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**ASSOCIATION NEWS**  
**Valann Budischak**  
**Executive Director, D.A.N.**

The winter of '99 is upon us, and at times you would never know it's winter. The temperature as I write this article is a balmy 59 degrees. In talking with many of our members, this normally slower season is finding you busier than ever! The Delaware Association of Nurserymen is also busier than ever.

The New Year started with a bang for D.A.N. ! The Delaware Horticulture Industry Expo was held January 12<sup>th</sup> -14<sup>th</sup> at the Sheraton Inn in Dover. Many interesting speakers and new and familiar exhibitors participated. Our 1998 Landscape Award winners were presented their plaques and checks at the annual D.A.N. Business Meeting. The winners were as follows:

- Over \$10,000 category – Glen Markley of Wallace Landscape Associates, Inc.
- Under \$10,000 category – Andrew Durham of Andrew Durham & Associates

Please keep our Landscape Awards Program in mind throughout the year and consider submitting an entry. More information will follow throughout the growing and planting season.

Congratulations are in order for D.A.N. member, JB Landscaping in Lewes, DE. JB Landscaping was a National Landscape Association 1998 American Garden Award Winner for the Cerullo Residence project in the Outdoor Living Area category.

Planning has already begun for our 1999 and 2000 Association of Nurserymen events. At the present time, committees are being formed for the 1999 Summer Expo, the '99 Ornamental and Turf Workshop, and the 2000 DHIE. WE

welcome any and all that would choose to join one of these planning committees. The D.A.N. is attempting to reformat some of our events to better meet the various needs of our members. We'd appreciate any feedback you can offer. The Delaware Association of Nurserymen can only grow and events can only improve through member participation and involvement.

Let's enter the new millennium bigger and better than ever!

## **WELCOME NEW MEMBERS**

### **Active Members**

**Martin's Garden Center**  
Rehoboth Beach, DE

**Ace Landscaping Services, Inc.**  
Ocean View, DE

**Berry-Sloan Gardens**  
Bear, DE

**Southern States Milford Coop—Dover Branch**  
Dover, DE

### **Associate Members**

**Signe Hanson, Horticultural Consultant**  
Denton, MD

**Dean Johnston**  
Wilmington, DE

**Daniels Lawn Service**  
Warwick, MD

**Green Edges Lawn Service Inc.**  
Marydel, MD

**U of D NEWS**  
**Susan Barton**  
**Extension Specialist**

The ornamentals short course program for 1999 is underway. We have already taught classes in Soils for Greenhouse and Nursery Production; Nutrient Management for Turf Care, Landscape Maintenance, Nursery Production and Other Horticultural Businesses; and Horticulture on the Web. Diagnosis & Control of Insects and Weeds in the Landscape, Turf Management and Diagnosis & Control of Insects on Woody Ornamental Plants are all coming up in March. Sessions II and III will include Pest Walks and Landscape Troubleshooting Workshops in each county. Look for new brochures in late spring.

Trees Add Life, the new promotional program for garden centers focusing on tree selection, planting and care, will be tested in 25 pilot sites this spring. After conducting several industry focus groups and a survey at the ANLA Management Clinic in February, we have decided on a single banner with a tree graphic that outlines key planting practices. The large full-color banner will be supplemented with tree tags and trunk liners that contain more detailed selection, planting and care instructions. We will survey the pilot sites this spring and report on the effectiveness of this point-of-purchase program. There are three pilot sites in Delaware—Farm Meadows, Lord's Landscaping, Nursery & Garden Center and Gateway Garden Center. If you get a chance, take a look at the banners, tree tags and trunk liners. Then tell us what you think!

We are making progress with "Enhancing Delaware Highways – a roadside vegetation project." Last December we installed woody plants and/or seeds on 4 sites. Installation on 10 additional sites has just gone out for bid. We will start collecting data this spring on plant establishment and horticultural impact. By

comparing different vegetation schemes for Delaware roadways, we hope to prepare vegetation installation and maintenance recommendations that will result in horticultural success, economic feasibility and enhanced public perception of Delaware highways. While this is a long-term project, you may begin to notice interesting plantings along I95 and Route 1 along the coast (and several other sites in DE).

Many thanks to D.A.N. for helping support Garden Check-- a home horticulture publication produced by Delaware Cooperative Extension. The publication is designed to provide seasonal information when Delaware gardeners really need it. A one-year subscription includes 10 issues and costs \$17.50. We are trying to make Garden Check self-sustaining (that's very difficult without advertisements). We came closer to balancing our budget for 1998 than we did in 1997! But we are not there yet. To this end, the D.A.N. Board has provided a grant of \$500 from the Research & Education Fund to supplement the cost of publication. Many D.A.N. members receive Garden Check. Some garden centers post it for customer reference. We have about 900 subscribers now and we think we can reach more interested gardeners in Delaware. If you think your business would be interested in supporting Garden Check (with the business name included as a supporter in each issue), please give me a call (302-831-1375). Bruce Paulish had a great idea. He is a landscaper in Smyrna and on the D.A.N. Board. Bruce plans to give a free subscription of Garden Check to his good customers. He will purchase gift subscriptions from the New Castle County Extension Office (302-831-2506) and use them as thank you gifts. What a great way to promote gardening in Delaware! Bruce says anyone is free to steal his idea.

Helen Waite, Tom Ilvento and I have been working on an urban nutrient management project this winter. We have surveyed certified

applicators, golf course superintendents and athletic field managers. We will survey homeowners with a large Delaware resident mail survey that contains a few nutrient management questions and a customer intercept survey at Agway in New Castle County and sites to be named in Kent and Sussex Counties this spring. We hope to characterize current nutrient management practices in these various sectors and identify areas for additional educational efforts and research projects. The results of this project should provide some good information for the Governor's Council on Nutrient Management. Currently, the landscape industry represents an unknown component of the nutrient puzzle and therefore is often blamed for a greater portion of nutrient runoff than it probably contributes.

The Community Forestry Council has just published a great new resource for the nursery and landscape industry. The Community Forestry Resource Manual lists local, state and national agencies that provide services in the urban horticulture or landscape arena. It also includes sections outlining available materials/publications, newsletters, books and workshops. The final section covers funding sources for urban horticulture projects. If you'd like to receive a copy, please contact the DE Department of Agriculture, Forestry Division.

Congratulations to Val Budischak, D.A.N. executive director for pulling off an incredibly successful, ON BUDGET Delaware Horticulture Industry Expo. I hope every D.A.N. member has a chance to meet Val. When you do, I'm sure you'll be as impressed as I am with her poise and skills. Val and the entire Board are working hard to make the D.A.N. an organization that truly serves its members. It is a pleasure to work with them.

**DELAWARE DEPARTMENT OF  
AGRICULTURE  
PLANT INDUSTRIES NEWS  
Lynn Harrison, Sr. Entomologist**

Spring is nearly here. There are a variety of projects in the making for 1999. The Department of Agriculture (DDA), Plant Industries Section is preparing for spring nursery inspections. Plant inspectors will be visiting retail and field growing operations. At the retail level, inspectors will be looking at nursery stock, packed and bulk seeds, and a variety of other miscellaneous plants. Inspectors will be reviewing nursery stock source lists, conducting insect and disease inspections, and examining labels on all existing seed lots.

The Delaware Seed Law requires that tags on all seed packages, as well as, bulk bin containers be correctly labeled. Required information includes things like, whether the seed is treated; lot number; seed origin; correct weight percentage of weed seed, inert matter, other crop seeds, etc.; germination percentage and test date; the year the seed was packaged; and the name and address of the person who labeled the seed. All this information guarantees you have been sold a valid batch of seed. If someone tries to sell you seed without this information, contact the DDA.

The Department of Agriculture has recently become involved with its first known infestation of fire ants. Samples were collected and positively identified as Red Imported Fire Ants. The exact source of the fire ants is not known. We do know they arrived with a potted azalea plant received as a Mother's Day gift about three years ago. The colony has survived through several winters because the site is well-protected with a southern exposure. An intensive eradication program is currently in progress. We estimate that it will require at least three to four years of monitoring and

treatment to get rid of this colony. They are not easy to deal with by conventional pesticide treatments. Since they are located in a residential area, care must be taken in the selection and use of insecticides. We have already tried various chemicals, stomach poisons, and insect growth regulators, in an attempt to find which method works safest and most efficiently. We noticed a significant reduction in activity after repeated applications of baits. When colony activity ceased last fall, we stopped monitoring for the winter. We initially monitored ant activity two to three times each week. Monitoring surveys will commence again in March when the weather warms.

Plant Industries Section at 800-282-8685 (DE only), 302-739-4811 or 302-697-6287 (FAX) or [lynn@smpt.dda.state.de.us](mailto:lynn@smpt.dda.state.de.us)

Plant inspections of material from southern nurseries will be ongoing in an attempt to prevent other possible fire ant outbreaks. If you receive, or have on hand, any plant shipments from the southeastern United States, be on the alert for aggressive, stinging ant populations. We will be able to assist you with identification of suspect specimens.

The Plant Industries Section has recently become involved with the invasive species issue. Earlier this winter a concerned group of state and federal agencies, private citizens, and environmental organizations, met to discuss the serious impacts of unwanted foreign plant and animal species. The result of this meeting was the formation of the "Invasive Species Council." The council is working to promote public awareness of problems caused by non-native invasive species, to facilitate the exchange of information, to promote the use of locally native species, to encourage support for non-native species prevention and control, and to provide a forum discussion about non-native invasive species. There will be a council meeting March 11, 1999 at the Department of Agriculture.

For additional information, contact the DDA,

**IDEAS FROM SKH**  
**Susan Barton**

Steve Gallion, owner of one of the Stauffer's at Kissel Hill stores in Pennsylvania spoke to Delaware garden center operators at the 1999 Delaware Horticulture Industry Expo. Here are a few of the good ideas he shared with us.

Develop a code of ethics and core values and distribute to every new employee. Employees must know how you feel about customers and business practices. They won't know unless you tell them!

Landscape your properties. Would you go to a dentist with brown teeth?

Get involved with the community. Offer your site for car washes, bake sales and concerts by the high school band. Community service breeds loyal customers and helps you become acquainted with more people.

Feature plants as part of special gardens, i.e. butterfly gardens or container gardens. Get plants off the ground for effective display. Lattice makes a great backdrop for special displays and signs that promote those products.

Try handing out "caught in the act of delighting customers" citations to employees who qualify. Then draw one winner a month to receive \$50. Then draw a yearly winner from the 12 monthly winners and treat him or her to dinner at a nice restaurant. Everyone needs a pat on the back occasionally, especially employees who are doing a good job.

**INSECTS TO HELP MANAGE PURPLE  
LOOSTRIFE**

**Joel Allen**  
**Cornell Cooperative Extension**

There recently have been a great number of questions about, and a fair amount of press coverage on, the pretty purple flower that can be found growing just about everywhere in Columbia County. The flower is purple loosestrife (*Lythrum salicaria* L.) And it has become a very invasive plant throughout much of the northeast. The concern expressed by many landowners, is that this invasive plant, introduced from Europe during the early to mid-1800s, has gained a foothold in the northeastern part of North America, has a competitive advantage over most native wetland plants, and quickly dominates other plant life in the area. According to Dan Carroll, a senior Wildlife Biologist with DEC's Region 8 office in Western, NY, "Purple loosestrife has consequently degraded many prime wetland habitats throughout the state by significantly reducing the diversity of native vegetation and the associated species of wetland wildlife." Because this plant has become so invasive and difficult to manage (and impossible to eliminate), DEC has embarked on a campaign to try to determine what methods might be effective in reducing the plant's population and/or just keeping it in check.

An article by Carroll that appeared in the August 1994 issue of Conservationist magazine listed several methods to help manage purple loosestrife. They include: pulling, mowing, burning, flooding, disking, and chemical and biological treatment. Some of these methods are difficult, costly, and/or temporary. The only method that has seemed to show any long-term results has been the biological method that uses natural enemies to manage the weed. What they have discovered are several insect pests that

have been found to attack and feed only on purple loosestrife.

In doing some additional research, I learned of the Biological Control of Non-Indigenous Plant Species Program in the Department of Natural Resources at Cornell University. Directed by Dr. Bernd Blossey, this program is designed to develop methods and strategies that deal with non-indigenous plants to New York State including the invasive purple loosestrife. Dr. Blossey is indeed raising these natural enemies of the purple loosestrife. They include four species of European insects: one root-mining weevil, one flower-feeding weevil, and two leaf-feeding beetles. A number of these insect pests have been released via DEC around the state over the past few years and good results are beginning to show up.

There are two specific times, or windows, when these insects can be released in New York State, according to Blossey: a spring window and an early July window. These insect pests can be ordered directly from Dr. Blossey, but he indicates that he always sells out each year long before he meets the demand. The cost of the beetles depends on the release date. Beetles for spring release are \$1.00 per beetle and the recommended release size is no less than 1,000 beetles. Beetles for the summer release are \$.025 per beetle while the recommended release size is no less than 5,000 beetles. Those for spring release are ready to oviposit and the impact will be nearly immediate on the purple loosestrife they attack. Those beetles for summer release are new generation beetles that will feed for only a limited time and then prepare for overwintering. The larger size of the summer release helps insure greater success in overwintering the beetles. The beetles are shipped overnight using Federal Express. Dr. Blossy states there is no minimum area size required for the release of these beetles, "20 plants are good enough, although I might reduce

the numbers to be released somewhat." He further states "that the smaller the area treated, the quicker the control will be, and besides, it is easier to find the beetles in half an acre than in 50 acres."

Those interested in learning more about these beetles and possible purchasing them, should contact Dr. Bernd Blossey by letter at: Biological Control of Non-Indigenous Plant Species Program, Dept. Of Natural Resources, Fernow Hall, Cornell University, Ithaca, NY 14853-3001.

In the meantime, homeowners, gardeners, landscapers, and all landowners are strongly discouraged from planting or transplanting purple loosestrife anywhere.

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## **PLANTS DEER TEND NOT TO EAT**

**Nicole C. Lemieux and  
Dr. Brian K. Maynard  
Sustainable Landscapes Program,  
Department of Plant Sciences,  
University of Rhode Island**

A problem that has plagued many parts of the nation is deer browsing on ornamental plants. In a survey recently sent by the University of Rhode Island (URI) to 1200 growers in the Northeast, over 65% of returns reported that they have a deer problem. In light of this problem, the URI Sustainable Landscapes Program is addressing the need for deer control strategies and is testing the efficacy of commercial repellents. In addition, we are working on the development of an Integrated Pest Management (IPM) approach to deer control.

An IPM approach is crucial in our battle with deer foraging and damage in the landscape and nursery industry. Nursery and homeowners grow increasingly exasperated with the failure of control methods. However, we believe that if IPM principles are applied to the use of these control methods, efficacy will increase dramatically. It is important to follow some simple steps in analyzing each situation and developing a deer IPM control plan.

### **I. Define Your Management Objectives**

In choosing an appropriate strategy, it is necessary to identify individual expectations, limitations, and thresholds. Answering the following questions will help pinpoint appropriate control methods: How much damage can be tolerated? How much money can you afford to spend on controls? How much damage is there? What are short-term and long-term goals?

### **II. Analyze Your Site**

Deer damage can vary widely. Document timing of damage, intensity of damage, which plants are damaged, where the deer are coming from, and where in your nursery or landscape browsing is taking place. Sometimes the problems can be solved by simply relocating preferred plants to one central location and using repellents, scare tactics, and/or physical barriers.

### **III. Develop A Plan/Strategy**

Strategies include future planning and phasing in control tactics. Consider your deer problem when planning future crops and locations. Budget for appropriate control strategies. Some situations may call for a temporary control such as a scare tactic until fencing or repellents are implemented.

### **IV. Use Pest Management Decision Tools**

Like any other pest problem, an Integrated Pest Management approach is the key to success. It is important to be aware that the nature of deer damage can change from season to season, year to year, and is seldom identical in various locations. The IPM approach, using several tactics in combination, offers the flexibility and variety needed. Deer adapt just as we do and can overcome control methods. Because of this, we have to be willing and able to change methods when need be. In addition, it is a good idea to alternate the use of repellents, when possible, in order to prevent deer from adapting to them.

### **V. Network**

Everyone with a deer problem will benefit from communication. It is important to ask questions and share information about successful and unsuccessful approaches. Stay informed about

new products and methods. Unnecessary damage can be avoided by timely and effective communication between professionals. However, understand that each herd and every deer is individual and differs in habits and patterns. A strategy that was not successful for one person may well be the best for another.

An important element of the IPM approach is the awareness of preferred and non preferred plants. There are several lists available. However, they should be considered with a grain of salt. Deer preferences vary from herd to herd and especially from region to region. It is best to supplement these lists with local opinions from nursery and landscape professionals. By analyzing various lists and combining them with information from our recent survey, we have put together a least-preferred plant list. We plan to continue to update this list with opinions from other professionals. We invite comments from all. Please send comments to the above address, or via the Sustainable Landscapes web site: [www.uri.edu/research/sustland/](http://www.uri.edu/research/sustland/)

#### Plants Least-preferred by Deer

##### Trees

*Acer saccharinum* (Silver maple)  
*Acer platanoides* (Norway maple)  
*Cornus kousa* (Kousa dogwood)  
*Cornus florida* (Flowering dogwood)  
*Crataegus* spp. (Hawthorn)  
*Cryptomeria japonica* (Japanese cedar)  
*Fraxinus americana* (White ash)  
*Ilex opaca* (American holly)  
*Liquidambar styraciflua* (Sweetgum)  
*Picea glauca* (White spruce)  
*Picea pungens* (Colorado spruce)  
*Picea abies* (Norway spruce)  
*Pinus mugo* (Mugo pine)  
*Pinus thunbergiana* (Japanese black pine)  
*Pinus sylvestris* (Scotch pine)  
*Populus* spp. (Poplar)

*Pyrus communis* (Common pear)

##### Shrubs

*Amelanchier* spp. (Serviceberry)  
*Berberis* spp. (Barberry)  
*Buddleia* spp. (Butterfly bush)  
*Buxus sempervirens* (Boxwood)  
*Caryopteris* spp. (Blue mist)  
*Clethra* spp. (Sweet pepperbush)  
*Cotinus coggygria* (Smoke tree)  
*Cotoneaster* spp. (Cotoneaster)  
*Cytisus* spp. (Broom)  
*Enkianthus campanulatus* (Refvin enkianthus)  
*Forsythia* spp. (Forsythia)  
*Hibiscus syriacus* (Rose of Sharon)  
*Juniperus virginiana* (Eastern red cedar)  
*Lagerstroemia* spp. (Crape myrtle)  
*Mahonia* spp. (Mahonia)  
*Myrica* spp. (Bayberry)  
*Pieris japonica* (Japanese pieris)  
*Potentilla* spp. (Cinquefoil)  
*Sassafras albidum* (Sassafras)  
*Spiraea* spp. (Spiraea)  
*Vitex* spp. (Chaste tree)  
*Yucca* spp. (Yucca)

##### Herbaceous

*Achillea* spp. (Yarrow)  
*Aconitum* spp. (Monkshood)  
*Agapanthus* spp. (Lily of the Nile)  
*Ageratum* spp. (Floss flower)  
*Allium* spp. (Allium)  
*Allium schoenoprasum* (Chives)  
*Anaphalis triplinervis* (Pearly Everlasting)  
*Anemone* spp. (Windflower)  
*Aquilegia* spp. (Columbine)  
*Arabis* spp. (Cress)  
*Armeria maritima* (Sea Pink)  
*Artemisia* spp. (Artemisia)  
*Astilbe* spp. (Astilbe)  
*Aubrietia* spp. (False Rockcress)  
*Calendula* spp. (Pot Marigold)  
*Campanula carpatica* (Harebell)  
*Campanula medium* (Canterbury Bells)  
*Chrysanthemum* spp. (Daisy)

*Coreopsis* spp. (Coreopsis)  
*Cynoglossum nervosum* (Houndstongue)  
*Delphinium* spp. (Delphinium)  
*Dicentra* spp. (Bleeding Heart)  
*Digitalis* spp. (Foxglove)  
*Dryopteris* spp. (Wood Fern)  
*Festuca* spp. (Fescue Grass)  
*Gaillardia* spp. (Blanket Flower)  
*Helleborus* spp. (Lakespur)  
*Hesperis matronalis* (Dame's Rocket)  
*Hyacinthoides* spp. (Hyacinth)  
*Hypericum* spp. (St. John's Wort)  
*Iris* spp. (Iris)  
*Linaria maroccana* (Toad Flax)  
*Lupinus* spp. (Lupine)  
*Lychnis* spp. (Rose campion)  
*Mentha spicata* (Spearmint)  
*Moluccella laevis* (Bells of Ireland)  
*Narcissus* spp. (Daffodils)  
*Nephrolepis* (Sword fern)  
*Nepeta* spp. (Cat Mint)  
*Origanum* spp. (Majoram)  
*Paeonia lactiflora* (Peony)  
*Papaver orientale* (Oriental poppy)  
*Perovskia* spp. (Russian sage)  
*Polygonum vulgare* (Tansy)  
*Pteridium* spp. (Bracken)  
*Pulsatilla vulgaris* (Pasque flower)  
*Rosmarinus officinalis* (Rosemary)  
*Salvia* spp. (Sage/salvia)  
*Santolina* spp. (Lavender cotton)  
*Sedum kamtschaticum* (Yellow stone crop)  
*Stachys byzantina* (Lamb's ear)  
*Teucrium* spp. (Germander)  
*Trillium* spp. (Trillium)  
*Woodwardia* spp. (Chain fern)

### Ground Covers

*Calluna* spp. (Heather)  
*Erica* spp. (Heath)  
*Ajuga reptans* (Carpet Bugle)  
*Lavandula angustifolium* (Lavender)  
*Manzanita* (Bearberry)  
*Thymus* spp. (Thyme)  
*Vinca minor* (Myrtle)

*Zantedeschia* spp. (Calla lily)

### Vines

*Lonicera* spp. (Honeysuckle)  
*Wisteria* spp. (Wisteria)

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## MANAGING FAMILY BUSINESSES

Susan Barton

George Koziarz, a business consultant to the nursery and landscape industry gave an interesting talk at a Long Island nursery conference this winter. I especially liked the advice he had for handling multiple generations in a family business. Koziarz believes “generation 2” kids need to have the freedom to make decision, so they can become good leaders. He suggests the following rules of engagement:

1. You must finish college. The degree doesn't matter but college teaches them how to finish something.
2. Find employment on your own.
3. Be promoted to a managerial position where you work.
4. Then you may return home to the family business. Your experience outside the business will give you more to contribute when you come home.

Koziarz also cautions that the compensation should match the responsibility and not the relationship. Nothing harms morale at a company more than “generation 2” kids who are not performing up to par.

# UNDERSTANDING, IDENTIFYING, AND TREATING WINTER INJURY TO WOODY PLANTS

**Jeff Iles**  
**Department of Horticulture**  
**Iowa State University**

Winter injury is the term used to describe tissue damage or death after plants are exposed to harsh winter weather. The causes of winter injury are many, however low temperature or dramatic temperature fluctuations, and several physical forces associated with ice and snow loading are the main culprits. Even damage resulting from the use of deicing salts and the activity of mice and rabbits can be considered a kind of winter injury.

## **Acclimation and Tolerance to Low Temperature**

Trees, shrubs, and even some herbaceous perennial plants exhibit dramatic seasonal differences in their ability to tolerate low temperatures. For example, *Hedera helix* 'Thorndale' (English ivy) will tolerate temperatures as low as -30 F when at maximum hardiness during mid-winter, but is easily killed by temperatures near 25 F during the summer. This transformation from unhardy to hardy condition is called acclimation. The process is initiated by shortening daylength in the fall, but acclimation to very low temperatures typically encountered in midwinter happens gradually, taking place with increasing exposure to subfreezing temperatures.

Trees and shrubs adapted to the region in which they are planted, and those that achieve full acclimation before the onset of severe cold, will usually escape winter with little or no damage. But winter injury manifested as injury or death of flower buds, bark splitting twig and branch

dieback, root death, and/or death of the entire plant can occur when winter temperatures are lower than normal; low temperatures occur in early fall before plants have acclimated or in late spring after deacclimation; or when dramatic winter temperature fluctuations occur during the dormant period so that dormancy is broken and plant tissues are damaged.

Woody plants most likely to suffer winter injury are those that are marginally hardy for the area, or those that enter winter already weakened by previous stress. If plants with marginal hardiness are used, they should be planted in protected sites (courtyards, sheltered areas, eastern exposures, etc.). To encourage the fall hardening process, late-summer pruning and fertilization should be avoided. Plants that deacclimate in response to warm late-winter temperatures should be planted on northern or eastern exposures to slow their early season development.

## **Browning of Evergreens**

Conventional wisdom states that winter injury on conifers and other broad-leaved evergreens often called desiccation injury, occurs when foliage transpires water on sunny, windy days during the winter when temperatures are above freezing. If the soil is frozen, transpired water cannot be replaced and the tree suffers desiccation stress (foliage browning and tissue death). Certainly, this kind of winter desiccation can occur in early spring when the foliage is actively losing water and the soil is still frozen, however, researchers have shown water loss alone in midwinter does not cause foliar browning. Instead, recent studies suggest a complex combination of environmental stresses causes foliar symptoms associated with winter injury on conifers.

Winter browning results from the interaction of injurious minimum temperatures, frequent

freeze/thaw cycles, and rapid cooling and thawing rates. These conditions are more apt to be found on portions of the plant that intercept the most sunlight during the winter months, and explains why "browning" or "burning" is usually found on the south or southwest side of conifers. Therefore, the key to reducing this type of winter injury is to minimize foliar temperature extremes for injury-prone plants. Planting sensitive species in sheltered locations, providing tough companion plants like spruce to shield tender plants, or screening plants with burlap or snow fence can help prevent unsightly foliar browning. Landscape managers should avoid the temptation to prune browned areas from evergreen trees and shrubs in early spring since these branches may still have viable buds that will produce new foliage when growth resumes.

### **Sunscald**

Characterized by bark splitting and the formation of isolated dead areas on the south or southwest side of tree trunks, sunscald is most frequently associated with small-diameter, thin-barked shade and ornamental trees such as maple, ash, linden, and crabapple. Sunscald injury is thought to occur when bark surfaces are warmed by winter sunlight and then frozen rapidly when temperatures drop sharply at night. Bark and cambial tissues killed by this rapid freezing may result in discoloration or a sunken area on the bark. Insects also are often associated with sunscald injury. Trunk protecting materials like white fabric tree wrap may provide some relief from this type of injury, although scientific studies have never clearly proven this claim. Instead, tree specialists now believe preventing wounds to tree trunks, following proper branch removal techniques that avoid injuring the branch collar, and leaving lower branches on young trees are more effective strategies for preventing sunscald. At

present, there are no effective treatments for ameliorating existing sunscald injuries.

## **Damage from Deicing Salts**

Deicing salts, primarily sodium chloride, can injure or even kill many species of trees, shrubs, and turfgrass. Symptoms of salt damage appear in spring and early summer and include browning of evergreens, leaf scorch, and dieback of deciduous trees and shrubs, and dead areas in turf. Damage from aerial salt deposits or excessive levels of salt in the soil can be mitigated by: (1) replacing traditional deicing salts with abrasives (sand) or alternative deicers that do not contain sodium or chloride, (2) calibrating salt spreaders so that only what is needed is applied, (3) eliminating wasteful hand spreading, (4) irrigating soils to leach sodium and chloride before commencement of spring growth, (5) applying gypsum (calcium sulfate) to the soil which decreases sodium buildup by displacing it with calcium, (6) instructing snow removal crews to never pile snow into tree and shrub beds, (7) protecting plants subject to salt spray with burlap barriers, and (8) using salt-tolerant species for sites where salt stress may be a problem. Baldcypress, Colorado spruce, English oak, European larch, honeylocust, horsechestnut, littleleaf linden, Norway maple, red oak, and white ash are examples of salt tolerant tree species.

## **Injury from Snow and Ice**

Ice loading, and to a lesser extent, snow loading can result in weight accumulation on tree limbs causing branch failure. In fact, accumulations of ice can increase the branch weight of trees by 30 times or more! Multi-stemmed evergreens such as arborvitae, juniper, and yew also may be damaged by the weight of snow and ice. Limb breakage on evergreens can be prevented by tying branches together with twine or strips of cloth or fabric. These materials are secured to the main stem and wound spirally upward to the top and back down to compress the shrub's size. If ice accumulates on trees and shrubs, branches

can be supported to prevent damage. Ice encased branches should not be disturbed since attempts to physically remove the ice can cause additional injury. Heavy, wet snow should be carefully brushed off of injury-prone plants before it freezes to limbs and branches. Any branch that suffers injury should be pruned back to the main stem to promote rapid wound closure.

## **Animal Damage**

Feeding damage from animals like mice and rabbits is most problematic during winters where there is prolonged, heavy snow cover. The bark and young stems of apple, crabapple, hawthorn, euonymus, and viburnum are preferred delicacies, however, almost any plant might become a feeding station if other food is scarce. Rabbits generally feed on the bark above the snow, while mice tunnel under the snow to feed near ground level. Partial girdling of trunks and stems creates favorable sites for insect and disease activity and weakens the plant by compromising its vascular system. Complete girdling of stems can cause plant death. Feeding can be deterred by protecting trunks, stems, and low branches with screen wire or hardware cloth that is buried below the ground line and extends well above the expected snow line. Trees and shrubs with girdling injury will enter the growing season in a weakened state, and therefore eliminating any further wounding and paying close attention to their moisture needs is of paramount importance. Wound dressings, pruning paints, and fertilizers do little if anything to help the injured plant and are not recommended. High value plants that have been completely girdled can be bridge-grafted to restore the vascular connection between the roots and plant canopy.

## **Mitigating Winter Injury**

Winter injury may not be immediately apparent when plants resume growth in the spring. Some plants may actually leaf out and appear quite normal for a time, only to decline and die later during stressful summer conditions. To minimize unsightliness and promote plant health, dead branches should be pruned out as they die.

Providing appropriate amounts of water to compromised plants may be the most important task for landscape managers. Plants already suffering from winter injury may die quickly if forced to cope with drought stress. Mulching the area around trees and shrubs with organic materials like wood chips or shredded bark will help conserve soil moisture and keep lawn maintenance equipment away from sensitive bark and stem tissue.

Finally, it is important to remember that fertilizer is not a cure-all for winter-injured plants. If a soil test determines that mineral elements are deficient, then applying an appropriate fertilizer makes perfect sense. But high rates of fertilizer will not miraculously close sunscald wounds, restore life to killed roots or buds, or reverse any of the other negative effects brought on by the winter of 1996.

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## **BITTERCRESS MANAGEMENT IN CONTAINER NURSERY PRODUCTION**

**Jeffrey Derr, Weed Scientist,  
Virginia Tech at HRAREC**

Through funding from the Virginia Nursery and Landscape Association, I am continuing my efforts to improve weed management in nursery production. One important weed in container production is bittercress (*Cardamine* spp.). I have learned through my studies that there are at least two species of bittercress that can infest container stock. I have devoted several studies this year to develop management strategies for this weed.

Bittercress is in the mustard family and behaves primarily as a winter annual. In cool, wet sites, however, it can be found during the summer months. The container environment is well suited to this plant.

Bittercress germinates primarily in fall and spring. Plants develop with a basal rosette. Leaves are pinnately compound with one to three pairs of leaflets. Plants produce small flowers with four white sepals.

Flowering occurs generally in mid to late spring. The cigar-shaped fruit will throw seed several feet when mature. Since the plant can throw seed over five feet, and since seed readily germinate once reaching soil, this species can rapidly infest a container nursery.

Bittercress is relatively easy to hand weed from containers, especially when small. Due to movement of seed, however, bittercress will reinfest a site that has been hand weeded. I have been investigating preemergence and postemergence herbicides for control of bittercress. In my preemergence studies, the broadleaf herbicides Gallery and Goal, and the combination products that contain these herbicides, such as Rout and Snapshot, have

provided good to excellent bittercress control. Ronstar has also provided good control. The commonly-used grass herbicides, such as Surflan, Pedulum, and Factor, are providing much lower levels of control. This is of concern to growers of perennials, since the more effective broadleaf compounds cannot be used due to injury concerns. Goal and Basagran have controlled emerged bittercress.

Based on my results, a good strategy for managing bittercress in woody nursery stock is using a preemergence broadleaf herbicide in late summer or early fall. Since annual bluegrass can also germinate at this time, I would add a preemergence grass herbicide for improved weed control. The treatment should be repeated in spring after a hand weeding. Reduce excessive irrigation and maintain good drainage around containers since this weed grows best in moist conditions. Bittercress control in herbaceous plants becomes more difficult since we are generally limited to grass herbicides. Use Gallery or Snapshot where tolerance exists. Otherwise, hand weeding will be necessary for control of plants that escape the preemergence application.

Selective postemergence control of bittercress can be accomplished in dormant conifers using Goal. Due to injury concerns with the available products, postemergence control will not be an option for most other nursery crops.

Reprinted from *VNLA Newsletter*,  
September/October 1998.

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## **MONARDA AND POWDERY MILDEW RESISTANCE**

**Richard G. Hawke, Coordinator of Plant Evaluation Programs, Chicago Botanic Garden**

Monarda is undeniably one of the showiest summer-blooming perennials, and the flash of its vibrant-colored flowers is positively captivating. But is also notorious for its bad habits--invasiveness and a predisposition to powdery mildew. While those may be reasons enough to keep your distance, it can be difficult to resist its floral charms.

Beebalm and bergamots are great perennials for meadows and wild gardens, along streams and ponds, in woodlands and also in the garden boarder. The boldness of beebalm makes it equally good for massing or as an accent, and it mixes well with other summer perennials such as phlox, iris, daylilies and yarrows. The long season of color attracts bees, butterflies and hummingbirds in July and August, and will capture your attention as well.

We learned a great deal about Monarda in four years. We observed that powdery mildew was a serious disease and that many beebalms are susceptible to it, but we also discovered that a handful of cultivars are resistant. We measured the abundance and brilliance of flowers produced each summer and saw how they attracted bees, birds, butterflies and people. We tracked the rapid outward growth of stems by underground rhizomes. And in the end, we admitted that we liked Monarda.

There are many Monarda cultivars currently available in the U.S. with new selections still arriving from Europe. The 1997-98 edition of The RHS Plant Finder lists 61 hybrids or cultivars of Monarda available in England. Unfortunately, many nurseries in the United States offer a limited list of beebalm cultivars

and are only beginning to sell the newer selections. We found that a number of the most commonly available cultivars were also some of the lowest-rated plants, for example, 'Beauty of Cobham' and 'Croftway Pink'. Final ratings were based on resistance to powdery mildew, plant health, flower production and winter hardiness. Plant health was measured by the degree of powdery mildew, leaf spot or rust and stem vigor during the growing season and following each winter. A lesser rating in one category may not have affected the overall rating significantly, whereas low ratings in more than one category often significantly decreased the final rating.

Ten cultivars were outstanding in over-all performance, receiving at least a four-star rating: 'Blue Wreath', 'Colrain Red', 'Falls of Hill's Creek', 'Gardenview Scarlet', 'Marshalls Delight', 'Ohio Glow', 'Raspberry Wine', 'rose Queen', 'rosy-Purple' and 'Violet Queen'. These cultivars exhibited powdery mildew resistance, strong habits, high flower production and low winter injury.

Our trial was a bit unnatural because so many beebalms were grown in close proximity, which is something that would probably not happen in a home garden. It was certainly a contributing factory to the high levels of powdery mildew. But this environment also made the mildew-resistant cultivars stand out. Taxa that exhibited the best mildew resistance were 'Colrain Red', 'Marshalls Delight', 'Purple Mildew Resistant', 'Raspberry Wine', 'Rose Queen', 'Rosy-Purple', and 'Violet Queen', and *M. fistulosa* f. *albescens*. The highly rated 'Marshalls Delight' became the benchmark for measuring powdery mildew resistance because of its low level of mildew infection. Although 'Purple Mildew Resistant' was completely resistant to powdery mildew, it was an inferior plant because of its susceptibility to rust.

The final determination of mildew resistance will occur in your own garden, but we can offer several recommendations to improve the performance of beebalm. Powdery mildew can be lessened by selecting mildew-resistant cultivars, increasing air movement between plants, minimizing overhead watering, and removing diseased leaves each fall. Cutting stems to the ground after flowering and dividing plants every few years can further enhance plant health and vigor.

#### Reading List:

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Reprinted from *Landscape Plant News*, Volume 9, No. 3, 1998

## RECOGNIZING NUTRITIONAL PROBLEMS

### Bill Cook

Everyday growers take the time to evaluate their crops to see how well they are growing and to catch possible problems before they get out of hand. This investigation is critical to your success as growers, so I want to take this opportunity to cover some of the basics of recognizing nutritional problems.

What you are usually looking for as you survey your greenhouses are symptoms of a problem. A symptom can range from clear, subjective evidence of physical disturbance or disease, to only a slight indication of something not being quite right. When you see symptoms that you feel are nutritionally-related you want to ask yourself the following questions:

Did the symptom appear overnight? Nutritional symptoms usually develop over time, although some toxicities, like Boron toxicity, can show up every quickly.

What is the location of the problem? Are there different symptoms depending on the location in the greenhouse or bench? Is a different growing media or fertilizer used in these areas compared to where symptoms don't occur or are less noticeable?

Are the symptoms uniform or randomly patterned? Uniform symptoms over the entire area can be indicative of macronutrient (N-P-K) problems. Random patterns are an indication of possible pH-related micronutrient problems.

Have there been any recent environmental changes? Plant damage/death symptoms from diseases or misapplied chemicals are easily confused with nutritional symptoms. Phytotoxicity symptoms usually appear within a week of a pesticide application, but can

sometimes take longer, so keep accurate application records and check to see if any correlation exists. Look for patterns of spray application such as banding, spotting, side damage, damage crossing leaf veins. Nutritional symptoms tend to be located between veins.

Do you see one single symptom or are there multiple symptoms present? Multiple symptoms can indicate multiple causes, or you may just be seeing changes as symptoms progress over time.

Once you've taken the time to evaluate the symptoms you see, with the previous questions in mind, and you believe you have a nutritional problem, the key below can be used to help zero in on the possible cause. Keep in mind that diagnosing a plant disorder can be tricky, even when you know what questions to ask and where to look. When in doubt, if the problem is wide spread or severe or just to back up your own evaluation, I suggest sending out media and tissue samples for testing by a commercial lab.

## Key to the Classical Symptoms of Various Nutrient Problems

Modified from Greenhouse Operation and Management, P.V. Nelson, Prentice Hall

- A. The dominant symptom is chlorotic foliage
  - 1. The entire leaf blade is chlorotic
    - a. Only the lower leaves are chlorotic followed by necrosis and leaf drop - *Nitrogen deficiency*
    - b. Leaves on all parts of plant are affected and some times have a beige cast - *Sulfur deficiency*
  - 2. Yellowing of leaves takes form of interveinal chlorosis
    - a. Only recently mature or older leaves exhibit interveinal chlorosis- *Magnesium deficiency*
    - b. Only younger leaves exhibit interveinal chlorosis. This is the only symptom. - *Iron deficiency*
  - 1. In addition to interveinal chlorosis on young leaves, gray or tan necrotic spots develop in chlorotic areas. Green areas may extend short distance from veins. - *Manganese deficiency*
  - 2. While younger leaves have interveinal chlorosis, the tips and lobes of leaves remain green followed by veinal chlorosis and rapid, extensive necrosis of leaf blade. - *Copper deficiency*
  - 3. Young leaves are very small, sometimes missing leaf blades altogether, internodes are short giving a rosette appearance. - *Zinc deficiency*
- B. Leaf chlorosis is not the dominant symptom
  - 1. Symptoms appear at base of plant
    - a. At first all leaves are dark green, and then growth is stunted. Purple pigment often develops in leaves, particularly older leaves. - *Phosphorus deficiency*
    - b. Margins of older leaves become chlorotic and then burn, or small chlorotic

spots progressing to necrosis appear, scattered on old leaf blades.

-*Potassium deficiency*

-*Boron toxicity* - poinsettia, Rieger begonia

2. Symptoms appear on recently matured leaves

a. Leaves edges yellow and then burn. Leaf margin may roll upward

-*Molybdenum deficiency* - poinsettia

b. Leaves burn inward from margins  
-*Boron toxicity* - chrysanthemum

3. Symptoms appear at top of plant

a. Terminal buds die, giving rise to a witches broom. Young leaves become very thick, leathery and chlorotic. Rust colored cracks and corking occur on young stems, petioles and flower stalks. Young leaves are crinkled. - *Boron deficiency*

b. Margins of young leaves fail to form, sometimes yielding strap-leaves.

Growing point ceases to develop, leaving a blunt end. Light green color or uneven chlorosis or young tissue develops. Root growth is poor in that roots are short and thickened. - *Calcium deficiency*

Reprinted from *Gro-Gram*, Maryland Plants and Supplies, Inc., Vol. 6, No. 4, Winter 1998.

## Pesticide News

### Insecticides

DISTANCE (pyriproxyfen) - Valent - received EPA label to use on ornamentals grown in greenhouses, lathouse and shadehouses to control whiteflies, fungus gnats, shore flies, leafminers and scale.

LINDANE - Drevel - Due to high cost of registration all usages will be deleted from the label except for seed treatment (effective 3-29-99).

CGA-215944 (pymetrozine) - Novartis - Registration is pending in 1999 for use on ornamentals as a foliar spray or soil drench to control sucking insects.

FLORAMITE -32.6% UP (bifenazate) - Uniroyal - Registration is pending in 1999 to control mites on ornamentals.

ICON (buprofezin) - Agro Evo - Registration is pending in 1999 for use on ornamentals. It will be marketed by the Scotts Company.

KNACK (pyriproxyfen) - Valent - Being developed for usage on ornamentals and various fruit, nut and vegetable crops.

PFR-97 (*Paecilomyces fumosoroseus*) - Olympic Hort - A biological insecticide currently registered in FL on ornamentals to control whiteflies, mites and thrips. A national label is anticipated.

PYLON (chlorfenpyr) - American Cyanamid/Olympic - Registration is pending for usage on ornamentals to control mites and thrips.

PFR-MUP/PFR-97 WDG (*Paecilomyces fumosoroseus* Apopka strain 97) - Thermo Trelogy - EPA approved and application to register this bioinsecticide to control whiteflies, aphids, thrips and spider mites on ornamentals and non-food crops in greenhouses and interiorscapes.

CASCADE (fonophos) - Zeneca - This turf insecticide has been voluntarily withdrawn from the market due to the high cost of re-registration.

KELTHANE (duofol) - Rohm & Haas - The company has notified EPA that it will cancel all residential usages from its labels.

OFTANOL (isofenphas) - Bayer - Due to the high cost of re-registration the company has voluntarily proposed to cancel the registration for this turf product. This will be effective on the 2E registration on 9-30-99 and the technical registration on 12-31-99.

RELAY 50WG (pymetrozine) - Novartis - Being developed to control whiteflies and aphids in landscape ornamentals and non-bearing fruit and nut tree nurseries.

TRIMPH (isazophos) - Novartis - This turf insecticide has been voluntarily withdrawn from the market due to the high cost of re-registration.

## **Fungicides**

TX-1 (Pseudomonas aureofaciens) - Eco-Soil - A bio fungicide being developed for use on turf to control various diseases.

CHIPCO-26019 (iprodione) - Rhone-Poulenc - the company has agreed to delete from their label, all residential uses of this product.

CYGNUS (kresoxim-methyl) BASE - Received EPA approval to use on greenhouse ornamentals to control powdery mildew.

DECREE 50 WDG (fenhexanid) - Se Pro - Being developed for usage on ornamentals to control Botrytis.

FLINT/CGA-279202 (trifloxystrobin) - Novartis - A new fungicide being developed on ornamentals and other crops to control powdery mildew and leaf spots.

HERITAGE (agoxystrobin) - Zeneca - Received EPA approval to use for disease control on lawn care and on sports turf. Previously it was only registered on golf courses. Sod farms.

COPPER NAPHTHENATE - Due to high cost of re-registration. The interior usage of this product will be dropped from the label of those people who market the products. This also applies to zinc naphthenate.

CAMELOT (copper salts of fatty and rosin acids) - Griffin - A new formulation developed for usage on ornamentals.

JUNCTION (mancozeb/copper hydroxide) - Griffin - A new formulation developed for usage on ornamentals and turf.

PRE STOP (Gliocadium catenulatum) - Kemira Agro - This bio-fungicide was formerly named Primastop. It is being developed to control Pythium and Rhizoctonia on vegetables and ornamentals.

MONSANTO - The company announced a toll manufacturing agreement with Dow AgroSciences to the rights to glyphosate registration data on a world wide basis except for Japan. Dow will be able to register its own brand of glyphosate and it can be used on Round-Up Ready Crops. Lawn and garden uses were not included.

## **Herbicides:**

BARRIER (dicolobenil) - PI Gordon - A new label recently introduced for usage on ornamentals. It is a 4% granule.

TUPERSAN (siduron) - PBI Gordon - Additions to the label include Bermuda grass suppression in bentgrass golf greens and the usage on roadside slopes and other areas applied via hydro-seeding.

ENVOY (clethodim) - Valent - Received EpA registration to use on conifer trees for grass control.

## **Miscellaneous:**

B-NINE (daminozide) - Uniroyal - Label changes for this growth regulator indicate the usage in container grown ornamentals in greenhouses and shadehouses as well as outdoor grown plants as long as they are grown in containers.

GAME STOP (fish oil) - Therae Corp - the EPA approved an application to register this new active ingredient to apply to foliage and twigs of trees, shrubs and ornamental plants to repel deer and rabbits.

# Research Briefs

## *Propagation:*

### **Propagation of Thuja x 'Green Giant.'**

'Green Giant' arborvitae is a narrow, upright, pyramidal evergreen tree with a rapid growth rate, and lustrous dark green foliage. It has no major pest problem and is not eaten by white tail deer. Results of this study demonstrate that asexual propagation of Thuja x 'Green Giant' by stem cuttings is rapid and efficient. Moreover, cuttings root in high percentages throughout the year, reducing the importance of growth stage as a factor in successful rooting. Hardwood cuttings, which are less perishable and inexpensive to handle, consistently rooted > 95% regardless of cutting type or auxin concentration. (J.J. Griffin, F.A. Blazich and T.G. Ranney)

Excerpted from *J. Environ. Hort.* 16(4):212-214. December 1998.

## *Plant Selection:*

**Red maple selections for color and potato leaf hopper (PLH) resistance.** Forty selections and cultivars of red maple and Freeman maples were evaluated in Maryland over a three year period. The best red color was exhibited by 'Autumn Flame,' 'Brandywine,' 'Cumberland,' 'Red Rocket,' 'Sun Valley,' 'Somerset' and 'Van.' 'Jeffersred' had the best red fall color among the Freeman maples. The Freeman maples generally had better PLH resistance. Clones that flush early in the spring have better PLH resistance than later flushing clones. (A. M. Townsend and L. W. Douglass)

Excerpted from *J. Environ. Hort.* 16(4):189-194. December 1998.

**'Petite Delight' Monarda.** 'Petite Delight' monarda is the first dwarf hybrid cultivar of monarda, a summer flowering, herbaceous perennial. It combines unique dwarf stature, a good winter hardiness, a high resistance to powdery mildew and an adaptability to hot, dry summers. 'Petite Delight' averages 25-30 cm in height and width. Plants are round to oval in shape. Foliage is dense, shiny dark green. Flower color varies from light pink-purple to light purple. Flowers last 6 to 8 weeks, beginning in late July and extending to August (in Canada). 'Petite Delight' can be propagated by rhizome, softwood cuttings, division and tissue culture. 'Petite Delight' monarda is registered with the Canadian Ornamental Plant Foundation (COPF), P.O. Box 21083, North Bay, ON, P1B 7N8, Canada. The following have exclusive propagation and distribution rights to this cultivar: COPF in Canada; Bailey Nurseries Inc. in the U.S., FarPlants Sales Ltd. in Europe and Colourwise Nursery in Australia. Propagation material is available by contacting the author. (L.M. Collicutt and C.G. Davidson, Morden Research Centre, Canada)

Excerpted from *HortScience*, 34(1): 149-150. February 1999.

## *Field Production:*

**Hardiness of bare root shrubs.** Most bare root plants are lifted during fall and early winter, kept in cold storage and shipped in the spring. Shrubs lifted earlier in the fall had higher mortality and dieback when compared to shrubs lifted later in the season. This study concluded that plants should be lifted when they are dormant and have developed sufficient hardiness. (H. Lindqvist)

Excerpted from *J. Environ. Hort.* 16(4):195-201. December 1998.

**Fertilization of Freeman maple.** Most field nursery stock is fertilized once or twice annually; during spring, before or after budbreak, an/or in late fall when plants are dormant. Nursery growers avoid fertilization in late summer or early fall for fear of delaying cold acclimation. Other researchers (Pellet and Carter, 1981) concluded that late summer/early fall fertilization did not prevent cold acclimation. Some research even indicates that fertilization at this time stimulates the development of cold-hardiness (DeHayes et al., 1989). This data suggests that applying fertilizer in late summer or early fall may be more efficient than applying it earlier in the season. (M.A. Rose and B. Biernacka)

Excerpted from *HortScience*, 34(1): 91-95. February 1999.

#### ***Container Production:***

**Cyclic irrigation to reduce N loss in containers.** Cyclic irrigation reduced total N loss by at least 89% when compared with a single irrigation and increased irrigation efficiency. Growth was increased when irrigation was applied in six cycles as compared to a single application. The pinebark:coir substrate improved irrigation application efficiency and trees grown in a pinebark:peat substrate had higher shoot dry weight than trees grown in pinebark alone. (G.B. Fain, K.M. Tilt, C.H. Gilliam, H.G. Ponder and J.L. Sibley)

Excerpted from *J. Environ. Hort.* 16(4):215-218. December 1998.

**Reducing herbicide loss with cyclic irrigation and grass waterways.** Three herbicides (Cleary's 3336, Dursban and Snapshot TG) were applied to container nursery beds. Cyclic irrigation reduced runoff water volume 15% compared to continuous irrigation. All

pesticides were detected in runoff water on the day of application from both treatments. Isoxaben (component of Snapshot TG) was detected in runoff water through 8 days after application from both treatments. Isoxaben concentrations and amounts were reduced by the cyclic irrigation/grass waterway treatment on the day of application and as a total for the duration of the study. (J. Briggs, T. Whitwell, M.B. Riley and T. Lee)

Excerpted from *J. Environ. Hort.* 16(4):235-238. December 1998.

#### ***Greenhouse Production:***

**Enhance flowering of *Phlox paniculata* with cold treatment and photoperiod.** For potted plant production of *P. paniculata*, a cold treatment is required for complete, rapid and uniform flowering and a high flower count. Recommendations for propagation of vegetative *P. paniculata* cuttings include cold-treating plants and providing photoperiods <10 hours. For commercial production of flowering plants, we suggest cold-treating and forcing under photoperiods > or = 14 hours or using a 4 hour night interruption. (E.S. Runkle, R.D. Heins, A.C. Cameron and W.H. Carlson)

Excerpted from *HortScience*. 33(7):1172-1174. December 1998.

**Marigold cultivars vary in susceptibility to iron toxicity.** During production of African marigolds, a disorder called bronze speckle can develop. The disorder is characterized by a chlorotic and bronze-brown necrotic speckling, and downward leaflet curling. It is caused by excess levels of Fe and possibly Mn in leaf tissue. The Fe concentration in marigold leaves supplied with Fe-chelate typically used in commercial greenhouses varied with different cultivars, as did the Fe-level at which toxicity occurred. Order of susceptibility of the tested

cultivars was as follows: 'Orange Jubilee' > 'First Lady' > 'Orange Lady' > 'Yellow Galore' > 'Gold Lady' > 'Marvel Gold' > 'Discovery Orange.' (J.P. Albano and W.B. Miller)

Excerpted from *HortScience*. 33(7):1180-1182. December 1998.

**Auxins minimize the effects of transplant shock on Vinca seedlings.** Auxins (IAA and NAA) increased the posttransplant growth of young bare-root vinca seedlings. Maximum growth stimulation of both roots and shoots was obtained with IAA at 10 mg/L and NAA at 0.1 mg/L. Posttransplant growth of plug seedling was not increased by NAA drenches to the shoots and roots of the plants. This study suggests that auxins may be useful in stimulating posttransplant growth, but the sensitivity of vinca to exogenous auxin applications may depend on the transplant method, growing medium, application method, or developmental stage of the plants. (M. van Iersel)

Excerpted from *HortScience*. 33(7):1210-1214. December 1998.

**High temperatures reduce flowering of marguerite daisy, swan river daisy and bacopa.** Using growth chambers, researchers imposed various temperature regimes on specialty floral crops. The results help growers estimate how well these species will perform in different climates. For example, according to normal average daily temperatures, 'Butterfly' and 'Sugar Baby' marguerite daisy would flower best until mid-June, reflowering at the beginning of August in Knoxville, TN, when the average daily temperature is below 82 F. However, flowers on these plants would last all summer in Buffalo, NY, where the average daily temperature does not get above 79 F. Swan river daisy and bacopa are spring crops, flowering from mid-April until mid-May in

Knoxville; however, they would flower until June in Buffalo, when average daily temperatures are below 73 F. Growing these plants further south in Albany, GA would result in flowering until the end of April, while marguerite daisy would bloom until the end of May. Growers in the south can treat these plants as spring holiday crops purchased mostly as gifts that must look good for the holiday, but when long-term performance is not necessary. (M.S. Williams, T.W. Starman and J.E. Faust)

Excerpted from *HortTechnology*. 9(1):94-98. January-March 1999.

**Control flowering in Rudbeckia fulgida 'Goldsturm.'** Noncooled seedlings of *R. fulgida* 'Goldsturm' should be grown under photoperiods  $\leq$  13 hours to promote vegetative growth, until plants have at least 10 nodes. Under long days, a 15-week treatment at 41 F (5 C) hastens flowering by approximately 4 weeks at 68 F (20 C) but provides no other horticultural benefits. To induce flowering, recommended inductive photoperiods are  $\geq$  14 or 13 hours without or following a cold treatment, respectively, or a four hour night interruption. (E.S. Runkle, R.D. Heins, S.C. Cameron and W.H. Carlson)

Excerpted from *HortScience*, 34(1): 55-58. February 1999.

### **Landscape:**

**Characteristics of composted yard waste.** Initial C, N, P and K content averaged 30%, 1.3%, 0.2% and 0.9%, respectively in windrows of municipal yard and landscape waste at three commercial composting sites in California. Carbon concentration declined rapidly through the first 6 to 9 weeks, while n, O, and K remained relatively stable throughout the sample period (12-15 weeks). Overall, at least 9 to 12 weeks of composting were required to minimize

the undesirable characteristics of immature compost. (T.K. Hartz and C. Giannini)

Excerpted from *HortScience*. 33(7):1192-1196. December 1998.

### **Turf:**

**Growth responses of perennial ryegrass to Trinexapac-ethyl (TE).** This plant growth regulator is designed to decrease mowing frequency and increase tillering and rooting. Successive applications of TE to perennial ryegrass reduced leaf elongation rate (LER) with no effect on root mass. In greenhouse experiments, four applications of TE significantly increased tiller density but in growth chamber experiment, two applications promoted tillering only on the last sample date. (E.H. Ervin and A.J. Koski)

Excerpted from *HortScience*. 33(7):1200-1202. December 1998.

**Turf response to controlled-release nitrogen fertilizers.** Some controlled-release fertilizers (e.g. Esso T-90, Meister7, Polyon 4% and SulfurKote) produced uniform turfgrass growth and an acceptable green color over a longer period of time than did the non-coated urea. Turfgrass growth was associated with the rates of N release from coated urea products in a moderate temperature area. The results suggest that a single annual application of controlled-release fertilizers (with 70- to 90-d release rates) will produce the most consistent turf quality. The findings also imply that a suitable mixture of controlled-release fertilizers with various release rates would benefit turfgrass growth. (M. Zhang, M. Nyborg and S.S. Malhi)

Excerpted from *HortScience*. 33(7):123-1206. December 1998.

**Biology and management of dollar spot disease on turf.** Symptoms of dollar spot include 5- to 7-cm-diameter spots of straw-colored turfgrass on closely mowed putting greens and tees, or large coalescing spots on lawns and turfgrasses maintained at higher mowing heights. The pathogen is *Sclerotinia homoeocarpa*. Currently disease is primarily controlled through fungicides and by cultural practices. A strain of *T. harzianum* has been registered for managing several turf diseases. Turf amendments containing microrganisms and N have shown promise for management of dollar spot. There is no accurate disease prediction model for dollar spot. (B. Walsh, S.S. Ikeda and G.J. Boland)

Excerpted from *HortScience*, 34(1): 13-21. February 1999.

### **Marketing:**

**Communication with garden writers.** Garden writers get the best response from consumers when they write about low maintenance plants, herbaceous perennials and new plant varieties. They value information on new plant releases, current pest problems in their area and a listing of local suppliers of new plant varieties. Since most maintain home gardens (97.3%) and evaluate new plant varieties (88.1%), providing sample of new productions for use by garden writers may be a valuable educational opportunity. (M.P. Garber and K. Bondari)

Excerpted from *J. Environ. Hort.* 16(4):201-211. December 1998.

**Retail garden centers evaluate wholesale nurseries.** Retailers responding to this survey indicated quality of plant materials was the most important determining factor for conducting business with a wholesale supplier. In general, the majority of respondents in this study said they were very satisfied with plant material

shipments, but identified dry bare-root stock, physical damage to container-grown, balled-and-burlapped, and aquatic plants, and undersized herbaceous plants as occasional problems. Wholesale suppliers will reduce frustration and improve business relationships with retail nursery clients when they work to reduce or eliminate nursery stock order shortages, unauthorized substitutions, and last-minute cancellations, particularly on confirmed orders. (J.K. Iles, W.R. Graves, A.S. Aiello, C.L. Haynes and K.E. Stone)

Excerpted from *J. Environ. Hort.* 16(4):243-247. December 1998.

#### **Profitability of retail florists in Michigan.**

Overall, full-service retail florist businesses are not very profitable, particularly given the number of hours most owners work and the inherent business risk associated with the high level of competition. Many businesses are losing money on delivery because fees are not covering costs. Stores that receive more incoming wire orders than they send are being hurt by wire service commissions and membership fees. Labor and occupancy costs play critical roles in determining retail florist profitability. Labor efficiency with respect to wages expense is critical since labor is the second largest business expense. (C.A. Collins, B. Fails and O. Schabenberger)

Excerpted from *HortScience*, 34(1): 144-148. February 1999.

#### ***Insect Control:***

##### **Controlling white grubs in container plants.**

Talstar 0.2G as a preplant media incorporation was most effective in controlling white grubs over a two-year period. A Marathon 60W drench was also effective prior to egg introduction. Curative drenches were relatively

ineffective. (D.G. Nielsen and R.S. Cowles)

Excerpted from *J. Environ. Hort.* 16(4):202-206. December 1998.

#### ***Weed Control:***

**Herbicide leaching from coated slow release fertilizers.** Several slow release fertilizers coated with oxadiazon were tested to determine leaching rates in an effort to develop a method of slowly delivering enough herbicide for weed control without excess leaching into runoff water. Oxadiazon-coated Polyon (24N-1.7P-10K) releases less herbicide in the first few leaching events than several other commonly used control-released fertilizers. Addition of either Complex or Intac stickers or Prime Oil to oxadiazon-coated Osmocote also created a more consistent rate of oxadiazon leaching. (K.R. Keel, C.H. Gilliam, G.R. Wehtje, T.L. Grey, G.J. Keever and D.J. Eakes)

Excerpted from *J. Environ. Hort.* 16(4):230-234. December 1998.

## Publications

**Plant evaluation Notes: *Monarda* and Powdery Mildew Resistance**, which includes observations and ratings of 39 *Monarda* cultivars and species, is available from the Chicago Botanic Garden. Please include a check for \$2 (to Chicago Botanic Garden) with your request. Mail to: Attn: Richard G. Hawke, Chicago Botanic Garden, 1000 Lake Cook Road, Glencoe, IL 60022.

**The Fully Updated PGMS Grounds Estimating Guide** - The brand new, fully updated PGMS Estimating Guidelines publication debuted at the 1998 PGMS Annual Conference and Green Industry Expo. Everything about the Guide is updated, including the format. In addition to the updated estimating figures, the manual is now in a three ring binder for easy reference and updating. During this limited introductory period, the price of the Guide is \$30, and is available directly from the Professional Grounds Management Society (Maryland residents add \$1.50 state sales tax). Purchases may be made with cash, check, VISA or Master Card, directly from PGMS Headquarters: 120 Cokeysville Road, Suite 104, Hunt Valley, MD 21030. Tel. (410)584-9754, FAX (410)584-9756.

**Community Forestry Resource Manual.** Available at no cost from the Forestry Division of the Delaware Department of Agriculture, this resource manual contains listings of agencies, programs, publications, workshops and funding in the areas of urban and suburban horticulture.

## Calendar

**March 12** - 1999 Longwood Graduate Program Symposium at Longwood Gardens in Kennett Square, PA. Contact the Program Office at (302)831-2517 or e-mail James.Swasey@mvs.udel.edu

**March 13, 27 and April 17** - Environmental Concern. POW!: the Planning of Wetlands, St. Michaels, MD. 9:00 AM-3:00 PM, cost \$225. Instructor: Karen Ripple. For more information call:(410)-745-9620, fax (410)-745-3517, or e-mail: order@wetland.org. Check Website: www.wetland.org.

**March 15-16** - Environmental Concern. Wetland Hydrology, Patuxent NWVC, Laurel, MD. 9:30 AM-5:30 PM, cost \$350. Instructor: Albert McCullough, III, P.E. For more information call:(410)-745-9620, fax (410)-745-3517, or e-mail: order@wetland.org. Check Website: www.wetland.org.

**March 16-17** – Pesticide Applicator Training, Research and Education Center, Georgetown, Day 1: training 8:30 am – 4:00 pm, Day 2: training 8:30 am – noon, exam starts at 1:00 pm, Contact Susan Whitney (302) 831-2526.

**March 17** - Turfgrass Management, Ornamental Horticulture Short Course Series, 9 am – 3 pm, New Castle County Extension Office, Newark, DE. Contact (302) 831-2531.

**March 17** – Advanced Lighting Course, Hawthorne, NJ, Contact Aquarius Irrigation Supply, (800) 922-0717.

**March 22-23** – Pesticide Applicator Training, New Castle County Extension Office, Day 1: training 8:30 am – 4:00 pm, Day 2: training 8:30 am – noon, exam starts at 1:00 pm, Contact Susan Whitney (302) 831-2526.

**March 23** – CNP Exam, Delaware Dept. of Agriculture, Dover, DE. Contact Val Budischak (610-274-2166).

**March 23 and 25** - Diagnosis & Control of Insects on Woody Ornamental Plants, Ornamental Horticulture Short Course Series, 3-5 pm, New Castle County Extension Office, Newark, DE. Contact (302) 831-2531.

**March 25** - DNREC Sponsored Erosion, Sediment and Stormwater Management Product and Services Expo, University of Delaware, Clayton Hall Conference Facility, Rt. 896, 1 mile north of Newark. 1:00 PM to 4:00 PM. No fee or registration required.

Call for directions or information: Jeanne Feuer, DNREC, Division of Soil and Water Conservation (302)739-441 or [jfeuer@dnrec.atate.de.us](mailto:jfeuer@dnrec.atate.de.us).

**March 30-31** – Pesticide Applicator Training, Delaware Department of Agriculture, Dover, Day 1: training 8:30 am – 4:00 pm, Day 2: training 8:30 am – noon, exam starts at 1:00 pm, Contact Susan Whitney (302) 831-2526.

**April 19-23** - Environmental Concern. Wetland Delineation, Patuxent NWVC, Laurel, MD for classroom instruction, participants will then meet at various sites in the DC metropolitan area for field work. 9:30 AM-5:30 PM, cost \$875. Instructors: Albert McCullough, III, P.E.; Doreen Dudek; Deborah Herr, ASLA; and Spencer Smith. For more information call:(410)-745-9620, fax (410)-745-3517, or e-mail: [order@wetland.org](mailto:order@wetland.org). Check Website: [www.wetland.org](http://www.wetland.org).

**April 23** - The Mid-Atlantic Interior Landscape Conference. Longwood Gardens, Kennett Square, PA. Contact: Tom Contrisciano (610)378-1327. Sponsored by the Penn State Cooperative Extension.

**April 24** – UDBG Plant Sale, Fischer Greenhouse, Newark, DE. Contact (302) 831-2531.

**April 30** – Rare Plant Auction, Longwood Gardens, Kennet Square, PA. Contact Delaware Center for Horticulture, (302) 658-6265.

**May 10** - Environmental Concern. Wetland Botany, Environmental Concern, St. Michaels, MD. 8:30 AM-5:00 PM, cost \$145. Instructor: Doreen Dudek. For more information call:(410)-745-9620, fax (410)-745-3517, or e-mail: [order@wetland.org](mailto:order@wetland.org). Check Website: [www.wetland.org](http://www.wetland.org).

**May 19-21** – Bartram 300: A Gathering symposium exploring the life, works and legacy of John Bartram at the Academy of Natural Sciences, Philadelphia, PA. Contact Historic Bartram’s Garden, (215) 729-5281.

**June 7-9** - Environmental Concern. Evaluation for Planned Wetlands, Patuxent NWVC, Laurel, MD. 9:30 AM-5:30 PM, cost \$575. Instructor: Albert McCullough, III, P.E. For more information call: (410)-745-9620, fax (410)-745-3517, or e-mail: [order@wetland.org](mailto:order@wetland.org). Check Website: [www.wetland.org](http://www.wetland.org).

**June 15** – Pest Walk, Ornamental Horticulture Short Course Series, 9 am – 12 pm, Winterthur Museum and Gardens, Winterthur, DE, Contact (302) 831-2531.

**June 22** - Pest Walk, Ornamental Horticulture Short Course Series, 9 am – 12 pm, Governor’s Mansion, Dover, DE, Contact (302) 831-2531.

**June 28-29** - Environmental Concern. Wetland Ecology, Environmental Concern, St. Michaels, MD. 9:00 AM-3:00 PM, cost \$150. Instructor: Renee Wilson. For more information call: (410)-745-9620, fax (410)-745-3517, or e-mail: [order@wetland.org](mailto:order@wetland.org). Check Website: [www.wetland.org](http://www.wetland.org).

**June 30** – Integrated Landscape Management, Ornamental Horticulture Short Course Series, 9 am – 3 pm, Kent County Extension Office, Dover, DE, Contact (302) 831-2531.

**June 30** - Environmental Concern. Wetland Plant Identification, Environmental Concern, St. Michaels, MD. 9:00 AM-300 PM, cost \$75. Instructor: Doreen Dudek and Cindy Boyle. For more information call: (410)-745-9620, fax (410)-745-3517, or e-mail: [order@wetland.org](mailto:order@wetland.org). Check Website: [www.wetland.org](http://www.wetland.org).

**July 10-14** – Ohio Florists’ Association Short Course, Greater Columbus Convention Center, Columbus, Ohio. Contact 614-487-1117.

**July 6, 8, 13** – Small Flowering Trees, Ornamental Horticulture Short Course Series, 5-7 pm, UDBG, Newark, DE, Contact (302) 831-2531.

**July 10-14** – Ohio Florists’ Association Short Course, Greater Columbus Convention Center, Columbus, Ohio. Contact 614-487-1117.

**July 12** - Environmental Concern. WOW!: The Wonders of Wetlands, Environmental Concern, St. Michaels, MD. 9:00 AM-3:00 PM, cost \$75. Instructor: Cindy Boyle. For more information call: (410)-745-9620, fax (410)-745-3517, or e-mail: [order@wetland.org](mailto:order@wetland.org). Check Website: [www.wetland.org](http://www.wetland.org).

**July 13-14** - Environmental Concern. Wetland Creatures, Environmental Concern, St. Michaels, MD. 9 AM-4:00 PM, cost \$150. Instructor: Karen Ripple and Spencer Smith. For more information call: (410)-745-9620, fax (410)-745-3517, or e-mail: [order@wetland.org](mailto:order@wetland.org). Check Website: [www.wetland.org](http://www.wetland.org).

**July 14** – Landscape Troubleshooting Workshop, Ornamental Horticulture Short Course Series, 5-7 pm, New Castle County, DE, Contact (302) 831-2531.

**July 22**– Landscape Troubleshooting Workshop,

Ornamental Horticulture Short Course Series, 5-7 pm, Kent County, DE, Contact (302) 831-2531.

**July 23-29** - American Nursery & Landscape Association/PANTS Convention & Trade Show, Philadelphia, PA; Contact: (202)789-2900.

**July 26-28** - Environmental Concern. POW!: the Planning of Wetlands, Environmental Concern, St. Michaels, MD. 9:00 AM-3:00 PM, cost \$225. Instructor: Karen Ripple. For more information call: (410)-745-9620, fax (410)-745-3517, or e-mail: [order@wetland.org](mailto:order@wetland.org). Check Website: [www.wetland.org](http://www.wetland.org).

**August 9-11** - Environmental Concern. Field Wetland Botany, Environmental Concern, St. Michaels, MD. 8 AM-4:30 PM, cost \$435. Instructors: Doreen Dudek and Karen Ripple. For more information call: (410)-745-9620, fax (410)-745-3517, or e-mail: [order@wetland.org](mailto:order@wetland.org). Check Website: [www.wetland.org](http://www.wetland.org).

**August 17** – Landscape Troubleshooting Workshop, Ornamental Horticulture Short Course Series, 5-7 pm, Sussex, DE, Contact (302) 831-2531.

**August 17-19** – Perennial Plant Identification, Ornamental Horticulture Short Course Series, 4-6 pm, UDBG, Newark, DE. Contact (302) 831-2531.

**September 9** – Pest Walk, Ornamental Horticulture Short Course Series, 9 am – 12 pm, UDBG, Newark, DE, Contact (302) 831-2531.

**September 13-17** - Environmental Concern. Wetland Delineation, Patuxent NWVC, Laurel, MD for classroom instruction, participants will then meet at various sites in the DC metropolitan area for field work. 9:30 AM-5:30 PM, cost \$875. Instructors: Albert McCullough, III, P.E.; Doreen Dudek; Deborah Herr, ASA; and Spencer Smith. For more information call: (410)-745-9620, fax (410)-745-3517, or e-mail: [order@wetland.org](mailto:order@wetland.org). Check Website: [www.wetland.org](http://www.wetland.org).

**September 14** – Pest Walk, Ornamental Horticulture Short Course Series, 9 am – 12 pm, Research & Education Center, Georgetown, DE, Contact (302) 831-2531.

**September 21, 23 and 28** – Identification and Control of Diseases on Ornamental Plants, Ornamental Horticulture Short Course Series, 4-6 pm, Fischer Greenhouse, Newark, DE, Contact (302) 831-2531.

**September 21** - Environmental Concern. Wetland Horticulture, Environmental Concern, St. Michaels, MD.

9:00 AM - 3:00 PM, cost \$75. Instructors: Doreen Dudek. For more information call: (410)-745-9620, fax (410)-745-3517, or e-mail: [order@wetland.org](mailto:order@wetland.org). Check Website: [www.wetland.org](http://www.wetland.org).

**September 27-28** - Environmental Concern. Wetland Horticulture, Environmental Concern, St. Michaels, MD. 8:00 AM-4:30 PM, cost \$290. Instructor: Doreen Dudek. For more information call: (410)-745-9620, fax (410)-745-3517, or e-mail: [order@wetland.org](mailto:order@wetland.org). Check Website: [www.wetland.org](http://www.wetland.org).

**September 27-29** - Environmental Concern. Wetland Mitigation, Patuxent NWVC, Laurel, MD. 9:30 AM-5:30 PM, cost \$575. Instructor: Edgar Garbisch, Ph.D. For more information call: (410)-745-9620, fax (410)-745-3517, or e-mail: [order@wetland.org](mailto:order@wetland.org). Check Website: [www.wetland.org](http://www.wetland.org).

**October 2** - Environmental Concern. WOW!: The Wonders of Wetlands, Environmental Concern, St. Michaels, MD. 9:00 AM-3:00 PM, cost \$75. Instructor: Cindy Boyle. For more information call: (410)-745-9620, fax (410)-745-3517, or e-mail: [order@wetland.org](mailto:order@wetland.org). Check Website: [www.wetland.org](http://www.wetland.org).

**October 5 and 7** – Diagnosis & Control of Insects and Weeds on Woody Ornamental Plants, Ornamental Horticulture Short Course Series, 3-5 pm, Research & Education Center, Georgetown, DE, Contact (302) 831-2531.

**November 16** - Environmental Concern. Wetland Planting Techniques, Environmental Concern, St. Michaels, MD. 8:00 AM-5:00 PM, cost \$145. Instructor: Deborah Herr, ASLA. For more information call: (410)-745-9620, fax (410)-745-3517, or e-mail: [order@wetland.org](mailto:order@wetland.org). Check Website: [www.wetland.org](http://www.wetland.org).

