) conversion by symbiotic microorganisms in nodules of plant roots (primarily legumes), 2) conversion by nonsymbiotic or free-living soil microbes, 3) direct fixation from the atmosphere by electrical (lightening) discharge, or 4) fixation by chemical reactions in the manufacture of chemical fertilizers.

While blueberry plants undoubtedly benefit from small amounts of nitrogen converted by nonsymbiotic soil organisms and the direct fixation of nitrogen during electrical storms, the majority of atmosphere nitrogen used for growth and berry production comes via chemical (synthetic) fertilizers.

The other major source of nitrogen for plants is soil organic matter. Most of the nitrogen in soil organic matter (and in organic fertilizers) is not useable directly by plants and must also be changed to an available form for plant use by a biochemical process called mineralization.

Mineralization: Mineralization is the conversion of organic forms of nutrients to inorganic forms. For nitrogen, this means proteins, amino acids, amino sugars, and other complex nitrogenous compounds in plant and animal residues must be changed to NH₄⁺-nitrogen. Mineralization involves the heterotrophic (requires organic carbon (C) for energy) microorganisms in the soil and therefore, the rate of mineralization (decomposition) is greatly influenced by factors that affect microbial activity, such as soil pH, moisture, temperature, type of organic residues, etc. The NH₄⁺-nitrogen released during mineralization is subject to several fates, including: 1) absorbed **directly by plant roots**, 2) **nitrified to NO₃⁻ - nitrogen** in aerated soils by another group of soil microbes, 3) used by heterotrophic bacteria and fungi as a nitrogen source for increasing their populations, 4) held as an exchangeable nutrient by clays, 5) fixed in certain clay structures, or 6) converted to N₂ gas in excessively wet soils and lost back to the atmosphere. Note that two of the “end-products” of organic matter decomposition are NH₄⁺ and

NO₃⁻, the forms of nitrogen absorbed by plant roots.

Chemical Fertilizers: Several excellent chemical or synthetic fertilizers are available to supply nitrogen to blueberry plants. 1) Ammonium sulfate contains 20-21% N. When ammonium sulfate dissolves, NH₄⁺-nitrogen is formed. The NH₄⁺ from ammonium sulfate behaves in the same manner as NH₄⁺ from organic matter decomposition, i.e. the NH₄⁺ can be absorbed directly by plant root, nitrified to NO₃⁻, etc. Ammonium sulfate also contains 24% S and, therefore supplies another macronutrient for plant growth. Ammonium sulfate is an acid-forming fertilizer and is generally recommended for blueberry plants when the soil is above the recommended pH 5.5. Large quantities (40 to 50 # bags) of ammonium sulfate have been difficult to find in Missouri, but several agricultural chemical distributors, particularly horticulture firms, are now stocking ammonium sulfate fertilizers. 2) Ammonium nitrate fertilizer (33-34% N) is a popular fertilizer that contains nitrogen in both the NH₄⁺ and NO₃⁻ forms. Ammonium nitrate is a popular nitrogen fertilizer and is usually available from most fertilizer distributors, including bulk blending plants. Ammonium nitrate is very hygroscopic (absorbs water) and will solidify or “cake” if not properly stored. Care must also be taken to keep ammonium nitrate away from many petroleum products as the fertilizer can catch fire and/or explode. 3) Urea is an ammonia-based fertilizer containing 45-46%N. Urea (NH₂CO NH₂) is converted to NH₄⁺ in the soil, which reacts like other NH₄⁺-ions resulting from mineralization or other chemical reactions. The initial reaction of urea in the soil is basic and the soil pH will increase. In subsequent weeks, much of the NH₄⁺ will be nitrified to NO₃⁻-nitrogen by soil microbes. Nitrification occurs in well-aerated soils and produces hydrogen ions, which causes an acid soil reaction. Because of the initial basic reaction following urea applications, urea is recommended for fertilizing blueberry plants in soils with an acid (< 4.5) pH. However, if given enough time, urea applications will cause a reduction in soil pH. Urea is also volatile and should not be applied to soil or

mulched surfaces during humid, hot weather as much of the nitrogen from the fertilizer will be lost.

4) Nitrogen solutions are excellent fertilizers for blueberries as they can be applied through the irrigation system (fertigation). Nitrogen solutions are generally not as acid-forming as ammonium sulfate or urea. Many nitrogen solutions, however, contain “salts” and must be carefully applied to avoid salt buildup and plugging of the irrigation lines.

Organic Fertilizers: Some growers prefer to use organic materials to fertilize blueberries. Although organic nitrogen fertilizers are more difficult to find than chemical fertilizers, they are available from several distributors in Missouri. Feather meal (11-13% N), blood meal (13-15% N), and cottonseed and soybean meal (6-7% N) are excellent organic nitrogen sources. Because of their lower nitrogen content (compared to chemical sources), a greater amount of the fertilizer must be applied to obtain the same amount of nitrogen for the blueberry plant. Organic fertilizers must be mineralized, just like soil organic matter, and therefore should be applied 4-6 weeks prior to the time the plant actually needs the nutrient. Organic nitrogen fertilizers generally contain many other nutrients, thereby providing plants with an array of both macro- and micronutrients for growth and berry production. Another advantage of organic fertilizers is that some of the added nutrients will last more than one growing season, due to the slow decomposition of the organic materials.

Summary: Highbush blueberries require a large amount of nitrogen for good plant growth and berry production. Most of the nitrogen utilized by blueberry plants comes from either the mineralization of soil organic matter and organic fertilizers or from chemical fertilizer applications. All three sources eventually produce the same forms of nitrogen, NH_4^+ and NO_3^- , the two forms of nitrogen useable by blueberry plants.



Elderberry Resources

by Suzi Teghtmeyer

Elderberries, although somewhat bland to eat fresh, have always been a quite a treat when rendered into jam, syrup, or wine. But the native American species, *Sambucus canadensis* (Caprifoliaceae, or honeysuckle family), has never reached the mainstream market as have blueberries and strawberries. People who want to enjoy this bush fruit can grow their own or harvest wild fruit. I have selected a number of websites that will help you learn about the fruit and cultivation methods. [See also, Thomas, Andy (Spring 1999). In Search of a Champion Elderberry. *The Berry Basket*, 2 (1), p.5.

Elderberries for Home Gardens

<http://www.gov.on.ca/OMAFRA/english/crops/facts/95-005.htm>

This factsheet was produced by the Ministry of Food and Ag. in Ontario. It addresses the multiple aspects of cultivating elderberries, from planting and propagation, to site preparation and pest control. It is a solid introduction to the species.

Elderberries - Black (American) Elderberry - *Sambucus canadensis*, Red (Scarlet) Elderberry - *S. pubens*

<http://www.wvu.edu/~agexten/wildlife/ntvplts/eldrber.htm>

This site from West Virginia is a botanical key to *S. canadensis* and *S. pubens*. Leaves, twigs, flowers, and form are described for those wanting to go wild elderberry hunting and take cuttings, berries, or photographs.

Elderberries [Chapter 11]

<http://ssfuit.cas.psu.edu/chapter11/chapter11a.htm>

This multiple page site is from the *Pennsylvania Small Fruit Production Guide*, produced by the Penn State Cooperative Extension. Topics covered include Cultivar Selection, Planting and Fertilization, Pruning, Harvest, Insect Pests, Disease Descriptions, and Pest Management. Although many pages long, the pages are quick to load and the information is easy to glean.

Understory Plants for Riparian Forest Buffers

<http://www.agnr.umd.edu/MCE/Publications/Publication.cfm?ID=15>

This site is included for those who may want to use the elderberry not just for fruit, but for a windscreen or buffer shrub. The table, "Riparian Understory Shrubs", describes the wildlife value and flood tolerance of *Sambucus*.

Training and Pruning Small Fruits (Except grapes)

<http://www.hort.wisc.edu/cran/hort375/Small%20fruit%20training.html>

This site is part of a pomology class taught at the University of Wisconsin. Pruning elderberry is addressed in section II [2]. Bush Fruits. Pruning principles and procedures are described in short sentences, as a student note-taker would write. A concise site, but can prove useful.

Spring Weed Control

by John Avery

Winter is here and pruning should be underway. It is now time to consider your spring/summer weed control program. This is the time of the year to evaluate your past weed problems and plan for the coming year. Some weeds which cause problems in the spring and early summer actually germinate in late summer to early fall. These weeds need to be dealt with during late winter if they have not been dealt with already. They can compete with fruit plants early in the growing season, tying up nutrients and moisture that may be needed for the crop at that time. Other weeds germinate early in the spring and compete with the fruit crop all summer. They can be especially bothersome in years when there is an extended dry period. Hopefully, we have used the fall period first to identify our summer weed problems from the previous year. Second, we need to determine what methods to use for best control in the crop. And last, we must decide on the timing - when do we need to control the weeds that are present in our fruit planting?

There are basically two types of weeds that we have to deal with on a yearly basis. The first type we dealt with in the last issue of the *The Berry Basket* is the winter weeds that generally germinate in late summer, grow fall to early spring, and then produce a late spring/early summer seed crop. The second is the summer weeds that generally germinate in spring, grow during the summer and produce a seed crop from mid-summer through fall. This article deals with summer weeds. Examples of these weeds are the annual grasses like crabgrass, panicums, and foxtail; and broadleaves like pigweed, ragweed, and chickweed. Also in this group are the summer perennials like horsetail, bindweed, plantain, and milkweed.

Unlike the winter weeds, the summer weeds can be very competitive with our fruit crop since they grow all summer. They can take moisture and nutrients, needed by the crop plant to grow new wood, mature a crop of fruit and set new fruit buds for the following year. It is very important to control weeds during the summer and particularly the early fall period. The health of our fruit planting

can be negatively affected by the growth of many summer weeds throughout the summer and early fall.

In review, there are three primary methods of controlling weeds. The first is mechanical removal of the weeds. The old trustworthy hand hoe works for a few weeds or a small planting. Other devices include tractor mounted weed hoes or weed badgers. A newer concept is the use of fire to burn weeds down. These devices use a torch with a portable propane gas tank pulled behind the tractor.

The second method is the use of post emergent herbicides. There are two basic types of post emergent herbicides to use. The contact type kills any green tissue the herbicide contacts. The other type are systemic herbicides which are translocated within the plant and will kill the tops as well as the root system. Within the systemic group are herbicides that will kill only plants within the grass family (fluazifop, sethoxydim, or clethodim) and others that will kill only plants within the broadleaf family (2,4-D). 2,4-D is labeled for use in strawberries, grapes, apple, pear, and stone fruits. There are two systemic herbicides, glyphosate and sulfosate, which will kill both grasses and broadleaf weeds. The use of any particular herbicide will depend on the type of weeds that are present. Emerging seedlings of annual or perennial weeds are best controlled by the use of contact herbicides while the presence of mature perennial weeds may require the use of a systemic herbicide. A note of caution here is systemic herbicides will do damage to the fruit crop if any green tissue is contacted. This can be severe when the herbicide is sprayed late in the fall. The systemic herbicides should be used primarily in the winter after the fruit crop has gone dormant and leaves are no longer present. Spot treating early in the season can accomplish some control of perennial broadleaf weeds but care must be exercised to not let the systemic herbicide contact new leaves or stems or the fruit crop. For some crops like the brambles, systemic herbicides should never be used because canes can take up the herbicide even when dormant. For grassy weed problems, use grass killing systemic herbicides early in the season. Be sure to check labels for the crop and days to harvest before using any herbicide.

A third method of weed control in crops is the use of pre-emergent herbicides. These herbicides work by creating a chemical barrier to the germinating weed seedling. As the seedling grows through the barrier and the seedling takes up the chemical it will be killed. There are a number of pre-emergent herbicides on the market. Each has its strengths and weaknesses for the weed species it will control. It is very important to identify the species that are causing problems in the fruit planting and then study the labels of the herbicides available for the crop to determine which herbicide to use. Over time the composition of weed species causing trouble will change and the use of herbicide(s) will need to change too. As a general rule it is best to rotate the use of pre-emergent herbicides on an annual basis. This will help to control more of the weeds without letting one or two build up large populations. Pre-emergent herbicides are a good choice for giving season long control.

Late February to early March is a good time for a herbicide control program. Cool season weeds will not grow all winter and may even appear to be dead during the cold days of December and January but will re-appear and grow during late winter. A systemic herbicide can be applied in a tank mix with your spring/summer pre-emergent herbicide program. As stated in the last issue, where the predominant weed species are annuals such as henbit or annual bluegrass, you may want to leave them until spring to help with winter soil erosion in the planting, especially where the crop is planted on a slope. Keep in mind that these annuals need to be allowed to mature a seed crop every second or third year if you wish to use them to your benefit. When more competitive weeds predominate then control needs to take place before the fruit crops begin to break buds in the spring so that systemic herbicides can be used to good advantage.

Use the winter season to develop a good weed control program for the next growing season. Identify your weed problems, update your spray guides, study herbicide labels, and develop a spray program that will help reduce competition with your fruit crop.

Blueberry Insects

by *Dan Waldstein*

Although insect pests are generally much less of a problem in blueberries than in other fruit crops, occasionally they can cause significant damage. Because insect pest populations in blueberries are often minimal or absent, conducting a thorough monitoring and scouting program is essential to eliminating unnecessary and costly insecticide applications.

The immature forms (larvae) of cherry fruitworm, cranberry fruitworm, plum curculio, and blueberry maggot, burrow into and cause damage to blueberry fruits.

Cherry Fruitworm

The adults of this species are dark gray moths that fly at dusk. Female adults lay eggs on the underside of blueberry leaves during bloom. Larvae that emerge from eggs become orange to pink in color and turn red after a few days of feeding on berries. Adults can be monitored with pheromone baited wing or delta traps. Monitoring of adults should be coupled with scouting of berries for larvae. If necessary, insecticide applications should be made 7-10 days after the first moths are caught in traps or at petal fall for materials with any bee poisoning potential and 10 days later (1st cover) or shortly after the peak trap catch. Imidan, Guthion, Asana, Diazinon, Sevin, Lannate, or SpinTor can be used to control cherry fruitworm, but should not be applied until after bloom because of toxicity to bees and other pollinators. Confirm can be applied during bloom to control cherry fruitworm because it is not hazardous to bees.

Cranberry Fruitworm

The adults of this species are grayish brown moths that fly at night. Female adults lay eggs on the inside rim of the calyx. Larvae are greenish with some brownish-red coloration on the top of the body. Once larvae enter the berry and begin feeding they gradually replace the berry's contents with sawdust-like excrement (frass) and typically join adjacent berries with silk threads. Monitoring, scouting, and insecticide applications to manage

cranberry fruitworm are similar to cherry fruitworm, except the first application is usually not made until 7-10 days after petal fall.

Plum Curculio

The adults of this species are snout beetles and are primarily active in warmer temperatures. Plum curculios are especially a problem in early varieties and mulched fields. Female adults lay eggs in berries leaving behind a crescent or D-shaped scar. Larvae are white with a brown head and are legless. Adults can be monitored at dawn and dusk by putting a white sheet beneath blueberry plants and shaking the bushes to cause the adults to drop on the sheet. Berries should be examined early in the season for evidence of D-shaped scars. If necessary, insecticide applications can be made 10 and 20 days after petal fall. Imidan or Guthion will control plum curculio and are targeted against the adults before they lay eggs.

Blueberry Maggot

Although the blueberry maggot is primarily considered a pest in the northern U.S. and southern Canada, it has also been found in high numbers in Georgia and Alabama. The adult is approximately the size of a house fly but has black bands on its wings. It is similar in appearance and closely related to the apple maggot. Peak emergence for adults occurs shortly after the first fruits begin to ripen. Eggs are laid 7 to 10 days after adults emerge. Adults lay a single egg in a berry, the larvae mature and drop out of the fruit onto the soil below to pupate. Larvae are white, have an indistinct white head with a pair of small black mouth hooks, and are legless. Fruit infested by blueberry maggots will become soft and leaky. Adults can be monitored with sticky spheres or yellow sticky boards baited with ammonia. Traps should be placed at a density of two to four traps per acre. Insecticide applications are recommended if there are more than three adults per trap per week. Imidan, Guthion, Asana, Malathion, Diazinon, Sevin, or Lannate can be applied to control blueberry maggot.

Condensed Information on Biology and Control of Four Internal Feeders of Blueberry Fruits.						
Common Name	Scientific Name	Adult	Immature	Monitoring	Control *	Timing**
Cherry Fruitworm	<i>Grapholita packardii</i>	Dusk flying, dark gray moth	Orange/pink/red, 3 pairs of legs	Pheromone- baited wing or delta traps	1-9	PF, 1 st Based on trap catches
Cranberry Fruitworm	<i>Acrobasis vaccini</i>	Night flying, gray brown moth	Mostly green, 3 pairs of legs, frass/silk on fruit	Pheromone- baited wing or delta traps	1-9	1 st , 2 nd Based on trap catches
Plum Curculio	<i>Conotrachelus nenuphar</i>	Snout beetle	White, legless, brown head	White sheet and bush shaking	1, 2, 4	1 st , 2 nd
Blueberry Maggot	<i>Rhagoletis mendax</i>	Fly with dark wing bands	White, legless, indistinct white head	Sticky spheres or yellow sticky boards with ammonia	1-7	After > 3 flies/trap/wk

* 1 = Imidan 2 = Guthion 3 = Asana 4 = Malathion 5 = Diazinon 6 = Sevin 7 = Lannate 8 = SpinTor 9 = Confirm

** PF = petal fall (Confirm at bloom), 1st = 7-10 days after petal fall, 2nd = 10 days after 1st

References:

Gough, R. E. 1994. The Highbush Blueberry and Its Management. Food Products Press. Binghamton, NY. Pp. 176-178, 257.

Marucci, P. E. 1966. Insects and their control. In Eck, P., and N. F. Childers [Eds.]. Blueberry Culture. Rutgers University Press. New Brunswick, NJ.

R. C. Funt, M. A. Ellis, and C. Welty. 1997. Midwest Small Fruit Pest Management Handbook. The Ohio State University Extension Bulletin 861. Pp. 93-95.

Warmund, M., B. Barrett, P. Byers, J. Moore, M. Kaps, and L. Kovacs. 2002. Midwest commercial small fruit and grape spray guide. University of Missouri, University Extension, Columbia, MO, Southwest Missouri State University, Mountain Grove, Missouri, MX-377. 58 pp.

Below are a few websites and links containing more information and some pictures of blueberry insect pests.

http://ohioline.osu.edu/b861/b861_48.html

<http://www.msue.msu.edu/vanburen/e-1863.htm>

<http://www.ces.ncsu.edu/depts/ent/notes/Fruits/fruitb2.html>

<http://www.ento.vt.edu/Fruitfiles/BlueberryMaggot.html>

http://www.hort.purdue.edu/hort/ext/sfg/2003_pdfs/MO/IFBC-MO.pdf

http://ipmwww.ncsu.edu/small_fruit/cherworm.html

<http://www.msue.msu.edu/fruit/bbfrtwm.pdf>

<http://ssfruit.cas.psu.edu/chapter9/chapter9j.htm>

Update Spray Guides Now by Marilyn Odneal

It's time again for both commercial and home fruit growers to update their spray guide information. This information is revised annually and is available from local University Extension Offices as well as on the web. Please note that the label affixed to the pesticide you are using is the law. Spray guides and information printed from the web are guidelines. You must possess the actual label from the pesticide you are using and must apply the pesticide strictly according to label directions.

The list of Missouri pesticide use recommendations available from local university extension offices follows. The first entry is the spray guide for home fruit growers. The following entries are guides for commercial fruit producers. All of these guides are listed on our publications webpage at <http://mtngrv.smsu.edu/publications.htm>

Fruit Spray Schedules for the Homeowner

<http://muextension.missouri.edu/xplor/agguides/hort/g06010.htm>

Midwest Tree Fruit Pest Management Handbook

<http://ohioline.osu.edu/b861/index.html>

2003 Midwest Commercial Tree Fruit Spray Guide

<http://www.extension.iastate.edu/Publications/PM1282.pdf>

Midwest Small Fruit Pest Management Handbook

<http://ohioline.osu.edu/b861/index.html>

2003 Midwest Commercial Small Fruit Spray Guide

<http://www.hort.purdue.edu/hort/ext/sfg/>

2003 Missouri Commercial Grape Pest Control Guide

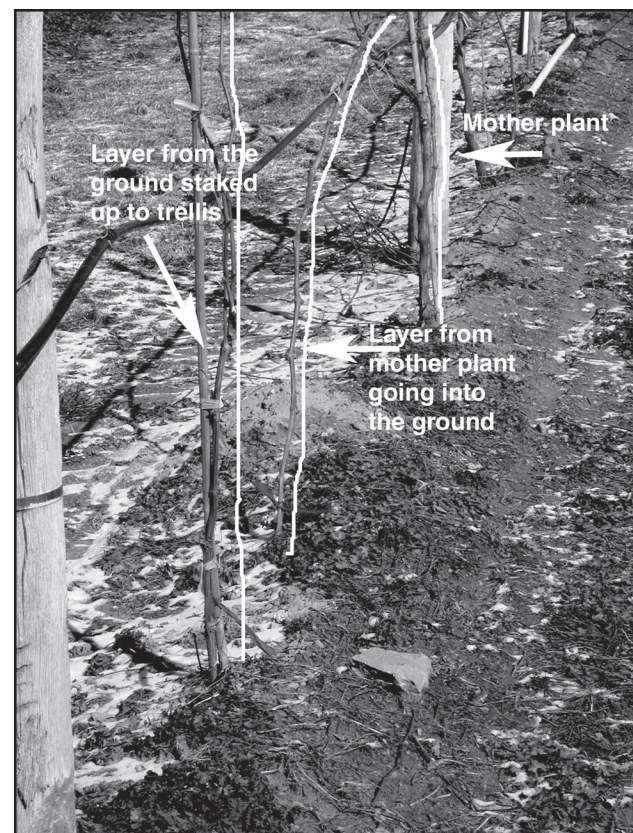
<http://mtngrv.smsu.edu/Publications.htm>

Midwinter Vineyard Care: Propagation

by Susanne Howard

If you have pruned your vineyard, the major winter chore is done. If you pruned before the onset of really cold weather, in December or early January, you should have left some extra buds on the canes so the loss of a few buds to the cold nights still ahead doesn't lead to over pruning. What else can be done in late winter or very early spring?

One answer is propagation through layering and by cuttings. Layering is a method of propagation that is mostly used to 'fill in' empty spaces where one or two vines adjacent to other vines are missing in a vineyard. To layer a vine, you need to select a long, vigorous cane from the adjacent vine and remember to not remove this cane during pruning. Flagging this cane helps. The selected cane needs to be long enough to reach to the position where the new vine will be, plus 2-3 feet. Whenever the ground is not frozen, dig a hole at the planting position, bring the long cane down into the hole,



and back up again, forming a loop. Fill the hole with soil so that the loop is covered but the end of the cane is sticking out. Place a stake or other training aid next to the tip of the buried cane and tie the tip to the stake.

During the growing season, buds along the partially buried cane will open and start to grow. Continuously remove all shoots that grow on the section of the cane between where it is attached to the mother vine, and where it disappears into the soil. The buried part of the cane will eventually form roots. Once the part of the cane that forms the new vine is thicker in diameter than the part that comes from the mother vine, the new vine is well established and the connection to the mother vine can be removed. Just cut the cane as close to ground level as possible (where it went into the soil) and shorten the other end to within the canopy of the mother vine. Layered vines, especially where a really long cane was available which extended a few feet out of the ground, have a better chance for survival in close proximity to large, established vines, than small, rooted cuttings, because of the lasting connection to the mother vine. They will fill out their canopy space possibly a year earlier than replacement vines from cuttings. The only drawback is that you have to have a neighbor vine with a long enough cane close to the location of the missing vine.

Another form of propagation can also begin around pruning time. This is the collection of cuttings from the canes that have been pruned off. Select healthy, undamaged canes and cut them into about 3 (bud) node sections. These cuttings can be lined out into a nursery area in a vineyard. The nursery is an area that is protected, will not be sprayed along with the vineyard and that can be kept weed free. Insert the cuttings 2-3 inches into the ground so that the buds point upwards. They can be placed close together. After one growing season, these young plants can be dug up and transplanted. Not all cuttings will root under these circumstances, but it is the easiest and simplest way. You will have increased percentages of rooting if you can place the cuttings into a heated soil bed first that will keep the bottom end of the cuttings around 75-80°F. This stimulates root formation. The tops

of the cuttings should be kept cool during this time, so that the buds do not open before roots have started to form. To achieve this combination of warm root zone and cool top, the soil bed can be placed in an unheated garage or similar location and the bottom heated with a heating mat designed for starting seedlings. You can check on root formation by removing some cuttings from the soil and looking at the bottom end. New roots will be easily visible and should be white. At that point the cuttings can be potted into small pots or planted in the vineyard nursery area, but only after the danger of all frosts is past, especially if any buds have opened.

Using Native Plants in the Home Landscape

by Jennifer Barnes

An appreciation of our natural landscape leads many gardeners to plant wildflowers and native plants in their home gardens. Many gardeners consider wildflowers to be one of nature's loveliest gifts. In prairies and meadows they provide a changing panorama of colors, shapes, sizes, and heights. It is the informal spontaneity of wildflowers, the mixture of colors and species, and the changes that occur as the growing season progresses that make them so delightful to the viewer. It is no wonder wildflowers have become popular with the home gardener.

Native plants make excellent landscape plantings because they are adapted to the local weather and soil conditions. Consequently, they require little or no fertilizer, are relatively low maintenance, and help conserve scarce resources such as water and energy. Native plants are also less frequently bothered by insect and disease problems thus reducing the need for chemical controls.

Wildflowers and native plants are found in a wide range of habitats. Those that are rare, threatened, or endangered should never be removed from their native habitat. Anyone interested in growing wildflowers should select those that can be grown from seeds or propagated in other ways for use in the garden. Avoid digging from native locations

unless native locations are being destroyed for some reason. There are a number of reputable garden wildflower producers. In addition to mail-order sources, you may have wildflower nurseries near your home.

Many wildflowers and native plants may be used in combination with other perennials or annual flowers in a perennial border. Many people, however, prefer to have an area designed specifically for wildflowers to develop a naturalistic look with relatively low maintenance. The actual placement of plants in the design is very flexible. Nature is very random and the wildflower garden should convey this appearance. Clusters, clumps, or individual placements are quite useful. Perhaps the only arrangement to be avoided is that of plants in rows or precise geometric forms.

Some native plants are more adapted to certain areas than others. Woodland wildflowers will be best suited to your landscape if your yard is shaded or wooded. Most woodland wildflowers prefer moist, well-drained soil high in organic matter, and light shade. Woodland wildflowers are best purchased as containerized plants, which establish themselves more reliably than plants started from seed. Meadow wildflowers prefer dry, sunny, open spots with adequate drainage. Many meadow wildflowers are easily grown from direct seeding, but may need a period of stratification (cold period to overcome dormancy) to assure germination. Many wildflowers that are associated with meadows are actually glade species. Glades are naturally occurring open areas characterized by thin, rocky soils, which produce an extremely hot, dry environment. Glade wildflowers will grow in locations that receive at least six hours of full sun each day. They are particularly tolerant of poor soils and drought conditions.

A prairie garden can be obtained by planting native prairie grasses and flowers. In the home landscape, one should plant about two or three native grasses for every ten to twelve prairie wildflower species. Sideoats grama grass and little bluestem, medium-height grasses, may be more appropriate in the home landscape than tall grasses like Indian grass or big bluestem. The prairie garden can be started from seed or transplants. Seeds are

better for larger, naturalized plantings while transplants work well for small areas. The first year after planting prairie plants establish root systems with very little visible above ground growth. Your garden will begin to look more like a prairie garden during the second and third years of growth. During this time the prairie garden may benefit from an early-summer mowing to help control the growth of annual weeds. The planting should be mowed again in the fall when plants reach a height of 6"-10". By the fourth year, your prairie garden should be fairly well established and maintenance tasks will be minimal, and your prairie will pretty much take care of itself for years to come.

The Adventure Continues - Pawpaws!

by Patrick Byers

Recently Andy Thomas, of the UMC Southwest Research and Education Center, and I had the opportunity to travel in quest of information on persimmons and pawpaws. A previous issue of *The Berry Basket* described our persimmon adventures. In this issue I would like to share the experiences that we had related to pawpaws.

The pawpaw has several unusual characteristics. This small tree is the only temperate zone representative of a subtropical-tropical family that includes such delicious fruits as the cherimoya and custard apple. The pawpaw fruit is the largest North American fruit – individual fruit may weigh as much as two pounds. And the taste of the pawpaw is certainly unique among temperate fruit.

The native range of the pawpaw includes much of the southeastern US, stretching north into Michigan, Nebraska, and the Appalachian Mountains. Pawpaw is found across Missouri, often as an understory tree near streams and rivers. Missouri has many sites naturally suited for commercial pawpaw production.

Development of the pawpaw as a commercial fruit began in the nineteenth century. Recent years have seen a renewed interest in pawpaw, spearheaded by individuals such as Neal Peterson and the members of the Pawpaw Foundation.

Kentucky State University (KYSU) has emerged as a center of pawpaw activity, first under the direction of Desmond Lane and currently under the leadership of Kirk Pomper. The USDA Germplasm Repository for pawpaw is located at KYSU. Andy and I decided that our first stop in quest of pawpaw information would be KYSU, so we headed for Frankfort.

Kirk Pomper, our host at KYSU, met us early on a rainy morning at his lab on the KYSU campus. Joining us was Ken Hunt, of the UMC Agroforestry Center, and Alan Ware and David Redhage, both of the Kerr Center for Sustainable Agriculture in Poteau, OK. Also present was Snake Jones, Kirk's research associate in the pawpaw program. Kirk began our visit with a fascinating presentation on pawpaw history, culture, and germplasm. We



Kirt Pomper, director of the KYSU pawpaw research program

next toured Kirk's lab, where Snake demonstrated seed extraction from pawpaw fruit. The seed is immediately stratified and germinated to produce rootstock trees. We sampled a wide range of pawpaw cultivars, both from the plantings at KYSU and fruit provided by Ken from an orchard in Columbia, MO. My personal favorite was Mango, with Sunflower a close second. Kirk and Snake then had a treat for us – pawpaw ice cream!

We next loaded up into our vans and headed out to the pawpaw orchards. KYSU maintains the USDA pawpaw germplasm collection, which includes several species of *Asimina* as well as many



Andy Thomas (left), David Redhage, Alan Ware, Ken Hunt, and Patrick Byers in the pawpaw research greenhouses, KYSU.

pawpaw cultivars. The hardy plants are maintained in the orchard, and tender species are kept in greenhouses. After touring the greenhouses, we hiked through the orchards. In addition to the germplasm collection, KYSU is coordinating a regional pawpaw cultivar test project, where identical groups of promising pawpaw cultivars are planted at sites around the eastern US. Andy and I are planning satellite plantings similar to these orchards, at Mountain Grove and Mount Vernon, so we were particularly interested in this planting. Our plantings will include the cultivars "Sunflower", "Pennsylvania Golden", "Overleese", "Wells", "NC-1", "Shenandoah", "Susquehanna", and "10-32". After several hours of hiking orchards in the rain – the remnants of Hurricane Isidore were showing no sign of letting up – we bid Kirk, Ken, Alan, and David farewell and headed north to our next destination, Terre Haute, Indiana.

Following are some thoughts on pawpaw culture gleaned from our visit to KYSU. Pawpaw orchards are usually planted with named cultivars grafted on seedling rootstocks. Rootstocks from "Sunflower" seedlings are considered superior to other seedling sources. Young trees are often shaded for the first year, using 30-50 % shade cloth. Trees usually do not need shading after the establishment year. Young trees benefit from weekly applications of fertilizer through mid summer; a slow release fertilizer will work well. Pawpaw is often trained to a central leader system.



Andy Thomas with ripe pawpaws.

Limbs should be spread to encourage strong crotch angles. Remove suckers from the root stock. Trunk protectors are useful for preventing rodent and deer damage. Weed control and irrigation are critical, especially with young trees. Pawpaw fruit may weigh up to 2 pounds. Fruit may be born individually or in clusters of up to 11 fruit. Ripe fruit color ranges from green through yellow to orange brown. Fruit flavor ranges from mild to strongly flavored. Fruit is harvested when finger soft. Desirable fruit characteristics include fruit born individually, light green color, rounded fruit, high pulp to seed ratio, mild flavor, and fruit that separate cleanly from the tree. The price received for fresh market pawpaw in Louisville, KY was \$2 per pound in 2002; the price in Washington DC was \$4 per pound.

The following day was the first day of the 2002 American Persimmon Conference. As the attendees introduced themselves and their interests, however, it was clear that many of us had a passion for pawpaw as well. Recognizing this in advance, the conference organizers included several presentations on pawpaw, including an overview by Kirk Pomper. The second day of the conference included a tour of the Jerry Lehmann orchard near Terre Haute. In addition to his extensive persimmon orchard, Jerry also toured us through his pawpaw orchard. Following the tour Andy and I headed home, full of enthusiasm for pawpaw and persimmon and exciting plans for research on these crops for Missouri. Further information on pawpaw is available in the *Proceedings of the*

2001 Missouri Small Fruit Conference (available from the SMSU Department of Fruit Science) and at the Kentucky State University Pawpaw Website: <http://www.pawpaw.kysu.edu/>.

Workshops on Developing and Enhancing Farmers' Markets *by Tammy Bruckerhoff*

More and more consumers are shopping at farmers' markets. As a result, the Missouri Department of Agriculture is helping producers develop new markets and enhance existing ones through a series of workshops scheduled in February throughout the state.

Robert Chorney, executive director of Farmers' Markets Ontario, will share his experience developing farmers' markets across Canada and the United States at the workshops.

"Whether you're interested in developing a farmers' market or enhancing an existing one, you should plan to attend the workshop in your area," said Deanne Hackman, director of the Missouri Department of Agriculture's Division of Ag Business Development, which is sponsoring the workshops along with the US Department of Agriculture and the Missouri Farmers' Market Association. "Producers will receive new information, fresh ideas and a broader vision that can be applied to your markets."

Here is the workshop schedule:

- Feb. 24, Cape Girardeau County Extension Office, Jackson
- Feb. 25, Warren County Extension Office, Warrenton
- Feb. 26, Moberly Inn, Moberly
- Feb. 27, Johnson County Fairgrounds, Warrensburg
- Feb. 28, Clarion Inn, Springfield

Registration is available online at

www.aginnovationcenter.org or contact Tammy Bruckerhoff, business specialist with the Missouri Department of Agriculture, at 573-751-3394 or Tammy_Bruckerhoff@mail.mda.state.mo.us. The \$10 registration fee and registration information is due by February 14, 2003.

2003 Missouri Small Fruit and Vegetable Conference

by *Patrick Byers*

The SMSU State Fruit Experiment Station is pleased to invite all interested persons to the 2003 Missouri Small Fruit and Vegetable Conference, February 17, 18, and 19, at the Clarion Inn and Conference Center, Springfield, Missouri. The Conference, in its 23rd year, brings together small fruit and vegetable growers, researchers, extension workers, and commercial suppliers from across the state and around the country.

A small fruit/vegetable bus tour on the first day of the conference, February 17, will visit several farms in southwest Missouri. Featured will be the farm of **Dennis Hatfield**, near Aurora. Dennis is a major producer of gourds, which are marketed across the US. He also produces tomatoes for fresh market sales. Second stop on the tour is **Herndon's Orchard**, at Marionville. Bob and Sara Herndon have grown quality apples and peaches for many years. Fruit is sold direct market from a roadside stand. Bob and Sara also produce some of the best cider in the area. The third stop on the tour is the farm of **Shawn Crowley**, also near Marionville. Shawn produces blackberries and asparagus, primarily for fresh market. Following the tour, participants are invited to an **ice cream social** at the Clarion Conference Center, sponsored by **Agri-Missouri**. Missouri fruit products will be featured as toppings for Missouri ice cream.

The conference continues on Tuesday, February 18, with keynote speaker **Dr. Chad Finn (USDA)**, who will look into the future and share his view on small fruit production. The vegetable session follows, with presentations on managing curcubit insects, growing heirloom tomatoes, and raising ethnic vegetables. The alternative session is next, with speakers on IPM, blackberry production, and selling ethnic vegetables. The blueberry session concludes the second day of the conference, with discussions on selecting blueberry cultivars for the Ozarks and the importance of nutrient management for blueberry.

The final day of the conference, Wednesday, February 19, begins with the strawberry session. Strawberry cultivar selection (with an emphasis on new cultivars), annual production systems, and advances in matted row production will highlight this session. The general session will round out the conference, with talks on a small fruit grower's perspective on using the internet and email, the current situation regarding organic standards in Missouri, and the business end of direct marketing.

Among the speakers at the 2003 conference are **Dr. John Clark**, respected small fruit researcher and breeder from the University of Arkansas, and **Dr. Paul McLeod**, vegetable entomologist from the University of Arkansas. Vegetable growers and marketers **Robbins Hail** and **Dr. Steve Salt** will share their experience with ethnic and heirloom vegetables. SMSU's **Dr. Ben Fuqua** and **Dr. Martin Kaps** will discuss research results, and IPM Specialist **Dr. Dan Waldstein** will give information on small fruit pest management. A strength of the Small Fruit and Vegetable conference is the practical, production related information that commercial growers are willing to share with attendees, and we are pleased to have **5 growers** on the schedule.

For information on the conference schedule and registration information, contact us at SMSU State Fruit Experiment Station, 9740 Red Spring Road, Mountain Grove, MO, telephone 417.926.4105, or email plb711t@smsu.edu for conference details. The latest information on the Missouri Small Fruit and Vegetable Conference is available at the following website: <http://mtngrv.smsu.edu/calendar.htm>. See you at the conference!

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