



The Berry Basket

Newsletter for Missouri Small Fruit and Vegetable Growers

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Blueberries – A Nutraceutical?

By Ben Fuqua

Professor, Soil Science, SMSU

Health professionals continue to tout the healthy attributes of blueberries. Blueberries are not only recognized as a nutritious, great-tasting fruit, but are also identified as a major fighter of many diseases. The term “nutraceutical” was coined in 1989 by *The Foundation for Innovation in Medicine* to identify ‘any substance that may be considered a food or part of a food that provides health benefits, including the prevention or treatment of disease.’ Based on the following evidence, blueberries certainly appear to meet this definition.

1. **Antioxidants** – USDA -ARS researchers found blueberries to have the highest antioxidant activity of some 40 fresh fruits and vegetables tested. Antioxidants help neutralize free radicals, unstable and highly reactive molecules in our bodies that are linked to the development of several diseases, including cancer, heart disease, and strokes. Blueberries contain a number of compounds that exhibit antioxidant properties, including anthocyanin, the pigment that makes the “blue” berry.

2. **Anti-Aging** – Neuroscientists have discovered that blueberries slowed age-related loss in mental capacity in laboratory animals. Although the effects from long-term studies with humans are not yet available, the results show promise for improving balance, coordination, and short-term memory as we get older. Other research is being focused on the use of antioxidant supplements to delay the onset of Alzheimer’s disease and other cognitive functions.

From the Editors

by Marilyn Odneal

I hope everyone is weathering the winter well. Please note the **resubscription form** inserted in this issue. If you are receiving a printed copy of the newsletter, please fill in the form and send it in by March 15, 2005 in order to continue to receive the Berry Basket in print. If you wish to cancel your print subscription, you do not have to send anything in as we will take you off the mailing list.

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3. Disease Prevention – Antioxidants are also believed to be the active component that reduces the build-up of “bad” cholesterol that contributes to cardiovascular diseases and strokes.

4. Prevention of Urinary Tract Infections – Researchers have identified a compound in cranberries and blueberries that promotes urinary tract health and reduces the risk of infection. It appears to work by preventing bacteria from binding to cells that line the walls of the urinary tract.

5. Antibacterial Agents – In Sweden, dried blueberries have been successfully used to combat childhood infections caused by *E. coli* bacteria. Anthocyanosides, a natural substance found in blueberries, is believed to be lethal to *E. coli*.

6. Improved eyesight – Blueberries have been shown to improve eyesight (especially night vision) and ease eye fatigue. Additional studies are underway to see if blueberries can prevent/delay macular degeneration and the formation of cataracts.

7. Nutritious Berries – In addition to disease-fighting benefits, blueberries are one of the most nutritious fruits you can eat. A half-cup of blueberries contain 2 grams of fiber, 0% cholesterol, less than 0.5% total fat, and only 42 calories. Blueberries also are rich sources of potassium, phosphorus, and iron, as well as Vitamins A and C.

Conclusion – Blueberries have been labeled as the “can do” fruit. Blueberries fit most every diet and continue to receive a lot of attention from health advocates, dietitians, TV cooking shows, etc. as the “healthy” fruit. The 2005 USDA dietary guidelines recommend 5 daily servings of fruits. What better way to attain a least one of these servings than with the delicious, healthy blueberry; (a half-cup of fresh or frozen blueberries, 6 ounces of blueberry juice, or one-fourth cup of dried blueberries). Although some scientists believe that declaring blueberries as a nutraceutical is premature, everyone agrees on one thing: **“blueberries are good for you!”**

Early Spring Bloomers in the Garden

By Jennifer Barnes-Schutter
Regional Horticulture Specialist, MU

In just a couple of more months signs of spring will be everywhere. Nothing signals the end of winter like the first spring flowers poking their heads through the melting snow. Few plants are as easy to grow, or as rewarding, as the early-blooming bulb flowers.

Snowdrops (*Galanthus nivalis*) are the earliest flowers to appear, often weeks before crocuses, and often through the snow in early March. The flowers are white with green inner tips. The plants are 4-6 inches tall and should be planted in clumps three inches deep and three inches apart. Snowdrops readily increase in number, which makes them ideal for naturalizing. They are usually not touched by deer and rodents.

Winter Aconite (*Eranthis hyemalis*) blooms shortly after snowdrops and sometimes can be seen blooming in the snow. It is a member of the buttercup family bearing bright yellow, cup shaped flowers on 3–6 inch tall plants. Their leaves are deeply divided with one dissected leaf just below the flower almost like a frilled collar. Winter Aconite grows best in full to partial sun. It develops from a pea-sized tuber instead of a bulb. The tubers should be soaked overnight in water prior to planting, then placed three inches deep and 4-6 inches apart. They will spread freely and naturalize themselves. Winter Aconite does not like to be disturbed. If division is necessary, the tubers should be dug shortly after blooming and separated into clumps instead of individual tubers. It may take more than a year for the plants to reestablish. Winter Aconite works well combined with crocus or in masses at the front of borders.

Glory of the Snow (*Chionodoxa*) sends up clusters of star-like flowers. Most varieties have light to dark blue flowers with white centers but pink and all white cultivars are available. Each stem only produces two strap-like dark green leaves so the flowers are very showy. Plants grow 4–6 inches

tall, and grow best in full sun or partial shade. Glory of the Snow looks best when planted in large numbers in borders, rock gardens and under trees and shrubs, and are good for naturalizing.

Siberian Squill (*Scilla siberica*) is also one of the earliest spring flowers to bloom, featuring deep blue, 1/2 inch, bell like flowers in loose clusters of 3 to 5 flowers. These upright six-inch tall plants prefer fertile, well-drained soil in full to partial sun. Siberian Squill is one of the very best bulb plants for naturalizing. The foliage dies down quickly after bloom. They are exquisite when planted in large groups under spring flowering shrubs such as forsythia, azaleas, rhododendrons, and magnolias.

Dwarf or Reticulated Iris (*Iris reticulata*) produces small iris type flowers in purple or blue with yellow throats. These irises grow from bulbs instead of rhizomes like German Iris. The Reticulated Iris grows only five inches tall. Like most bulbs these plants prefer moist well-drained soil.

Lenten Rose (*Hellebores*) can be seen blooming in the snow. Flowers can be a range of colors that include pale green, cream, and maroon-speckled shades of rose. The Lenten Rose prefers partial shade and well-drained soil. It is considered deer-resistant.

Crocus, another early blooming favorite, brightens up the landscape around the world with white, yellow, blue, and light orange flowers above thin grass-like leaves. These small plants grow just 4-6 inches tall. They are easy to grow and are very prolific. There are 100 known species of crocus, but only 30 have been cultivated. Crocuses are grown from corms, which can be a tasty meal for a hungry squirrel. Crocus should be planted in full sun to partial shade, and are grown in borders, rock gardens, lawns, under shrubs and trees, and for indoor forcing.

As the weather warms and we move into late March, April, and May other spring bulbs will make their showing. Tulips, daffodils, and hyacinths provide a beautiful display of color in spring gardens. Spring just wouldn't be spring without these beauties.

Along with early spring blooming flowers are a couple of early flowering shrubs.

Forsythia (*Forsythia x intermedia*) blooms in early to mid-March producing bright yellow flowers

appearing before the leaves. Flowers usually last 2-3 weeks unless killed by cold. Forsythia is easy to grow and can reach 8-10 feet in height and 10-12 feet wide.

Vernal Witch Hazel (*Hamamelis vernalis*), is a deciduous, winter-blooming shrub, with a rounded habit which typically grows 6-10' tall with a somewhat larger spread. It is noted for its extremely early, January to February-March, and lengthy (up to 4 weeks) bloom period. The fragrant, globular flower clusters have variable coloration, but flowers most frequently have yellow petals and reddish inner calyxes. Its' dull green leaves (2-5") turn an attractive golden yellow in autumn. It is hardy in zones 5-8.

As the days get longer and winter begins to loosen its grip, these brave plants welcome the warm sunlight of late February and March. As your thoughts begin reveling in the moist-earth scents, warm sun, and gardening, why not take a look around your yard. Explore the possibilities for adding plants for winter interest to help satisfy the senses as you face next winter's challenges. Now that you see some of the possibilities, is there really any reason for your garden to "hibernate" next winter?

Brrrrrr! It's Cold Outside. Is it Time to put on Row covers?

Jay Chism, Regional Ag Specialist, MU

Last fall, along with another farmer, I had the opportunity to plant approximately three acres of 'Chandler' strawberries. We decided to utilize the annual plasticulture strawberry system that has been popular in California and throughout the Southeast U.S.

After planting, and fall plant growth had slowed, our intention was to apply row covers in mid-December. Row covers are spun bonded polyester or propylene material, and are an integral part of the strawberry plasticulture system. Protection by row covers can prevent flower losses from late frosts and helps to modify the environment around the plant. The end result being that we would have more rapid growth, earlier maturity, and hopefully,

an increase in our yields. Our decision to apply row covers in December was based on previous experience where I applied straw mulch after the plants were dormant in a traditional modified matted row strawberry system.

Unfortunately or fortunately, I'm not sure which; temperatures late in the season remained mild. Our planting did not go dormant until after the first of the year. I was advised from an experienced grower in Arkansas not to apply the row cover at that time because the protective material may warm the soil up to the point that the planting would break dormancy and winter injury may occur.

So here we are in the middle of January and we still have not applied row cover protection to our plasticulture system. Other growers in S. W. Missouri using the same system and planting dates have already applied their row covers. Which is the correct management decision? I honestly do not know. Most research I have read does suggest that row covers that are applied in the fall will provide increased yield. Under short days and low fall temperatures, flower buds are initiated. Row covers protect the fall planted strawberry plants allowing more time for floral initiation and plant development.

Our dilemma was that plant growth continued to develop even without the row covers. We were concerned that fall applied row covers would amplify the growth, not allowing the planting to go dormant, thereby exposing our strawberry plants to winter injury.

I am not suggesting that we will not apply row covers to our planting. We are planning to apply row covers to initiate earlier growth in the spring and we consider row covers a necessity for frost protection when temperatures threaten our plants as flower development begins.

Like many decisions a grower faces, when to apply row covers to a plasticulture strawberry planting is a management decision. These types of decisions should be based on research from educational institutions, experience, and perhaps combinations of other management criteria, such as finances. With spring just around the corner, I will have to let you know in another issue, if we feel the decision not to cover was a good one.

Perennial Bed Preparation

By Marilyn Odneal

Horticulture Outreach Advisor, SMSU

A shrub and herbaceous perennial border was designed and installed at the foundation of old Faurot Hall at the Southwest Missouri State University Mountain Grove Campus in honor of the University's Centennial Celebration in 2005. We followed the guidelines for perennial bed preparation listed in *The Well Tended Perennial Garden* by Tracy DiSabato-Aust: 1. test the soil; 2. eliminate perennial weeds; 3. make sure the soil drains well, yet is able to hold water and nutrients; 4. provide sufficient organic matter in the soil; and 5. add fertilizer if the soil does not have ample phosphorus – a key nutrient in perennial plant establishment. These steps worked well for us and we had excellent growth of our perennial flowers, and grasses by the end of the season.

Although all of the steps in bed preparation are important, the amendment of the soil for perennial plants is highlighted here. Initially a soil sample was collected for our planting in spring of 2003. The results were: pH_s 7.1, Phosphorus (P) 77 lbs/a, Potassium (K) 408 lbs/a, Calcium (Ca) 4404 lbs/a, Magnesium (Mg) 746 lbs/a, Organic Matter 3.3%, Neutralizable Acidity 0.0 meq, Cation Exchange Capacity 14.6 meq/100g.



Soil samples are collected and analyzed before incorporating the organic amendments. Another sample is taken after incorporation to see the change.

The Perennial Plant Association (PPA) recommendations for a soil *after amendments have been added and incorporated* are pH 5.5 – 6.5, organic matter content of 5% by weight, 50 pounds per acre (25 parts per million) available phosphate, and 120 pounds per acre (60 parts per million) available potash.

We followed DiSabato-Aust's recommendation to incorporate 4 inches organic matter tilled to a 12 inch depth. In order to calculate how much organic matter we would need, we divided our bed into three sections (two rectangles and an irregular area). We calculated the area in square feet of each rectangle, estimated the square footage of the irregular section, and then added the areas all together. We also estimated how much organic matter we would need to cover our area. There are several ways to calculate this, however, keep in mind that 1 cubic foot of amendment will cover a 12 square foot area 1 inch deep; or a 6 square foot area 2 inches deep; or a 4 square foot area 3 inches deep; or a 3 square foot area 4 inches deep. If you want to incorporate 4 inches of organic matter, each cubic foot of amendment you have will cover 3 square feet of your area, so divide your area by 3 to see how many cubic feet of material you need.

We purchased bales of compressed sphagnum peat moss (pH of 4). The 3.8 cubic foot compressed sphagnum peat moss will expand to about 7 cubic feet out of the bag (personal communication, Bill Eskes, Hummert International, Springfield, Missouri). We applied about 2-3 inches of the peat moss as well as about an inch of aged cow manure from a local farm.

We initially used a rear tined tiller (e.g., Troy-built Pony) to work in peat moss but came to prefer the smaller tiller/cultivator (e.g., Mantis or Echo brands) with pointed tines to mix the organic matter in with the soil. You can basically dig a hole with the smaller tiller/cultivator thoroughly mixing the organic matter into the soil. This may not, however, be suitable for very large projects.

When the organic matter was incorporated into the soil, we ended up with somewhat of a raised bed. The soil also looked very "organic" and it looked like we might have added too much. As the season progressed, however, the earthworms



Peat was incorporated in 2003. More was added with aged cow manure in 2004.

worked hard to mix the organic matter and soil together. A soil sample taken in mid-July, 2004, after the organic amendments were incorporated resulted in: Ph, 6.8, Phosphorus (P) 148 lbs/a, Potassium (K) 573 lbs/a, Calcium (Ca) 3356 lbs/a, Magnesium (Mg) 613 lbs/a, Organic Matter 5.5%, Neutralizable Acidity 0.0 meq, Cation Exchange Capacity 11.7 meq/100g. The pH was lowered although not to within the 5.5-6.5 range. We decided, however, that no further amendments were needed since the plants we were installing would tolerate this pH. No additional phosphorus or potassium was needed based on the results, so we fertilized the new planting with 2 separate applications of nitrogen at the rate of 1 pound per 1,000 square feet. The organic matter increased from 3.3 to 5.5% in 2004, which is slightly over the minimum level recommended by the Perennial Plant Association, but lower than we anticipated.

Tracy DiSabato-Aust notes "Our amended beds generally test out to approximately 16-18% organic matter, improved from the original 2-3% of the native soil. Remember the PPA recommendation is a minimum of 5% organic matter. Most authorities say 6-8% is good for increased perennial plant growth. I have had great success with this higher amount of organic matter for both plant establishment and growth in later years. I find that it is about 4 to 5 years before I need to start adding more organic matter to the soil. But a word of caution: if you get above 20% organic matter, you are really working with what is considered more of a con-

tainer mix, and your watering practices need to be monitored.”

We will continue to monitor our soil through the years and maintain a 1 – 2 inch organic mulch. The plant growth was very good in the first season, with our ‘New Dawn’ climbing rose reaching the top of the 12 foot high arbor. We expect it to go over the top in the next couple years with continued care.

Literature Cited

DiSabato-Aust, Tracy. The Well Tended Perennial Garden: Planting and Pruning Techniques. Oregon, Timber Press, 1998.

SMSU-Mountain Grove Welcomes Dr. Inno Onwueme

By Patrick Byers

Fruit Grower Advisor, SMSU

The staff of the SMSU-Mountain Grove Campus are pleased to introduce Dr. Inno Onwueme, newly named Director of the Missouri State Fruit Experiment Station and Head of the SMSU Department of Fruit Science. Dr. Onwueme combines a rural childhood upbringing with a fascinating professional career. His early years were spent in rural West Africa, where agriculture was a way of life and he was involved in farm work after school each day. Following high school he left Africa for California, where he received a BS from the University of California-Davis. He went on to earn a PhD in crop physiology, also from UC-Davis. Dr. Onwueme returned to Africa, where he began a professional university career that would take him around the globe.

While in Africa Dr. Onwueme served in a variety of university posts – department head, dean of a college of agriculture, dean of a graduate school, director of a research center, and university president. After he emigrated to the US with his family, his international interests continued, as he served a period at a university in Papua New Guinea and at other South Pacific locations. In time he settled in Pennsylvania, where he became director of a center focusing on agricultural sustainability.



Dr. Onwueme’s research interests fall into three areas. The first area deals with sustainability and the environment. In particular he worked in the areas of environmental stress, environment tolerance, and erosion. His second area of interest is the production physiology of sweet potato and other root/tuber crops. He has authored three textbooks and numerous journal articles in relation to these crops. The third theme of Dr. Onwueme’s research is the characterization, conservation, and utilization of biodiversity, including novel practices for the propagation, domestication, and production of various semi-wild medicinal and condiment plants.

Dr. Onwueme brings an international perspective to the SMSU-Mountain Grove campus. He has lived and worked on four continents – North America, Africa, Europe, and Asia/Pacific, and his professional duties have taken him to about a third of all the countries on earth. He has served as a consultant to the United Nations, and has led missions to many interesting parts of the world – Fiji, Zimbabwe, Zambia, Indonesia, Tonga, Samoa, Vanuatu, and Kenya. His particular interest is in agriculture, food security, and environmental issues. Dr. Onwueme has received grants from numerous global organizations to support his international interests.

In addition to his responsibilities at the SMSU-Mountain Grove campus, Dr. Onwueme will also serve as Associate Dean of the School of Agricultural Sciences at SMSU.

Ten Attributes of a Good Vegetable Gardener

Gaylord Moore

Horticulture Specialist, MU

1. Planner

Good gardens don't automatically happen. They are well planned and methodical. If schematics are helpful, draw your plan on paper and follow it. However, realize the pencil should have an eraser and use it. Know the characteristics and special needs of specific plants. Know the plant's cultural and management needs and plan accordingly.

2. Protector

Keep your plants healthy. Good soil fertility is imperative; therefore, test your soil for basic nutrients and apply as needed. Know the pests common to various vegetable species and watch your plants carefully. Quick attention to problems before they get out of control will increase success.

3. Proud

Take pride in your garden and accomplishments. A caring attitude will be accompanied by timely management tasks that promote a beautiful and productive garden. Develop a garden that raises the eyebrows of the neighbors.

4. Brave

Don't be afraid of trying new varieties and growing methods. Innovative gardening practices can be adventuresome and fun. So what if a new idea or method doesn't work? Understand why the idea may have failed and make the necessary changes to not repeat the same mistakes.

5. Builder and Maintainer

Every outstanding garden generally goes through building stages. Start with the location and soil. Vegetable gardens should receive at least 6 to 8 hours of direct sunlight. Soils should possess good drainage and nutrient holding capacities. Often good gardens soils need to be developed by adding ample organic matter regularly. Organic matter is the life of the soil and must be maintained.

6. Sharing

Typical gardeners are anxious to share ideas and produce. They are eager to swap ideas, best gardening practices, and favorite varieties that perform or tastes the very best. A typical gardener discourages waste. Excess harvest is shared with neighbors or others who appreciate fresh produce.

7. Good Listener

Gardeners are eager to gain new knowledge that leads to better gardening practices. They read periodicals, books, attend seminars or engage in other self-helps to promote better gardening results.

8. Dedicated

Good gardeners are determined to succeed. Often success depends on tasks performed in a timely and efficient manner.

9. Ambitious

Successful gardeners are not lazy. They love what they do and spend time daily in their garden. Frequent inspection of plants heads off potentially severe problems while they are still manageable.

10. Determined

Call them stubborn if you will. Failure is not acceptable but they understand the risks. Frequent setbacks or disappointments are possible but often are situations beyond their control. Gardening is subject to inclement weather conditions such as drought, extreme temperatures or other variables that effect results. Some unfavorable factors can be overcome but if not, they chalk the results up to a learning experience and hope for better results next year. A good gardener is an eternal optimist.

Armadillos in Missouri

By Lynn Robbins

Professor of Biology, SMSU

The nine-banded armadillo (*Dasyopus novemcinctus*) is the only member of its order (Xenarthra) found in the United States, although there are a number of other species of armadillo, and the related sloths and anteaters found in Central and South America. This species is a relatively new arrival in the United States, with the first record from Texas in 1848. Since that time it has made relatively rapid expansion of its range north and east, aided by pranksters and animal dealers, as well as releases from zoos. They now range throughout the southeastern United States, and in Missouri, they are locally common anywhere south of the Missouri River, with numerous records north of the river. Although the expansion of their range has been aided by humans, this is a natural, not an introduced species in Missouri.

The Missouri Department of Conservation noticed an increased number of sightings of armadillos in southern Missouri during the early and mid-eighties, and asked me if I could initiate a study to determine their present range, feeding habits, and potential benefits or damage that they might cause to other native wildlife as well as problems they might cause to human endeavors. During this study we sent out questionnaires, collected stomach contents, and collected other ecological and behavioral data.

Although we were asked to carefully check the stomach contents for any evidence that they might be eating quail or turkey eggs, or young birds, our analyses found that 95% of their diet was invertebrates, including ants, centipedes, millipedes, and many varieties of insect larvae. Less than 5% was made up of vertebrate remains and was restricted to small snakes and lizards. No egg shells or feathers were found. Vegetation was almost nonexistent. Most of their food is found by digging in soft soils or under leaf litter or fallen logs. It is this

digging behavior that was commonly noted and considered a problem by those that answered our questionnaires. Not only do they make extensive shallow excavations during their foraging activity, they also dig many nest or escape burrows within their range. Unfortunately, if their range includes barns or other buildings, they will dig under the floors or foundations. However, on the good side, burrows in the forest and forest edges provide shelter for many other species of ground dwelling animals.

Our ecological and behavioral data indicate that armadillos are very active and move long distances during the spring, summer and early fall months, as also indicated by the number of carcasses found on the roads during this time. Their activity is also more nocturnal during these months. During the colder months, they move much shorter distances and are more active on sunny or warm afternoons and seek shelter during the colder nights. Extensive long-term ice or snow cover will negatively impact the survival of armadillos because they do not hibernate and need to find food on a regular basis.

Another question that is commonly asked concerns armadillos and leprosy. The scientific literature on this indicates that research scientists infected armadillos as a model animal in order to study this disease, and distributed these infected animals to numerous research facilities. Somehow the disease has become established in a few populations in Texas and Louisiana, but numerous studies in other areas of their range indicate that although there has been some transmission to humans that handled armadillos on a regular basis, it is restricted to these two states.

In conclusion, these recent invaders of our state have set up permanent residence, and although they can cause considerable damage to lawns, gardens, and outbuildings, they do not seem to pose any threat to wildlife populations or human health, other than some increased blood pressure or the occasional thump in the night as we travel down Missouri's highways.

Armadillo Damage Identification, Prevention and Control

By *Scott McWilliams*
Wildlife Damage Biologist, MDC

Damage Identification

Most armadillo damage occurs as a result of their rooting in lawns, golf courses, vegetable gardens, and flower beds. Characteristic signs of armadillo activity are shallow holes, 1 to 3 inches deep and 3 to 5 inches wide, which are dug in search of food. They also uproot flowers and other ornamental plants. Some damage has been caused by their burrowing under foundations, driveways, and other structures.

Legal Status

Armadillos may be live trapped /killed under the Wildlife Code. "Landowners have the right to protect their property". If you are having property damage, contact your local Conservation Agent for authorization. Check local laws and ordinances before using shooting as a control method.

Damage Prevention and Control Methods

Exclusion

Armadillos have the ability to climb and burrow. Fencing or barriers, however, may exclude armadillos under certain conditions. A fence slanted outward at a 40° angle, with a portion buried, can be effective. The cost of exclusion should be compared to other forms of control and the value of resources being protected.

Cultural Methods

Armadillos prefer to have their burrows in areas that have cover, so the removal of brush, wood piles, old automobiles, or other such cover will discourage them from becoming established. Another excellent winter habitat is large stacks of round bales, both in barns and outdoors.

Trapping

Armadillos can be captured in 10 X 12 X 32-inch live or box traps, such as HAVAHART, Tomahawk, or homemade types. The best locations to set traps are along pathways to armadillo bur-

rows and along fences or other barriers where the animals may travel. The best trap is the type that can be opened at both ends. Its effectiveness can be enhanced by using "wings" of 1 X 4-inch or 1 X 6-inch boards about 6 feet long to funnel the target animal into the trap (Figure 1). Proven baits include canned cat food, night crawlers, grubs, and meal worms. Remember, you may want to put up your domestic house cats prior to baiting with cat food.

Shooting

Shooting is an effective and selective method. The best time to shoot is during twilight hours or at night by spotlight when armadillos are active. A shotgun (No.4 BB-Size shot) or rifle (.22 or other small caliber) can be used. Good judgment must be used in determining where it is safe to shoot. Check local laws and ordinances before using shooting as a control method.

Other Methods

Since most of the damage armadillos cause is a result of their rooting for insects and other invertebrates in the soil, soil insecticides may be used to remove this food source and make areas less attractive to armadillos.

For additional information contact:

Missouri Department of Conservation
Scott McWilliams, Wildlife Damage Biologist
P. O. Box 138
West Plains, MO 65775
417-256-7161 ext. 272

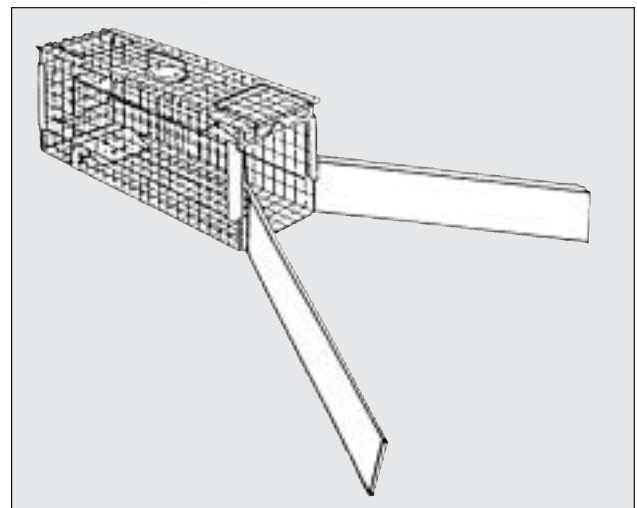


Fig. 1. Cage traps for armadillos are more effective when "wings" are added to direct the armadillo into the trap.

Tree Fruit Research Results, By Dan Waldstein, Asst. Prof. IPM, SMSU

POME FRUITS

APPLE: *Malus domestica* Borkhausen ‘Ozark Gold’

D. E. Waldstein, T. A. Bradshaw, J. A. Waldstein

Codling moth (CM): *Cydia pomonella* (L.), Oriental fruit moth (OFM): *Grapholita molesta* (Busck), Obliquebanded leafroller (OBLR): *Choristoneura rosaceana* (Harris), Redbanded leafroller (RBLR): *Argyrotaenia velutinana* (Walker), Plum Curculio (PC): *Conotrachelus nenuphar* (Herbst), Rosy apple aphid (RAA): *Dysaphis plantaginea* (Passerini), San Jose scale (SJS): *Quadraspidiotus periculosus* (Comstock), Tarnished plant bug (TPB): *Lygus lineolaris* (Palisot de Beauvois)

ASSAIL AND IMIDAN AIRBLAST EVALUATION ON APPLES, 2004.

The trial was conducted at the Missouri State Fruit Experiment Station in Mountain Grove, Missouri. The trial blocks consisted of 0.5-2.2 acre mature mixed cultivar plantings with 8-20 ft between trees and 16-20 ft between rows. Treatments and an unsprayed check were replicated in a minimum of one row in three separate orchards. Insecticides were applied with an airblast sprayer at a rate of 300 gallons per acre. Insecticide treatments included Assail 70 WP (0.5 oz/100 gal), Imidan WSB (1 lb/100 gal), and Damoil (2 gal/100gal). Damoil was applied to all treatments at half inch green (29 Mar). The first application of Assail and Imidan was made at petal fall (27 Apr). Subsequent applications were made on 11 May, 24 May, 7 Jun, 21 Jun, 20 Jul, and 4 Aug. A total of 200 ‘Ozark Gold’ apples/treatment were evaluated for insect damage on 15-16 Jul and 17-20 Aug.

In the 15 Jul assessment (Table 1), the petal fall application of Assail was not significantly better than the Damoil check for most insect pests. The full-season Assail and Imidan programs provided comparable control for all insect damage except plum curculio oviposition. Assail was significantly better than Imidan at reducing plum curculio oviposition scars. The full-season Assail program was significantly better than the Damoil check for control of tarnished plant bug but not significantly better than the Imidan program. All treatments provided good control of San Jose scale.

In the 17 Aug assessment (Table 2), the full season Assail and Imidan programs provided comparable control of all insects. Internal lepidoptera damage in the Assail petal fall treatment was significantly greater than the Assail and Imidan full season treatments, but less than the Damoil check. San Jose scale control was significantly better in the Assail and Imidan full season programs than the Assail petal fall treatment and the Damoil check. Plum curculio and tarnished plant bug control was similar for all treatments.

STONE FRUITS

PEACH: *Prunus persica* (L.) ‘Redhaven’

D. E. Waldstein, T. A. Bradshaw, J. A. Waldstein

Oriental Fruit Moth (OFM), *Grapholita molesta* (Busck), San Jose scale (SJS), *Quadraspidiotus periculosus* (Comstock), Tarnished plant bug (TPB), *Lygus lineolaris* (Palisot de Beauvois) (catfacing insect), Brown stink bug: *Euschistus servus* (Say) (catfacing insect), Green stink bug: *Acrosternum hilare* (Say) (catfacing insect)

CONTROL OF INSECTS ON PEACH, 2004

The trial was conducted at the Missouri State Fruit Experiment Station in Mountain Grove, MO. The trial block consisted of 13 yr old, 9 ft tall ‘Red Haven’ trees with 20 ft x 20 ft spacing in a 1.1 acre section of a 3.8 acre block. Treatments and an unsprayed check were replicated four times in a CRB design. There was a minimum of a one tree buffer between treatments to minimize the effects of insecticide drift. Insecticides were applied to single trees dilute to runoff with a high-pressure handgun sprayer (200 psi). The first application was made at shuck split (14 Apr). Subsequent applications were made 26 Apr, 7 May, 17 May, 27 May, 10 Jun, and 24 Jun. Insecticide treatments included Assail 70 WP (0.85 oz/100 gal), Esteem 35 WP (1.25 oz form/100 gal), Pounce 3.2 EC (2 fl oz/100 gal), Provado 1.6F (2 fl oz form/100 gal), and Damoil (2 gal/100 gal). A total of 160 peaches/treatment were evaluated for insect damage on 1 Jul.

Pounce and Assail were the best treatments for control of oriental fruit moth. Provado and Damoil also significantly reduced oriental fruit moth damage. The Esteem treatment did not significantly reduce damage from oriental fruit moth or catfacing insects. Damage from catfacing insects was significantly reduced by Pounce, Assail, and Damoil. San Jose scale damage was minimal in all treatments and the untreated check.

POME FRUITS Table 1

Treatment/ Formulation	Rate-amt form/ 100 gal	Date	% Damage(15 July)						
			IL ¹	LR ²	PC-O ³	PC ⁴	RAA ⁵	SJS ⁶	TPB ⁷
Assail 70 WP	0.5 oz	27 Apr	33.0a	7.0b	5.0ab	2.0b	2.5a	0.1a	3.5ab
Assail 70 WP	0.5 oz	27 Apr, 11 May, 24 May, 7 Jun, 21 Jun, 20 Jul, 4 Aug	7.0b	6.0b	0.0c	5.5b	0.1a	0.0a	1.5b
Imidan WSB	1 lb	27 Apr, 11 May, 24 May, 7 Jun, 21 Jun, 20 Jul, 4 Aug	6.5b	0.1b	4.0b	4.0b	0.1a	0.0a	6.0ab
Damoil Check ⁸	2 gal	29 Mar	39.5a	9.5a	14.0a	11.0a	2.5a	0.0a	7.5a

Means in a given column followed by the same letter are not significantly different (Fisher's protected LSD, $P = 0.05$)
¹Internal Lepidoptera (CM, OFM, LAW) ²Leafroller species (OBLR, RBLR) ³Plum Curculio Oviposition
⁴Plum Curculio Adult Feeding ⁵Rosy Apple Aphid ⁶San Jose Scale ⁷Tarnish Plant Bug ⁸Damoil applied to all treatments at ½ inch green

POME FRUITS Table 2

Treatment/ Formulation	Rate-amt form/ 100 gal	Date	% Damage(17 Aug)						
			IL ¹	LR ²	PC-O ³	PC ⁴	RAA ⁵	SJS ⁶	TPB ⁷
Assail 70 WP	0.5 oz	27 Apr	44.5b	3.5a	15.0a	0.0a	0.0b	6.0a	3.0a
Assail 70 WP	0.5 oz	27 Apr, 11 May, 24 May, 7 Jun, 21 Jun, 20 Jul, 4 Aug	22.0c	0.0b	15.5a	2.0a	0.0b	0.0b	2.5a
Imidan WSB	1 lb	27 Apr, 11 May, 24 May, 7 Jun, 21 Jun, 20 Jul, 4 Aug	19.5c	0.0b	18.5a	3.0a	0.5b	0.0b	2.5a
Damoil Check ⁸	2 gal	29 Mar	57.5a	2.5ab	22.5a	0.0a	3.0a	10.0a	2.0a

Means in a given column followed by the same letter are not significantly different (Fisher's protected LSD, $P = 0.05$)
¹Internal Lepidoptera (CM, OFM, LAW) ²Leafroller species (OBLR, RBLR) ³Plum Curculio Oviposition
⁴Plum Curculio Adult Feeding ⁵Rosy Apple Aphid ⁶San Jose Scale ⁷Tarnish Plant Bug ⁸Damoil applied to all treatments at ½ inch green

STONE FRUITS Table 1

Treatment/formulation	Rate-amt form /100 gal	% Damage		
		OFM ¹	Catfacing	SJS ²
Assail 70 WP ³	0.85 oz	3.7cd	3.1b	0.0a
Esteem 35 WP ³	1.25 oz	16.8a	6.8ab	0.1a
Pounce 3.2 EC ³	2.0 oz	0.1d	2.5b	0.0a
Provado 1.6 F ³	2.0 oz	10.6b	5.6ab	0.0a
Damoil ³	1 gal	6.8bc	5.0b	0.1a
Untreated Check	—	16.8a	10.6a	0.1a

Means in a given column followed by the same letter are not significantly different (Fisher's protected LSD, $P = 0.05$)
¹Oriental Fruit Moth ²San Jose Scale ³Applied 14 Apr, 26 Apr, 7 May, 17 May, 27 May, 10 Jun, and 24 Jun

Natives are for the Birds

By Judy Allmon, Grow Native!

Source: Kansas City Gardener, January, 2005.

Everyone enjoys the sights and sounds of birds, especially during winter months when we spend more time looking through windows. Many homeowners—and businesses—have birdfeeders to attract birds, but you can create a living songbird station to attract a wide variety.

The winter landscape offers a perfect opportunity to take stock of what is already in your landscape. Look for perennials with seedheads that persist through the snow and ice as well as shrubs and trees with fruits and nuts as well as dense branches to provide cover.

The recent decline of songbirds is partly linked to the increased use of non-native shrubs that do not offer the protection of dense branches and thorns for successful nesting. Also, many of these exotic landscape plants do not provide the natural foods produced by native species.

If your landscape lacks bird appeal, you can begin planning for spring additions to your landscape. It's easy to add a few of Missouri's native shrubs or small trees to an existing border. In addition to fruit, many offer spring flowers such as Serviceberry and the viburnums or add fall color like the Wahoo or the sumacs. Birds also appreciate fruiting native trees like Flowering Dogwood, Roughleaf Dogwood, American Plum and Black or Indian Cherry.

Your songbird station can be designed for sun or shade. A sunny area can easily include a small patch of colorful wildflowers with abundant, delectable seeds. Examples include Lanceleaf Coreopsis, Western Sunflower, Yellow or Purple Coneflower and Rough Blazing Star. These wildflowers attract finches, mockingbirds and wrens. Native grasses, such as Big and Little Bluestem or Prairie Dropseed, also benefit wildlife and make a dramatic year-round addition to any landscape.

Shady sites, such as natural woodlands, will be dominated by shrubs and trees and will attract woodpeckers, thrushes and cardinals.

Consult Grow Native!'s web site, www.grownative.org, for more native species and landscaping ideas. You can use the site's "Plant Search" feature to find species that are appropriate for sun or shade and that provide cover, nesting or food sources for birds.

Remember, birds need food, cover *and* water. In addition to native plants, your local Grow Native! member garden center has a variety of additions to consider. Add a birdbath—perhaps with a heating element for winter—birdhouses or supplemental feeders to enhance the quality of your yard's habitat and help ensure birdwatching success any day of the year.

Suggested Species for Your Songbird Station

Perennials

Aromatic Aster - *Aster oblongifolius*
 Lanceleaf Coreopsis - *Coreopsis grandiflora*
 Purple Coneflower - *Echinacea purpurea*
 Western Sunflower - *Helianthus occidentalis*
 Willow-leaved Sunflower - *Helianthus salicifolius*
 Ox-eye Sunflower - *Heliopsis helianthoides*
 Rough Blazing Star - *Liatris aspera*
 Showy Goldenrod - *Solidago speciosa*

Shrubs and Small Trees

Serviceberry - *Amelanchier arborea*
 American Beautyberry - *Callicarpa americana*
 Gray Dogwood - *Cornus racemosa*
 Strawberry Bush - *Euonymus americanus*
 Wahoo - *Euonymus atropurpureus*
 Deciduous Holly - *Ilex decidua*
 Winterberry Holly - *Ilex verticillata*
 Indian Cherry - *Rhamnus caroliniana*
 Sumacs - *Rhus* spp.
 Golden Currant - *Ribes odoratum*
 Elderberry - *Sambucus canadensis*
 Viburnums - *Viburnum* spp.

Trees

Hackberry - *Celtis occidentalis*
 Pagoda Dogwood - *Cornus alternifolia*
 Flowering Dogwood - *Cornus florida*
 Green Hawthorn - *Crataegus viridis*
 American Holly - *Ilex opaca*
 Eastern Red Cedar - *Juniperus virginiana*
 Black Cherry - *Prunus serotina*

Source: Conservationist magazine column – native trees and shrubs with food and cover value for songbirds and other watchable wildlife

Conference Report: Part 3 of 3: AgNIC

By *Suzi Tegtmeyer*

Evans Library of Fruit Science, SMSU

Dear Readers,

In the previous issues I described conferences that took place in the Washington DC area. This last conference of this series took place in Pittsburgh, Pennsylvania, my first visit to this city at the confluence of the Monongahela and Allegheny Rivers, thus forming the Ohio River. The conference was the annual meeting of the Council on Botanical and Horticultural Libraries, Inc. (CBHL).

The members of the CBHL work in information and library centers at botanical gardens, zoos, universities, private industries, and government institutions like the Smithsonian and the U.S. National Arboretum. Each year we hold an annual meeting at one of the member libraries to conduct business and learn from each other through presentations and personal communication. It's also a great opportunity to visit new cities, examine library collections and their organizational systems, and tour book/information related industries in the area.

The Hunt Institute for Botanical Documentation, established in 1961 on the Carnegie Mellon campus, hosted the annual meeting in June, 2004. The core of the Hunt Institute book and art collection was the personal collection of Rachel McMasters Miller Hunt who collected 18th and 19th century botanical books, manuscripts and art, and especially documents pertaining to Carl Linnaeus, who is most famous for developing the Latin naming system of plants that is in use today. The collections of the Institute have grown to over 28,000 books and 54,000 portraits, watercolors, and other artwork, all pertaining to the study of plants and botanists. Visitors worldwide come to the Institute and its library to conduct research, view the exhibits, and consult with the research and library staff.

This year the presentation sessions revolved around the following topics: Exhibitions (how to properly set them up; online exhibits); Journal Publications (access to journals; skyrocketing



prices; online journals); Bibliographies and Indexing; Creative Collection Building (acquiring and organizing book and journal collections); and Preservation and Access (protecting collections for the long term). I've been a member for six years, but this was the first year I presented in one of the sessions. In the Creative Collection Building Session I presented, "Be Brave and Ask: Creative Collection Building Strategies that (may) Work." I shared my techniques of acquiring books, journals, and documents through means of monitoring freebie lists, trading what you have for what you need (bartering), writing grants to buy materials, and, of course, asking people, such as authors, publishers or retired faculty for what you need (note: this is not begging, it is "fulfilling the needs of my library patrons"!). I'm pleased to say that my presentation was warmly received, and I hope to present at future meetings.

This year I also served as parliamentarian during the business meetings. Admittedly, this was more nerve-wracking than presenting as I am not too familiar with *Roberts Rules of Order* (all 704 pages of how-to-conduct-a-meeting). Thankfully there were no controversies and the meeting progressed smoothly.

Outside of the meetings and sessions, we toured many nearby places: Preservation Technologies (a book de-acidification facility); the Rodef Shalom Biblical Botanic Garden (a beautiful, although small garden growing most of the plants mentioned in the Bible); the Andy Warhol Museum (the primary exhibit was "Playing with Nature: Flowers Observed, Flowers Transformed," and had

books from Hunt as part of the exhibit); and the Phipps Conservatory and Botanical Gardens. After the conference proper, many of us toured Frank Lloyd Wright's homes Fallingwater and Kentuck Knob - an opportunity I didn't want to miss.

Bringing home information and experiences and applying them here is the point of attending conferences. As a result of a connection I made at the conference, a fellow member and I have traded documents, thus boosting the quality of information here at Evans Library. I encourage everyone to seek out new experiences then share them with the people around you. We can't all attend every conference, read every book, or try every technique, but sharing an experience with others is the next best thing. In other words, Be Brave, Go



25th Missouri Small Fruit and Vegetable Conference

By Patrick Byers

Fruit Grower Advisor, SMSU

Back to the Basics Tour, February 21, 2005

The program for Back to the Basics 2005 features an informative and entertaining tour of three diverse businesses. The registration fee includes bus transportation for the day, lunch, and refreshments.

- Gordon's Orchard, Osceola, Mo.
- White Oak Berry Farm, Roscoe, Mo.
- Hammons Products Company, Stockton, Mo.

2005 Missouri Small Fruit and Vegetable Conference , February 21-23, 2005

The year 2005 marks the 100th Anniversary of Southwest Missouri State University, as well as the 25th anniversary of the Missouri Small Fruit and Vegetable Conference. To mark these significant events, we have invited **Gaylord Moore** and **Patrick Byers** to present the keynote address "History of Missouri Fruit Production."

Be sure to visit the conference **Trade Show**, which includes vendors offering a wide range of supplies, nursery plants, chemicals and equipment for fruit and vegetable producers. The trade show also includes the "Taste Test Table" of Missouri-produced products.

The Marketing Session is a new feature for the 2005 conference. **Katherine Kelly** and **Bernie Colvis** have real world experiences to share on the topics of pricing strategies and direct marketing. **Suzi Teghtmeyer** will discuss online resources for fruit and vegetable growers. Another new session is the Native and Ornamental Horticulture Session. **Judy Allmon** will discuss the commercial opportunities available for producers of native landscape plants. **Marilyn Odneal** and **Dr. Pamela Trewatha** will expand on the production and landscape use of wildflowers and grasses.

Wayne Roffman returns to the program in 2005 with his experiences in producing and marketing a wide range of vegetables from his farm near Carthage. **Dr. Chuck Marr**, noted vegetable specialist from Kansas State University, will elaborate on recent developments in tomato cultivars and pumpkin pest control. The plant diagnostic clinics at the State Fruit Experiment Station and the University of Missouri are valuable resources for Missouri producers; **Simeon Wright** will discuss procedures at the MU clinic.

Dr. Martin Kaps has many years of experience testing blueberry cultivars at the State Fruit Experiment Station, and he will discuss the latest trial of 12 recently released and standard cultivars. As Missouri enters the fourth decade of commercial blueberry production, we have invited several long time blueberry growers to share production and marketing experiences. Strawberry production is undergoing major changes, and we have invited **Dr. Sorkel Kadir** and **Bernie Colvis** to discuss high tunnel and plasticulture production practices. 2004 was a year of interesting strawberry disease problems, and **Dr. Dan Waldstein**, IPM specialist, will discuss several of these diseases.

The Alternatives session includes a fascinating presentation by **Nicola McPherson** of Ozark Forest Mushrooms on the production and marketing on shiitake mushrooms. **Andy Thomas** and **Patrick Byers** will share practical experiences for producing elderberries.

Two special sessions are planned for the 2005 conference. **The Missouri Farmers Market Association** will meet jointly with the Missouri Small Fruit and Vegetable Conference on February 22. This session will feature several chefs demonstrating cooking techniques for farmers' market participants. A workshop titled "**Human Risk Management, Realities and Resources: The Latino Labor Force in Missouri Agriculture**" will follow the conference on February 23. For additional information, including registration, for the conference, visit <http://mtngrv.smsu.edu/calendar.htm#MSFVC>, telephone 417-926, 4105, or contact Pamela Mayer at SMSU-Mountain Grove, 9740 Red Spring Road, Mountain Grove, MO 65711-2999.

Coming Events

25th Missouri Small Fruit and Vegetable Conference

February 21-23,
Clarion Inn and Convention Center
Springfield, Missouri
For the schedule and registration form, visit <http://mtngrv.smsu.edu/calendar.htm> or contact:
Pamela Mayer
pam621t@smsu.edu 417-926-4105

Tree Fruit Topics for Southwest Missouri

March 3, 6:00-9:00pm
UMC Southwest Research and Education Center
Mount Vernon, Missouri
Contact Patrick Byers
plb711t@smsu.edu 417-926-4105

Missouri Farmers' Market Workshop

Friday, March 18, 2005
(time and place to be finalized soon!)
For more information, contact:
Tammy Bruckerhoff
Tammy.Bruckerhoff@mda.mo.gov 573-751-3394

Grow Native! Connecting the Heartland Conference -Ecology, Culture, Economics

February 17, 2005
Adams' Pointe Conference Center
Blue Springs, Missouri
For more information or registration application, visit www.grownative.org or contact:
Judy Allmon
Judy.Allmon@mda.mo.gov 573-522-4171

Spring Horticulture Seminars

Saturday, April 2, 2005
SMSU - Mountain Grove
For more information contact:
Marilyn Odneal
mbo774t@smsu.edu 417-926-4105
Or check the calendar at <http://mtngrv.smsu.edu/calendar.htm>

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