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Editor: Susan Barton, Extension Specialist, University of Delaware
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ASSOCIATION NEWS
Valann Budischak
Executive Director, D.N.L.A.

Has spring sprung for everyone? I sure hope so!! Last year, due to the drought, many businesses limped into spring and crawled out of the dismal summer/fall season. Spring is the time of new beginnings, and I'm banking on 2003 to be a much better year than 2002 for all our members! I want to take this opportunity to bring everyone up-to-date on various DNLA topics and events.

The DNLA was privileged to have Steve Castorani of Gateway Garden Center and North Creek Nurseries join us at our last board meeting. Steve is our representative on the Delaware Invasive Species Council (DISC). He spends countless hours on behalf of our industry. We are truly grateful. As many of you may be aware, invasive species has become a hot topic throughout the country. It is vital that we educate the public and ourselves. At the Delaware Horticulture Industry Expo in January, you heard Faith Kuehn and Steve provide a recap of DISC activities. As for the public, the DNLA has committed to sponsor a public workshop entitled, Backyard Invaders: Plants In and Out of the Garden to be held on September 13th at the DE Center for Horticulture. To assist in exploring the economic impact of the potential regulation of specific plants, DISC has requested statistical and financial information. The DNLA may conduct a fall survey. Also, the board was asked to review and endorse the American Nursery and Landscape Association Voluntary Code of Conduct for nursery professionals. Upon review, the DNLA board recommends that all members support the Code (see Invasive Plants – Getting Ahead of the Curve on page 12). Becoming involved and/or assisting in this matter will only benefit the industry.

The Delaware Horticulture Industry Expo was held January 15th & 16th at the Modern Maturity Center in Dover. The first day we heard speakers discuss topics such as Once You've Sold It, Can You Make Money; Good Plants and Why; Increasing Garden Center Sales; and Nutrient Management. The second day of the DHIE was, once again, held in conjunction with the Annual Delaware Pesticide Conference. The Modern Maturity Center was a packed house! It was exciting to see so many people in our industry in one location!

Our 2002 Landscape Award winners were honored at the DHIE. They are as follows:

Deanna Pillarelli of Garden Escapes, LLC, located in Newark, DE

Tom Taylor of the University of Delaware, Newark campus

Congratulations to our winners! **We encourage any member to submit an entry for our 2003 Landscape Awards.** Please keep this in mind throughout the upcoming season. More information will follow later in the summer.

Mark your calendars! August 20th is the date that has been set for the Summer Expo and Annual Golf Tournament. Jonathan's Landing Golf Course will host the festivities this year. More information will follow.

CNP Update: On March 17th, the following individuals passed the Certified Nursery Professional exam:

Susan Boss
Winterthur Museum, Garden & Library
Landscape Specialist

William Cooper
City of Dover
Landscape Design

Welcome New Members:

DuPont Country Club

Attn: John Mizikar
1001 Rockland Road
Wilmington, DE 19803
(302) 421-1786

Carl D. Stump

436 North Shipley Street
Seaford, DE 19973-2318
(302) 629-2291

City of Dover

P.O. Box 475
Dover, DE 19903
(302) 736-7194

Thomas E. Moore, Inc.

P.O. Box 794
Dover, DE 19903
(302) 674-1500



U of D NEWS

Susan Barton, Extension Specialist

Spring greetings from the U of D. We've already conducted 5 ornamentals short courses during late winter/early spring for the nursery and landscape industry. Jay Windsor and Gordon Johnson conducted an extremely successful greenhouse short course that included classroom instruction in Kent and Sussex counties and greenhouse tours on two Saturday mornings.

Look for the following courses in the summer and fall:

Insect ID and Control – June 11, 4-7 PM, Kent County Extension Office

Plant Stress Management – June 12, 6-8 PM, Fischer Greenhouse, Newark

Safety Training – June 17, 5-8 PM, Kent County Extension Office

Plant Stress Management – June 25, 4-6 PM, Sussex County Extension Office

Water Garden Basics for Landscapers – July 8 & 10, 6-8 PM, New Castle County Ext. Office

Plant Stress Management – September 8, 6-8 PM, Kent County Extension Office

Ornamentals Research Expo – September 16, 5-8 PM, UDBG

Pruning Workshop – September 22, 4-6 PM, UDBG

Urban Wildlife Control – September 30, 6-9 PM, Kent County Extension Office

Groundcovers – October 7, 6-9 PM, Kent County Extension Office

PDA Training – October 9, 6-9 PM, New Castle County Extension Office

Integrated Landscape Management, October 14 & 16, 4-6 PM, NC County Extension Office

Ornamental Grasses – October 15, 6-8 PM, Kent County Extension Office

**HAS THE WINTER WEATHER
AFFECTED INSECT POPULATIONS?
Joanne Whalen, Extension IPM Specialist
University of Delaware**

Entomologists are often asked if extremely cold or mild winter weather has an impact on insect populations in the spring. Most would agree that there is no one answer to this question. Although mild weather conditions enable some overwintering insects to survive, winter weather has little or no impact on other species.

If you look at the major insects that attack field and vegetable crops, some general principles can apply –

Editor's Note: While this article was written about field and vegetable crops, the principles apply to overwintering insects that affect ornamentals as well.

Overwintering Stage: Insects that overwinter in the soil in the egg stage are generally not affected by cold winter temperature. The best example is the corn rootworm. In comparison, insects that overwinter in the adult stage, especially beetles can be more affected by cold winter temperatures. However, the heavy snow cover can negate these affects because it offers some degree of insulating protection.

Overwintering Location: Insects that overwinter deep in the soil – like grubs and wireworms – are generally not affected by the cold winter temperatures. Spring conditions including early planting followed by cool, wet weather can favor damage from these pests.

Natural Protection: The European corn borer (ECB), which overwinters as a full-grown larva, has an antifreeze type material in its body that protects it from cold winter weather. Vacillating temperatures (from very cold to very warm) in the winter can have a greater impact

on reducing overwintering ECB populations.

Migratory Species: Obviously, winter conditions in our area have no affect on migratory species like the potato leafhopper, cabbage looper and beet armyworm.

So, predicting the potential for infestations based on winter weather conditions is often not very accurate. It has been the experience of most entomologists that spring weather conditions have the greatest impact on insect populations and determine if an insect will become a pest problem. The only way to know if you have a problem is to understand which cropping systems favor certain pests and plan to scout fields on a routine basis in-season.

Reprinted from Weekly Crop Update, University of Delaware Coop. Extension, Volume 11, Issue 1.

**FROM THE DEPARTMENT OF
AGRICULTURE**

"Agriculture Counts" and we're counting on everyone that receives a 2002 Census of Agriculture form to complete it and mail it back as soon as possible. This is the first ag census completely planned and conducted by USDA, a project done just once every five years. The results will give us an updated profile of all the types of agriculture in each county, the state of Delaware and the U.S. If you didn't receive a Census of Ag form please call 1-888-424-7828 toll free so that your ag operation can be counted. You can also call Tom Feurer, Delaware Ag Statistics, at 800-282-8685 if you have questions.

**2002 Census of Agriculture: Fill It Out
- Mail It Back!**

USDA'S GROWER ENVIRONMENTAL INCENTIVES

We live in an era of increasing federal and state government oversight relating to protection of the environment. Historically, the green industry has borne the brunt of adjusting to these realities with little or no monetary help. Over the past decade or two nurseries and greenhouses have implemented an array of conservation measures: building retention ponds or wetlands on their properties to collect, recycle, and manage runoff; instituting IPM programs to control pests and reduce chemical use and; installing drip irrigation/low water use systems to conserve precious water resources. Most nurseries have funded such improvements on their own.

However, there is a federal/state partnership program in place that offers incentives in the form of cost-share funding for environmental quality initiatives on nurseries, farms, and ranches. It is called the Environmental Quality Incentives Program (EQIP). Recently expanded as part of the comprehensive Farm Bill of 2002, EQIP funds are overseen by the United States Department of Agriculture's Natural Resources Conservation Service (USDA-NRCS).

Unfortunately, after passage of the law there was some confusion at USDA and in the states as to whether nurseries could qualify for EQIP funds. Through meetings with USDA officials ANLA has clarified that these monies are indeed available to nurseries. Having said that, competition for these USDA resources is fierce and individual states have their own established environmental priorities, so not every project at every location will qualify or make it through the application process. Green industry representatives have the opportunity to get active at the county and state level to ensure that decision makers are aware of the challenges and opportunities facing our industry.

EQIP in Detail. The Environmental Quality Incentives Program (EQIP) is a voluntary conservation program that promotes agricultural production and environmental quality as compatible national goals. Through EQIP, farmers (including nurseries) and ranchers may receive financial and technical help to install or implement structural and management conservation practices on eligible agricultural land. EQIP was reauthorized in the Farm Bill of 2002 with funding of \$6.1 billion.

Growers interested in these monies can apply anytime as EQIP applications are accepted throughout the year and the NRCS continually evaluates each application using a state and locally developed evaluation process. Higher priorities are given to applications that encourage the use of cost-effective conservation practices, address national conservation priorities and optimize environmental benefits. State technical committees, Tribal representatives, and local working groups convened by the conservation district advise NRCS on implementation of the program to address state and local resource needs and concerns.

Of plans that are NRCS-approved, EQIP may pay up to 75 percent of the costs of certain conservation practices important to improving and maintaining the health of natural resources in the area. Priorities often include nutrient management, integrated pest management, irrigation water management, and wildlife habitat management. Limited-resource farmers and farmers just starting out may be eligible for up to 90 % of the cost of conservation practices.

EQIP activities are carried out according to an EQIP plan of operations developed in conjunction with the producer. These plans are then approved by the local conservation district with the practices subject to NRCS technical standards but adapted to local conditions. If the

applicant does not have someone on staff to fulfill the technical requirements, farmers may elect to use an approved third-party provider for technical assistance.

Total cost-share and incentive payments are limited to \$450,000 per individual over the period of the 2002 Farm Bill, regardless of the number of farms or contracts. Starting in fiscal year 2003, no individual or entity may receive EQIP payments in any crop year in which the individual or entity's average adjusted gross income for the preceding three years exceeds \$2.5 million, unless 75 percent of that income is from farming, ranching or forestry interests. While at least 60 percent of the EQIP funds are targeted to livestock production practices, including grazing, other sectors of agriculture, including the nursery industry, are eligible to apply for the remaining 40 percent.

Nursery owners, association managers, researchers, extension specialists and others should get involved at the county and state level to ensure that nursery-relevant projects are included among state EQIP priorities. The state technical committees and the state conservationist work to establish the priorities that will be funded in a given state. Assuming a proposed project qualifies as a state priority, the grower must complete and file an application. The state conservationist will then make the final decision as to whether projects get funded. While they do get input from the committees and other stakeholders, the decision to fund is theirs alone.

How Can the Nursery Industry Benefit from EQIP Funds? Nurseries have taken advantage of EQIP cost-share funding to convert their chemical spraying operations over to integrated pest management practices either as a whole operation or in response to specific insect/disease pressures. Secondly, some growers have used EQIP funds to install

wetlands or retention ponds on their properties. Aimed specifically at catching and filtering water run-off, these types of projects fulfill the EQIP mandate or projects that are both smart from a business perspective and promote clean water (and a better environment.) Other types of water quality improvements may also be funded.

Water quality and conservation projects continue to increase in importance for nurseries as the federal and state governments tighten up on non-point source (runoff) pollution. The Environmental Protection Agency (EPA) has nearly completed its final rule concerning TMDLS (Total Maximum Daily Loads) to protect water-ways from run-off pollution. Once finalized, the TMDL rules may strictly regulate runoff originating from nurseries and farming operations. And, some states are already going beyond federal mandates. Growing operations that sit nearby or adjacent to water bodies that the agency deems to be polluted will need to do everything in their power to ensure that their run-off is controlled. Without controls, growers may have to apply for expensive water pollution permits. Retention ponds, wetlands, buffer strips and similar improvements offer solutions to run-off problems.

In order to get more information about the EQIP program, how to obtain, complete and submit an application, how to contact your county and state USDA offices, or for any general facts and figures, please go to the USDA website: www.nrcs.usda.gov/programs/eqip

This article is provided by your state association and ANLA as a Lighthouse Program partner benefit. Geoff Galster, ANLA Director of Regulatory Affairs; 11 December 2002.

FERTILIZING TREES IN THE LANDSCAPE

**Tom Fernandez, Assistant Professor
Michigan State University**

In nature, trees usually appear to do fine without additional fertilizers, so why is it important to think about fertilizing trees in landscape situations? One of the main losses of nutrients from trees occurs when leaves fall in the autumn. In natural situations, the leaves become organic matter in the soils and the nutrients are for the most part recycled as they decompose. In landscape settings, leaves are usually removed from around the tree and do not get recycled or benefit someone else that composts them. Turfgrass and other landscape plants also can compete with tree roots for nutrients, although when they are fertilized the fertilizer becomes available to trees as well. Soils after new construction may be devoid of topsoil and deficient in nutrients. Certain landscape sites such as street trees, parking islands and other sites with restricted soil volume, may not provide the nutrient reservoir necessary for plants. Soil stresses such as compacted soils or soils with poor water relations can decrease root growth and root function resulting in less nutrient uptake.

So how do you know whether fertilizing trees is necessary? Many soils have adequate nutrition to support mature trees. One of the easiest ways to determine if trees are in need of fertilizing is to observe their growth rate and look for nutrient deficiency symptoms in the leaves and twigs. Slower than normal growth rates both in length and girth, twig die-back and small leaf size are indications of poor nutrition (although similar symptoms can be caused by factors other than poor nutrition). There are also several distinct patterns of nutrient deficiencies that can be observed in leaves. Some of the most frequent nutrient deficiencies are, with nitrogen, iron, and sometimes magnesium. Nutrient

deficiency patterns that can be observed in leaves are, for nitrogen, a yellowing of foliage beginning with older foliage. Iron has a distinct pattern of yellowing of leaf tissue between the veins while the veins remain green starting in the younger leaves. Magnesium has a similar pattern but starts in the older leaves first.

Soil and leaf testing are definitive ways of determining the nutrient availability from the soil and the nutrient status of the plant at the time the samples are taken and are the best tools to start with if you suspect a nutrition problem. Soil tests are used to make decisions regarding pH and nutrient content in the soil to optimize plant growth. Soil testing labs may use different techniques and cannot always be compared with each other so it is best to stick with one testing lab. The lab will return results regarding several soil factors. One of the most important soil characteristics is pH (which should be between 6.0 and 7.0 for most plants and soils), if pH is out of this range certain nutrients become unavailable to the plant in the soil. Other characteristics given from most soil testing labs include available phosphorus, potassium, calcium, magnesium and in many cases fertilizer recommendations. Leaf testing reflects the chemical composition of the leaf at the time the sample is taken. They are affected by the time samples are taken and the age of leaf so standard sampling procedures are recommended. The lab will supply standard values for specific plants to compare with if they are available, or you can supply healthy tissue for a comparison.

There are often sufficient nutrients in most soils for healthy mature trees. The roots of mature trees can extend under landscape beds and turfgrass, and if these areas are routinely fertilized the tree will usually acquire sufficient nutrients. Young trees usually benefit from additional fertilization. In general, it is recommended to apply 0.25 pounds of actual nitrogen per inch of trunk diameter measured at

4.5 feet. A complete fertilizer, meaning it contains nitrogen (N), phosphorus (P) and potassium (K), should be used. The numbers on a fertilizer labels give the percent of N, P₂O₅ and K₂O contained in the fertilizer. A fertilizer with a ratio of 2 N:1 P₂O₅: 1 K₂O is recommended for most situations, such as a 20-10-10 or 10-5-5. To determine how much fertilizer to apply based on trunk diameter use the equation:

$$\text{Pounds fertilizer to apply} = \frac{(\text{trunk diameter in inches} \times 0.25)}{\% \text{ N in fertilizer}}$$

So for a 12 inch diameter tree with a 20-10-10 fertilizer you would need to apply $(12 \times 0.25) / 0.20 = 15$ pounds of fertilizer. For trees less than 8 inches in diameter, use half of the rate.

Fertilizers should be applied where the absorbing roots are. For small trees this area can start within a few inches of the trunk, for large trees it is usually several feet out from the trunk, and in both cases can extend up to 50% further than the drip line. Fertilizer contact with the trunk should be minimized to reduce salt damage. Fertilizers should be distributed evenly throughout this area.

There are several application techniques. The most common and easiest method is to broadcast the fertilizer over the surface either in solid or liquid form. To reduce fertilizer damage to turfgrass, split applications of the total amount can be made and the fertilizer watered in afterwards. Split applications should also be made on coarse soils with low cation exchange capacity where leaching is high, otherwise the fertilizer may leach out of the root zone before the plant can take it up. Subsurface application can be accomplished by the drill hole method, where holes are drilled with a bar slanted slightly toward the trunk 6 to 15 inches deep spaced 3 feet apart. The holes are then

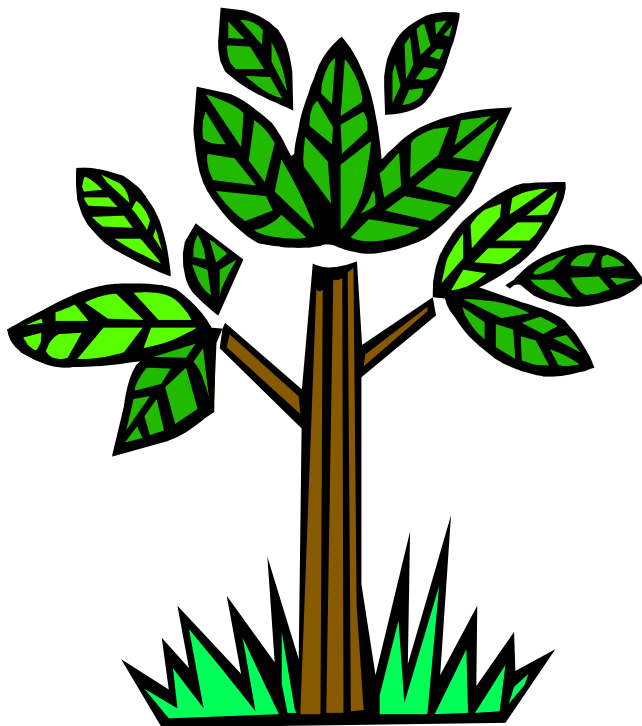
filled with equal amounts of the quantity of fertilizer to be applied. It is beneficial to mix the fertilizer with the extracted soil or peat moss or compost before filling the holes. Instead of drilling holes and filling with granular fertilizers, there are systems that use pressurized liquid injection to accomplish the same thing as well as supply water to the tree. Finally, foliar application of fertilizers is sometimes used. This is most effective for the short-term correction of micronutrient deficiencies and should not be used as the only means of fertilizing.

Fall through early spring are the best times to apply fertilizers. Soil temperatures and water levels are often best during this period. Applying fertilizers in the late summer can result in a growth flush that does not have sufficient time to harden off before winter and fertilizing in late spring may not supply adequate nutrition for this period of rapid growth. Fertilizing in the fall after the first hard frost will allow fertilizers to move into the soil without excess leaching and be available for early spring growth without causing a growth spurt. Roots remain active in the soil until soil temperatures reach about 40 F, so some of the nutrients will be taken up by the tree in the fall. Fertilizing through the winter can be done but there will not be much movement of fertilizer into the soil and some of the fertilizer can be lost if the ground is frozen. Early spring fertilizing will provide nutrients at the time that plants require them most but high rainfall during this period can hamper operations and may cause leaching of fertilizers.

One important thing to remember when fertilizing young trees is that water is more critical to proper establishment than fertilizer and that in drought periods fertilizers can increase water stress since most of them come in the form of salts.

Nutrition alone is not the answer to all of the problems trees will face in urban landscapes. Trees with proper nutrition will be better able to withstand pest and environmental stresses but these other stresses should not be forgotten when evaluating tree health. Other stresses can result in symptoms that are similar to nutrient deficiencies, so be sure to consider other factors since applying fertilizers when they are not needed can cause problems with tree health.

Reprinted from The Michigan Landscape™, March/April, 2003, pgs. 30-32.



7 QUICK WAYS TO REDUCE RENTAL EQUIPMENT COSTS

**Robert Wahrenburg
Rental Consultant,
Rental & Used Equipment Services,
Caterpillar Inc.**

In today's economy, contractors and business managers are increasingly renting equipment to help manage cash flow and ever-changing workloads. Before you visit the rental store with your list of equipment needs, take time to help ensure you will have the right tools and machines for the job – and the job site.

1. Examine the job site.

Take a look at travel distances, steepness of grades and underfoot conditions. Know the height and reach requirements for the aerial equipment that you may need. "Specifying the right machine can help prevent work delays," says Rod Beeler, manager of Rental and Used Equipment Services for Caterpillar Inc. "If you walk into one of our stores and you're not sure of what you need, our folks will visit your job site and advise you on the best equipment for the job."

2. Select the right machine.

In general, select the smallest machine that will get the job done. But don't cut yourself short on size and power. If the machine isn't large enough or is underpowered for job requirements, it may take longer to complete a task.

3. Consider work conditions.

Know whether rental equipment will work inside or outside – or both. Measure the size of building entries. If emissions are a concern, you may need equipment that's electric-powered. Also consider any lighting you will need, such as portable light towers.

4. Know the terrain

A piece of machinery operating on 4 inches of loose gravel may have different requirements than one working on smooth concrete.

Flotation tires may be necessary in some situations, while tracks may be required in others. Solid tires may even be needed if underfoot conditions are especially abusive.

5. Calculate rental duration.

Carefully calculate how long it will take to complete your work. However, be careful not to underestimate the length of rental. If you need a piece of equipment for three weeks, it may be more cost effective to rent it for an entire month, so be sure to ask.

6. Determine equipment delivery.

Many contractors require that the rental store deliver equipment to the job site. If your rental store does not do this, be sure to calculate whether your truck and trailer can haul the equipment's weight and size. If you have a truck capable of towing equipment but no trailer, ask whether the rental store will rent you a trailer.

7. Rely on the experts.

Working with professional and well-trained rental store staff can save you time and money and help increase your productivity.

“The customer wants to work with a salesperson who understands his business and his needs,” says Beeler. “A landscaper, for example, appreciates it when we recommend he rent a skid steer loader with work tool attachments. This helps him complete multiple tasks with one machine. The bottom line is we save him time and money.”

Reprinted from The Michigan Landscape™, March/April, 2003, pg. 73.

FIELD RESEARCH FINDS ANSWER FOR FOLIAR NEMATODES

Stanton Gill, Regional Specialist

Rondalyn Reeser, Technician

MD Cooperative Extension Service

In the spring of 2002 a Maryland greenhouse grower approached us concerning a problem with foliar nematodes that were killing tuberous begonias in a greenhouse. A supplier from Georgia had unfortunately sent the grower plants that had established foliar nematodes but the plants did not start showing symptoms until they were placed in the Maryland greenhouse.

Foliar nematode (*Aphelenchoides* spp.) is one of the worst pests to bring into a nursery or greenhouse operation. The nematodes enter the foliage, feed on the spongy mesophyll cells, and reproduce in the leaf tissue. In the moist conditions of a greenhouse, the nematodes can crawl around on the plant in a film of water and enter new leaves through the stomates. The nematodes can also be spread among the plants through routine watering. If you take the foliage from a plant with foliar nematodes, cut up the damaged plant tissue with a razor or sharp knife, and place it in water, you will see the nematodes swimming out of the foliage from the cut edges into the water. A dissecting microscope with 15 – 30X magnification will help you in seeing the nematodes. You can use a relatively inexpensive (around \$10.00 - \$20.00) pocket microscope with 30X magnification.

In monocots, which have parallel veins, such as hostas, lilies and irises, the symptoms are exhibited as stripes. In dicots, like the tuberous begonias, the symptoms appear as yellow discoloration that progresses to browning between leaf veins and eventually spreads to the leaf edges. Infested leaves turn brown or decay. Dry leaves that drop to the bench or to the ground can still contain nematodes that are viable. Removing fallen foliage is an essential

part of slowing down the spread of this pest in a greenhouse operation.

Back in the 1960 – 1980's most greenhouse and nursery managers used the systemic insecticide Temik (Aldicarb) to control foliar nematode. Temik was very effective, but this material has been pulled from the market place. In its place many growers started using Oxamyl which gave some level of control, certainly not as good as Temik. Oxamyl has also been removed from the market. Growers were left with very few options for controlling foliar nematodes other than destroying infested plants as soon they detected the problem.

In February of 2002, we contacted Olympic Chemical Company to see if they had any chemicals that might have potential for controlling foliar nematodes. We were in luck! Olympic had received EPA labeling for a new chemical for control of spider mites in the greenhouse. The chemical is marketed under the name Pylon (Chlorfenapyr). Pylon is slightly translaminar in action, which means it moves down into the foliar when applied as a spray. Dr. Ron Oetting, at Georgia University, had done some preliminary work with this material for foliar nematode that appeared to be working. Unfortunately, Pylon was only labeled for mite control.

We contacted Ray Frank, of the IR-4 program in Frederick, Maryland. The IR-4 program is a government program to help growers of specialty crops, such as greenhouse and nursery production, work with companies in expanding labels for specialty crop use. IR-4 funded a field research project to investigate the efficacy of Pylon for foliar nematode control. In the spring of 2002, we set-up a trial at the University of Maryland greenhouse to evaluate the efficacy of single and multiple interval applications of Pylon for control of foliar nematodes. We found that single applications gave some level

of control but not sufficient. The best control was obtained with 3 applications of Pylon at 14-day intervals. Yoder Company in Florida, conducted similar work.

Olympic Chemical Company applied to EPA to create a supplemental label that now includes foliar nematodes. Leaf-feeding caterpillars were also added to the label. With the expansion of the label on Pylon growers finally have a solution to dealing with foliar nematodes. The only unfortunate news is that it is labeled for greenhouses use only. If you have woody plants or perennials being grown in a greenhouse, it would be a legal application.

Reprinted from Free State Nursery and Landscape News, MD Cooperative Extension.

NEW TREATMENT FOR FOLIAR NEMATODE

Karen Najda, PA Dept. of Ag

Editor's Note: Here's some more information from PA.

A large perennial-growing company worked with the Pennsylvania Department of agriculture (PDA) to determine the effectiveness of this product at its site. Plants tested include Japanese acemone, tiarella, and *Tellima grandiflora*. Pylon was applied at 2 ¾ oz. Per 50 gallons, and after 5 days plants were tested at the PDA laboratory in Harrisburg. Previously infested lower leaves still contained high levels of foliar nematodes. Two weeks after the application, the same plant tissue was tested again. Many nematodes swam out of the leaf tissue; however, the next day, most of the nematodes were dead. Laboratory personnel speculated that the residues of Pylon on plant tissue remained throughout the two weeks, and effectively reduced the foliar nematode populations as they became exposed when they exited the leaf tissue. No new infestations were

observed on upper leaves. The chemical appeared to protect new leaf tissue from infestation.

According to the label directions, a maximum of three applications at the 5.2 oz/100 gallon rate may be made over the crop cycle. The grower made a second application at the same rate, two weeks after the first application. More samples from these plants showed no live nematodes in the upper leaf canopy, but a few nematodes were still alive in the lower leaves. After four weeks, there were no new symptoms on the treated plants.

For Pylon to be most effective, growers should follow these steps: practice strict sanitation; space plants to achieve good coverage; keep the plants off the ground; remove infested leaves and cut back plants; and apply the Pylon at the first sign of plant damage or nematodes. Two applications are allowed at 7-14 day intervals, and a third application can be made if fresh plant damage or nematodes are detected. Restrictions on the label allow no more than three applications per season or crop cycle, and no other chemicals from the same chemical class may be applied to a subsequent crop in the same greenhouse structure. Pylon is labeled for non-edible ornamental crops grown in commercial greenhouses; it may *not* be applied to vegetable transplants or ornamental herbs.

Excerpted from Regulatory Horticulture, 2002, Vol. 28

INVASIVE PLANTS – GETTING AHEAD OF THE CURVE

**Wayne Mezit, ANLA President,
Weston Nurseries, MA
Craig Regelbrugge, ANLA Senior Director of
Government Relations**

By now most in the nursery industry knows of the increasing attention being paid nationwide to the invasive plant issue. In brief, there is growing concern over the environmental and economic harms caused by some introduced non-native plants that escape from gardens and landscapes, and come to dominate or disrupt natural ecosystems. Industry response to invasive plant initiatives has varied widely, ranging from defensive to cautious to proactive. Many nursery people learning about invasives for the first time react negatively. This reaction is understandable, particularly when a group that has little understanding of our industry pushes a threatening initiative.

Some examples demonstrate how quickly this issue is evolving. Recently, the Plant Evaluation Sub-committee of the Massachusetts Invasive Plant Working Group, which includes nursery industry representation, voted to classify *Berberis thunbergii* as an “invasive plant”. This resulted from evaluation using the scientific Massachusetts Criteria for Invasiveness, which the industry participated in developing, and the vote was unanimous. The research work was completed by Dr. Les Mehrohoff (the author of the original Connecticut criteria on which it was based), and funded in part by an HRI grant. (See Connecticut’s criteria, which are similar to Massachusetts’, at www.hort.uconn.edu/cipwg/). Without question this determination will have far-reaching consequences for the nursery and landscape industry in Massachusetts, and we now have an obligation to develop strategies to manage and capitalize on this very soon. Most importantly,

the industry must consider when – and how – to respond to these rankings. Tools for responding range from education and outreach on appropriate use of a particular plant, potential alternative plants, management of the plant in important natural areas through a range of approaches, voluntary phase-outs, or regulatory limits.

The economic impact on nursery businesses nationwide is potentially enormous because market-significant species like *Euonymus alatus*, *Acer platanoides*, *Miscanthus sinensis*, *Lonicera tartarica* and others are coming under similar scrutiny. Fortunately, most invasives are not economic crops for the nursery and landscape industry. Florida has used this reality to their advantage to proactively ban from commerce a number of plants, and garnered voluntary compliance from the nursery industry (see <http://www.tbwg.org>). Most of the plants given up voluntarily in Florida are widely seen as serious problems, and have limited market appeal.

Last December, representatives from the ANLA and other industry organizations participated in developing voluntary Codes of Conduct intended to help prevent introduction of new invasives, and to reduce or eliminate use of known and agreed-upon invasives. The Nursery Codes of Conduct were approved as guidelines for the industry by the ANLA Board of Directors in February 2002, and national, state and regional industry groups are also reviewing and endorsing the guidelines. For more information, see the Missouri Botanical Garden's website at www.mobot.org/iss. When reviewing and considering the guidelines, remember this: the best way for the industry to avoid the headaches and expense of more and more regulation on this issue is to take matters into our own hands. This means becoming educated, involved, and taking positive, voluntary action to minimize the introduction

and use of exotic plants in areas where they are, or are likely to become, serious environmental weeds.

A follow-up meeting on the Missouri conference was held in late October at the Chicago Botanic Garden. Key topics for discussion included a review of progress on implementing the Codes, how to deal with regional differences in invasive species response activities, and criteria for development of alternative plant recommendations. More information will be posted on the "MOBOT" website as it becomes available.

The threat of invasive plant regulation is rising to be a significant issue far more quickly than we initially anticipated. If we choose to look upon this as an opportunity, many of us believe we can continue to capitalize on being perceived as "the good guys". This can best be done by recognizing the importance of the invasive plant issue, becoming directly involved in developing solutions, making factually/scientific-based decisions and taking the appropriate actions to accomplish the results needed. But we are rapidly running out of time to do this proactively in many regions. If we hold back and let others take control of this process, we will have to accept the results, however detrimental they may be to our future well-being.

The invasive plant issue is here to stay. Together we can decide how we want to influence it. We welcome your ideas.

NURSERY CODES OF CONDUCT

Following are the voluntary codes of conduct developed by nursery industry members at the December, 2001 Missouri Botanical Garden conference.

- Ensure that invasive potential is assessed prior to introducing and marketing plant species new to North America. Invasive potential should be assessed by the introducer or qualified experts using emerging risk assessment methods that consider plant characteristics and prior observations or experience with the plant elsewhere in the world. Additional insights may be gained through extensive monitoring on the nursery site prior to further distribution.
- Work with regional experts and stakeholders to determine which species in your region are either currently invasive or will become invasive. Identify plants that could be suitable alternatives in your region. Develop and promote alternative plant material through plant selection and breeding.
- Where agreement has been reached among nursery associations, government, academia and ecology and conservation organizations, phase-out existing stocks of those specific invasive species in regions where they are considered to be a threat. Follow all laws on importation and quarantine of plant materials across political boundaries. Encourage customers to use, and garden writers to promote, non-invasive plants.

This article is provided ANLA as a Lighthouse Program partner benefit.

RESEARCHERS IDENTIFY DAYLILY THREAT

Amy Spillman
USDA-Agricultural Research Service

Daylilies – one of our most popular perennials – are pretty, easy to grow, and require relatively low maintenance. During late spring and summer, their trumpet-shaped flowers and full, green foliage brighten up flowerbeds around mailboxes, on roadsides, and in backyards gardens all over the country. They even have their own fan club in The American Hemerocallis Society.

But something began attacking U.S. daylilies about two years ago – a fungus that had never before seen in the western Hemisphere.

It was first reported in Georgia during the summer of 2000 and has since been found in at least 20 other U.S. states, as well as in Costa Rica, where growers cultivate thousands of flowers for the U.S. market.

For a time, scientists weren't sure exactly what this threat was. They knew it resembled a species of fungus found on daylilies in eastern Asia, but they didn't have enough hard evidence to identify it conclusively.

Now, however, researchers with ARS Systematic Botany and Mycology Laboratory (SBML) in Beltsville, MD, have proof that the fungus attacking American daylilies is an Asian species.

Puccinia hemerocallidis, the fungal culprit, was first described in Siberia and has also been reported in China, Japan, Korea and Taiwan. It is a type of rust fungus – a group so named because of the rusty-colored spots, ranging from yellow to orange to dark-brown to black, that form on infected plants.

Daylily rust has a short incubation period and has spread rapidly in the United States through the extensive interstate trade of daylilies. The fungus mars the appearance of infected plants, which often exhibit powdery yellow dots on their foliage. In severe cases, it can kill them.

“although daylily rust is found in Asia, it is not considered to be a significant problem there,” says Mary Palm, a mycologist with the USDA’s Animal and Plant Health Inspection Service who works at SBML.

“Both the rust and daylilies originated in Asia and have had a long time to co-exist. That may be why the rust doesn’t cause the amount of disease on daylilies in Asia that it does on daylilies in America.”

Daylily rust fungus is known to produce five different types of spores. Two types are found on daylilies in the United States and Costa Rica: urediniospores and teliospores. Because rust fungi can usually be identified by the shape of their spores, SBML researchers tried to identify the American fungus by comparing samples taken from U.S. and Costa Rican daylilies with samples taken from daylilies grown across the Pacific. They observed differences between the samples and made note of some general trends.

For example, the wall thickness of the Asian urediniospores was consistent, while it varied in those from the United States and Costa Rica. Also, the American specimens contained more one-celled teliospores than the Asian specimens, which were far more likely to contain two-celled teliospores.

Although variations existed between fungal samples, the researchers found that all the specimens were of the same species.

Their investigation was aided by the U.S.

National Fungus collections, part of SBML, which houses more than a million fungal specimens from around the world. Scientists use these reference specimens to help identify and characterize agriculturally important fungi. But they don’t just compare them by their physical appearance.

Castebury says, “We also use DNA sequences to identify and characterize new and previously described species and to sort out relationships among various groups of plant-pathogenic fungi. Knowing how these fungi are related to one another makes it possible to predict how they might behave as pathogens.”

Hernández explains the differences they noted between the Asian and American rust fungus specimens. He says, “This fungus can replicate itself on a daylilies, but another type of plant host is necessary for it to complete its life cycle. In Asia, *Patrinia* – the alternate plant host - is common. In the United States and Costa Rica, it’s not. The differences seen between Asian and American rust specimens may be due to the fungus’ apparent lack of sexual recombination in the United States and Costa Rica. It has more limited genetic variability here.”

Palm believes the fungus was introduced into the United States accidentally. She says, “Last year APHIS made more than 1,400,000 plant interceptions at ports of entry, in the mail, and through our preclearance and predeparture programs. But we need the cooperation of industry and the traveling public to further enhance our safeguarding efforts.

Excerpted from article published in Mid-Atlantic Grower, January 2003.

WIRE BASKET MANIPULATION AND TREE STABILIZATION

Bonnie Appleton, Carolyn Beatty and Scharlene Floyd

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Most landscape tree installation specifications include as one of their components a requirement of some form of tree stabilization or support. In addition, if the trees were field grown and when dug and their root balls placed in wire baskets there may also be a recommendation or requirement relative to alternation or removal of the wire basket. These two practices are a source of continuing debate and controversy within the green industry, with nurserymen, landscape contractors and managers, and arborists often in heated disagreement about what should be done and what is best for our trees.

Wire Baskets. For the protection of roots of field grown and dug trees, root balls are generally drum laced in burlap or placed into burlap lined wire baskets. Many anecdotal reports exist that attribute tree stress, decline or death to wire baskets left intact (unaltered) when B&B trees are installed. This implied damage is never immediate, but generally occurs years after installation, when burlap may have deteriorated but wire baskets are still intact. The possible involvement of wire baskets in this reported problem is often not detected until tree removal becomes necessary.

Controversy exists within the green industry relative to the need to remove or alter wire baskets during installation. Many nurseries say removal/alternation is unnecessary, and consequently won't guarantee plants if such occurs. However many planting specifications mandate either total basket removal, or require baskets to split and laid into the planting hole, or

have the top loops removed or bent back. Specifications requiring alternation or removal do so supposedly to prevent detrimental cutting or girdling of tree roots or stems by the wire. This required removal or alternation places landscape contractors in a no win situation between nursery non-removal policies and specification removal/alteration requirements. In addition, landscape maintenance personnel often report encountering basket wires sticking above ground, especially if trees were planted shallow. Wire extending above ground poses a danger to people and equipment.

On the "other end" of a tree's life, many arborists who remove dying, dead and hazardous trees frequently point to unaltered baskets as "tree killers" when they encounter wires cutting into roots. Many question why removal or alteration is not required of landscape contractors. A negative view of nursery production and landscape installation practices exists within much of the arboricultural community.

To date, limited research has been conducted to specifically address if or how wire baskets should be removed or altered during installation. Wire baskets can last up to 30 years according to Dr. Gary Watson, tree root physiologist at the Morton Arboretum (Watson, G.W. and E.B. Himelick. 1997. Principles and Practices of Planting Trees and Shrubs. International Society of Arboriculture, Champaign, IL). Tops of flare roots generally grow into the upper horizontal basket wires, causing partial girdling of roots and restricting vascular flow (xylem water and nutrient transport up and phloem carbohydrate transport down). Though root tissue may eventually grow around the wires and graft together on the other side, this reestablishment of unrestricted vascular transport may take several years (articles and research by Fuecht, Goodwin, Holmes, Lumis, Struger – citations available upon request).

In addition to the question concerning unrestricted vascular flow there is also the question of anchoring stability. Trees that appear to have blown over due to flare root girdling have been observed (Appleton). It has been reported that in Europe, baskets made of supposedly breakable plastic, rather than of wire, are used (Gardner-Young, J.W. 1981. A new method of planting trees and shrubs. *Arboric. J.* 5:45-48). However, a literature search did not provide any published reports of what effects the plastic has had on root growth, or of research addressing the practice of wire basket removal, non-removal, or alteration.

The practice of using wire baskets to protect root balls of field grown trees is not being challenged or questioned. Protection of the root balls during harvest, transport and installation into the planting hole is necessary, and is adequately provided through the use of wire baskets. What is in question is what to do with wire baskets prior to back filling soil around the root ball during transplant.

Tree Stabilization. Current tree stabilization systems frequently contribute to deformation, stress or death of trees to which these materials are attached. Shading of one side of the tree by a single stake can lead to uneven trunk development and lean in the opposite direction.

Due to reduced compression wood formation, rigid staking can lead to reduced trunk caliper and taper formation. In addition, guying that is not removed in a timely fashion can lead to bark abrasion and trunk constriction, the latter blocking movement of materials in tree vascular systems.

Tree trunk stabilization systems can be justified for several reasons. Physical support may be needed in landscape sites that are windy, and where trees may lean due to unsettled or

amended back fill soil. Physical support may also be needed where tree crown are large or dense and their weight may cause trees to lean, or where tree crowns are large in proportion to the size of their root balls.

An indirect reason for stabilization systems is to create a physical barrier that reduces physical damage from landscape maintenance equipment, and to reduce uprooting vandalism. All of these reasons relate to the need to allow tree roots to grow from the root ball into the surrounding soil, anchoring the tree and reestablishing the absorptive function of the roots. Unfortunately, many trees that do not need stabilization due to size or location are needlessly staked, often due to outdated or “one size fits all” planting specifications.

Published research on tree stabilization is limited. Neel (Neel, P.L. 1971. Factors influencing tree trunk growth. Special Report, I.S.T.C. Research Project, 115-138.) showed that motion, light and growth regulators influenced trunk development (in particular, reaction wood formation) of most species studied. Harris (Harris, R.W. 1984. Effects of pruning and staking on landscape trees. *J. of Environ. Hort.* 2(4):140-142.) showed that trunk staking is often not only unnecessary, but can be detrimental to tree growth. The most recently published research comparing actual trunk support systems was conducted by Svihra, et. Al (Svihra, P., D. Burger, and D. Ellis. 1999. Effects of 3 trunk support systems on growth of young *Pyrus calleryana* trees. *J. of Arboric.* 25(6):319-324.). However, only one tree species and three systems were used. No research literature has been found comparing the relatively unknown system of tree stabilization via root ball anchoring with trunk staking (one article from England mentioned using root ball anchoring but gave no post transplant results).

The most commonly used tree stabilization

systems use one or more wooden stakes with hose covered wire guying attaching the stakes to the trunk. Unfortunately many of these staking and guying systems restrict trunk movement or cause trunk damage. Even where tree stabilization is justified, above ground supports are frequently left in place for an excessive period of time, often leading to inferior trunk development and damage. In urban areas, above ground supports can be a physical safety concern for grounds management personnel, pedestrians, cyclists, and pets due to the potential of entanglement in the stakes or guying.

Numerous alternative products and systems to above ground wooden stakes and hose-covered wire exist. Research is needed to compare these productions and systems. Also needed is evaluation of and comparison with below ground stabilization systems. These systems can potentially provide needed support, via root ball anchoring, without restricting trunk movement or causing any bark damage or trunk constriction.

Editor's Note: This article also included a plea for the nursery and landscape industry to complete a survey that will be used to design a research project slated for installation during the Spring of 2003. Results from this study should be available in the next several years.

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MONITORING EC, PH, AND NUTRIENTS IN LARGE NURSERY CONTAINERS

**Robert D. Wright, Mary Stanley, and Roger
Harris**

**Virginia Polytechnic Institute and State
University**

Research at Virginia Tech supported by the Virginia Nurserymen's Horticultural Research Foundation and the Virginia Agriculture Council has developed an innovative way to monitor fertility levels in large nursery containers. Suction-cup lysimeters were used to extract the substrate solution from large containers for EC, pH, and nutrient analysis. The lysimeter consists of a tube connected to a porous ceramic tip that is inserted into the container so that the tip rests on the bottom of the container. It is recommended that lysimeters be installed for the whole course of a growing season in large containers. To facilitate installation of the lysimeter, make a pilot hole approximately one-half the diameter of the lysimeter vertically through the substrate to the bottom of the container to guide insertion of the lysimeter. A 2 foot long piece of 1" re-bar is good for this purpose. The difference in diameter between the pilot hole and the lysimeter ensures a tight fit between the substrate and the lysimeter.

One to two hours following irrigation, after making sure any existing water is removed from the lysimeter, use a vacuum pump to create a vacuum of approximately 50 centibars (15 inches of mercury) in the lysimeter. Clamp the evacuation tube so that the vacuum remains for 5 to 15 minutes, providing sufficient time for the substrate solution to be drawn into the lysimeter. Release the vacuum, remove the port opening at the top of the lysimeter, and draw out the solution from the lysimeter with a syringe. The volume extracted may vary from lysimeter to lysimeter, but research has shown that

volumes extracted ranging from 10 ml up to 120 ml do not affect nutrient levels in the extracted substrate solution. The nutrient solution collected can then be analyzed for EC, pH or a complete nutrient analysis. Three or four water samplers should be installed within a block of plants of similar size and nutritional program.

Interpretation of Results. The EC values – a relative measure of the nutrient level in the container – as well as pH and other nutrient values obtained with this procedure, correlate well with plant growth. Values associated with optimal growth for the lysimeter are given in

Table 1. It is important that each nursery develop its own set of values because of differences in nutritional programs, plants grown, and irrigation practices among nurseries.

Equipment Availability. Suction cup lysimeters (soil water samplers) and associated equipment can be purchased from SoilMoisture Equipment Corp., P.O. Box 30025, Santa Barbara, CA 03105. www.soilmoisture.com. Soil water sampler model 1900 L24 with one-half bar air-entry value, vacuum pump 3005G2, and 1000K2 extraction kit are recommended.

Table 1. Desirable nutritional levels to be maintained in the container substrate solution. The range in values represents levels for plants with low to high nutrient requirements.

Desirable levels*

| Analysis | Fertigation | CR fertilizer |
|--|-------------|---------------|
| PH | 4.5 to 6.0 | 4.5 to 6.0 |
| Electrical conductivity, ds/m(mmhos/cm) | 0.5 10 1.0 | 0.2 to 0.5 |
| Nitrate-N, NO ₃ N mg/L (ppm) | 50 to 100 | 15 to 25 |
| Phosphorus, P mg/L | 10 to 15 | 5 to 10 |
| Potassium, K mg/L | 30 to 50 | 10 to 20 |
| Calcium, Ca mg/L | 20 to 40 | 20 to 40 |
| Magnesium, Mg mg/L | 15 to 20 | 15 to 20 |
| *Levels should not drop below these during periods of active growth. | | |

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SUDDEN OAK DEATH (SOD) ALERT
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Phytophthora ramorum is the casual agent of Sudden Oak Death (SOD) in California and Oregon. This new species of *Phytophthora* was first described as a pathogen on *Rhododendron* and *Viburnum* spp. In Germany and the Netherlands in 2001. *P. ramorum* has a broad host range. It also is a very destructive pathogen. This pathogen would cause devastating consequences to the nursery and forest industries as well as to the natural landscape should it be accidentally brought into the state.

Host range. The current list of host plants for *P. ramorum* spans at least 12 families. This list continues growing rapidly. Overall, *Lithocarpus densiflorus*, the tanoak, is the most susceptible tree species and *Rhododendron*, *Vaccinium*, *Pieris* spp. And *Kalmia latifolia* are among the most susceptible shrubs. Some host plants are listed below, under two categories.

Known host plants:

Acer macrophyllum – Big leaf maple
Aesculus californica – CA Buckeye
Arbutus menziesii – Madrone
Arctostaphylos manzanita - Manzanita
Chrysolepis chrysophylla – Golden chinquapin
Heteromeles arbutifolia – Toyon
Lithocarpus densiflorus – Tanoak
Lonicera hispidula – CA honeysuckle
Quercus agrifolia – Coast live oak
Quercus kelloggii – Black oak
Quercus parvula var shrevei – Shreve's oak
Rhamnus californica – CA coffeeberry
Rhododendron spp – including azaleas
Umbellularia californica – California bay laurel
Vaccinium ovatum & many other spp. –
Huckleberry

Viburnum x bodnantense – Arrowwood

Potential host plants:

Castanopsis chrysolepis – Chinquapin
Cotoneaster sp.
Kalmia latifolia – Mountain laurel
Pieris floribunda – Pieris
Prunus sp. – Laurel
Pseudotsuga menziesii – Douglas-fir
Quercus chrysoleis – Canyon live oak
Quercus garryana – Oregon white oak
Syringa sp. – Lilac
Zenobia pulverulenta

Symptoms. The most consistent and diagnostic symptom of the disease on large trees such as tanoak is cankers on the lower trunk that have brown or black discolored outer bark and ooze dark red sap. These cankers develop before foliage symptoms become evident. However, the whole crown of affected trees often appears to die rapidly. The name, 'Sudden Oak Death', reflects this disease development on foliage.

The most common symptoms on shrubs such as rhododendron are twig dieback and leaf spotting. Blackened shoots with or without foliage attached are typical of twig dieback caused by *P. ramorum*. Leaf spots have diffuse rather than sharp margins, which are characteristic of sunburn injury and generally do not involve the midrib of the leaf. *P. ramorum* usually does not cause mortality of shrub hosts.

It must be noted that these symptoms are not unique for sudden oak death. For example, *P. cinnamomi*, *P. cactorum*, and *P. citricola* can cause similar cankers on the trunk. Other species such as *P. nictianae*, *P. citrophthora*, and *P. heveae* may cause foliage symptoms similar to those of SOD. Differentiation of SOD from those caused by other *Phytophthora* spp. May be accomplished by examining the progress of the disease. This will require some

understanding of the basic biology and epidemiology of this disease.

Biology and epidemiology. *P. ramorum* produces abundant deciduous sporangia which release zoospores. Zoospores are the major infective propagules. These features allow efficient transmission of the pathogen. This species also produces a great number of large chlamydospores, which allow it to survive in the environment for a long time.

Viable zoospores were detected in stream and surface water. The species also was detected in soil collected from a hiking trail and hikers' shoes in a California State Park. As a precaution, anyone entering the quarantine areas in California is required to wear special shoes and relinquish them on-site before leaving. Similarly, vehicles are required to be washed before leaving the quarantine area to prevent this pathogen from spreading. Long distance transmission of *P. ramorum* through eastward movement of nursery stock is a serious concern due to the broad host range of this species.

P. ramorum attacks only aerial plant parts. No disease symptom has been seen below the soil-line. This contrasts with other *Phytophthora* canker diseases. Cankers caused by *P. cinnamomi*, *P. citricola*, and/or *P. cactorum* usually start with root rot then develop into cankers on the main stem and move upwards. This is a useful feature to differentiate cankers caused by *P. ramorum* from those caused by other *Phytophthora* spp.

Geographic distribution and spreading risk assessment. In California, sudden oak death was found on a variety of plants along approximately 325 km of the Pacific Coast from Big Sur in Monterey Co. (36°5'N, 121°47'W) to southern Mendocino Co. (38°56'N, 123°19'W). The sites furthest inland were approximately 70 km from the coast in Solano Co. (38°18'N,

122°12'W). The most severe sudden oak death occurs within approximately 30 km of San Francisco Bay including some popular state parks. The pathogen was recovered from forests at sea level to 800 m elevation. Although both the California Department of Food and Agriculture and USDA/Animal and Plant Health Inspection Service (APHIS) have very strict quarantine measures in place to prevent the pathogen from spreading, the infested areas continues expanding in California.

Sudden oak death also was found in nine sites in sites in Southwestern Oregon. *P. ramorum* was recovered from tanoak stem canker and from foliage and shoots of native *Rhododendron* spp. and *Vaccinium* spp. Fortunately, all sites were within a 9 square mile area in Curry Co. All lands within 1 mile of individual disease centers are subject to Oregon and APHIS quarantine, barring the transport of host materials. An eradication effort followed by intensive monitoring of treated and perimeter areas is underway.

Accordingly to a comparative study conducted by USDA/Forest Service, Washington is a high-risk area for sudden oak death epidemics in addition to California and Oregon on the Pacific Coast. Virginia along with North Carolina, South Carolina, Tennessee and Georgia also were ranked as high-risk regions for this disease among the rest of the United States. Pilot surveys for this pathogen at nurseries and surrounding forests in these five states are underway to gain first hand data about the spreading status of this pathogen outside of the quarantine areas in California and Oregon.

Precautions taken to prevent this pathogen from entering other states. No matter how strict the quarantine measures put in place by APHIS and local inspectors in California and Oregon are, it is advisable to take every precaution to safeguard the nursery and forest

industry as well as the natural. These precautions include:

1. Purchase of plant materials including stock plants and products from the quarantine areas of California and Oregon should be avoided if at all possible, as we still do not really know how wide the host range of *P. ramorum* is.
2. Precautions must be taken when plant materials, especially host materials, are being purchased from high-risk areas on the Pacific Coast, including the entire state of Washington and non-quarantine areas of California and Oregon.
3. All plant materials need to be checked by local inspectors and certified free of contamination by *P. ramorum* prior to shipment.
4. Any incoming plant materials suspected of *P. ramorum* contamination should be reported immediately to the State Department of Agriculture and Consumer Services and double-checked by a lab certified for identification of this pathogen.

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WEED CONTROL IN FIELD NURSERIES

James E. Altland, Charles H. Gilliam, and Glenn Wehtje

Weed control is an important component of producing quality field-grown nursery stock. Many field-grown crops are planted as small liners, which take several years before reaching salable size. During this time nursery crops offer limited competition with weeds for nutrients and water. Research on herbicide application timing for field-grown plants suggests the need for weed control is greatest during the first year following planting (Wehtje and Gilliam, 1991). Though growth suppression by weed competition in field-grown nursery stock has not been documented, reduced shoot growth up to 43% has been documented in container stock (Berchielli-Robertson et al., 1990). In addition, weeds reduce the aesthetic value of nursery crops and may also serve as a source of weed inoculation in the landscape or host plants for insects.

Successful use of herbicides for weed control requires a three-step process. First, when applicable, weeds should be eliminated preplant using a broad-spectrum postemergence herbicide or soil sterilant. Cultivation could be an acceptable method for eliminating annual weeds, however herbicides are more effective in controlling perennials or weeds with developed underground storage tissue. Second, occurrence of new weeds should be prevented using preemergence-applied herbicides. This should be the primary action taken to control weeds in nurseries, and thus will be the focus of this manuscript. And finally, escape weeds should be controlled using postemergence weed control methods.

Preemergence weed control. Why do herbicides fail? There are several reasons why herbicides are sometimes ineffective. The most common reasons include improper application

timing, improper application rates, and not choosing the most effective herbicide for the prevalent weed species.

Preemergence-applied herbicides should be applied to weed free areas because they have little or no activity when applied to emerged seedlings. A major reason why these herbicides fail in field-grown nurseries is that they are applied when weeds have already germinated. Also, many of the herbicides currently used do not have sufficient residual activity to provide season long control from a single application (Wehtje and Gilliam, 1991). In the southeastern United States, most herbicides provide only 10 to 14 weeks of activity in the field (Gilliam, 1989). As the herbicidal barrier from an application begins to degrade, a follow-up application is needed before weed seed germination. Monitoring weed populations is essential to determine proper timing. In a test that evaluated the effects of application timing using various combinations of simazine (Princep; Syngenta Crop Protection, Greensboro, N.C.), oryzalin (Surflan; Dow AgrSciences, Indianapolis, Ind.) and oxyfluorfen (Goal; Dow AgrSciences), application timing was shown to be of greater importance than herbicide selection. Specifically, an application in March of any combination of two herbicides providing broad-spectrum activity served to eliminate much of the weed competition during the period of spring growth, and a second application extended control through the remainder of the season (Wehtje and Gilliam, 1991). Also, rainfall or irrigation is necessary to activate most herbicides [usually 0.5 inch (1.27 cm) of precipitation, but may vary by herbicide]. Because many field-grown crops are not irrigated, application timing before precipitation is critical.

Identification of weed species is required in order to choose the most effective herbicides for controlling prevalent weed species. Even if

specific identification cannot be made, the ability to differentiate between grass, broadleaf, and sedge species is critical in choosing the correct herbicide.

No single herbicide controls all weeds. Preemergence herbicides are typically classified as controlling either broadleaf, grass, or sedge species. It is common practice to combine an herbicide effective in controlling broadleaf species with another effective against grasses. Oxyfluorfen, simazine, and isoxaben (Gallery; Dow AgroSciences) are preemergence herbicides currently available to control broadleaf species in field nurseries.

Oxyfluorfen, a diphenyl ether, is absorbed by foliage and root tissue where it inhibits protoporphyrinogen oxidase (also called protox) (Ross and Lembi, 1999). Oxyfluorfen is marketed for the nursery industry as Goal 2XL, an emulsifiable concentrate (EC) containing 2.0 lb/gal (0.24 kg.L⁻¹) a.i. (previous products were marketed as 2E and 1.6E formulations). Oxyfluorfen should be applied at 0.5 to 2.0 lb/acre (0.56 to 2.24 kg·ha⁻¹), and all applications should not exceed more than 2 lb/acre per year (C&P Press, 2001). Oxyfluorfen provides excellent preemergence broadleaf weed control, but almost no control of grasses (Coffman et al., 1984; Coffman and Frank, 1987). In addition, it is one of the few preemergence herbicides with postemergence activity on newly emerged weeds. Fretz et al. (1980) compared the 2E and 2G formulations, and reported the 2E formulation was significantly more injurious to woody plants. Davis and Minton (1982) reported injury from application of 2 lb/acre with the 2E formulation to three of 13 plant species. Over the top application of the 1.6E formulation to container-grown transplanted cuttings of wintercreeper euonymous (*Euonymus fortunei*) caused foliar injury with rates as low as 0.28 lb/acre (0.314 kg·ha⁻¹) a.i. (Horowitz et al., 1989). Weeler et

al. (1984) compared formulations in container nursery crops and reported the EC formulation to provide superior weed control but greater injury than either the granular or wettable powder formulations. Caviness et al. (1988) reported container-grown hino-crimson azalea (*Rhododendron obtusum japonicum*) to be more sensitive to foliar treatment than japanese holly (*Ilex crenata*). Generally, plants in either midsummer dormancy or winter dormancy are more tolerant to oxyfluorfen applied over the top. Over the top application of spray-applied oxyfluorfen in early May resulted in injury to 10 species of landscape crops, with injury generally being more severe on juvenile foliage (Milbocker and Elstrodt, 1982). Gilliam et al. (1989) demonstrated that midsummer applications applied over the top of four field-grown woody crops to be noninjurious. This tolerance was attributed to a semidormant period that plants enter during environmentally stressful periods of summer. Oxyfluorfen is labeled for use on about 70 woody species, provided applications occur during winter dormancy. When nondormant applications must be made, recommendations are for directed applications to the soil and only when foliage is fully expanded and hardened (C&P Press, 2001).

Simazine, a triazine herbicide, works as a strong inhibitor of photosynthetic electron transport (Ware, 1989). Simazine is marketed under the trade name Princep 4L [4.0 lb/gal (0.48 kg·L⁻¹) a.i.], and is active against large-seeded broadleaf species. The label recommends applications at 2 to 3 lb/acre (2.2 to 3.4 kg·ha⁻¹) a.i., with the first application made one year after transplanting (C&P Press, 2001). Crop tolerance to simazine is both rate and species dependent. In previous work (Wehtje et al, 1986) with field-grown littleleaf boxwood (*Buxus microphylla*) and red tip photinia (*Photinia Xfraseri*), tank mixtures of oryzalin and simazine at rates up to 3 + 1 lb/ acre (3.4 +

1.1 kg·ha⁻¹), respectively, were noninjurious yet provided a maximum degree of weed control. At the close of the 3-year study, growth indices from these treatments were either equal to or superior to the hand weeded control. Young (1980) reported a tank mixture of simazine and oryzalin [2 + 8 lb/acre (2.2+9.0kg·ha⁻¹)], applied preemergence, provided excellent (90%) seasonlong control of both broadleaf and grass weeds in nonbearing peaches (*Prunus persica*) without causing injury. Ries et al. (1969) identified simazine as providing up to 6 weeks of weed control at either 2 or 4 lb/ acre (2.2 or 4.5 kg·ha⁻¹), with the required rate dependent on the prevalent weed species. Akers et al. (1984) reported that simazine, either alone or in combination with oryzalin, diphenamid, alachlor, or napropamide, provided season-long weed control. Statistically, a tank mixture of simazine and oryzalin (1+4lb/ acre) was not injurious to norway maple (*Acer platanoides*), creeping juniper (*Juniperus horizontalis*), and japanese spurge (*Pachysandra terminalis*). However, inspection of the data reveals that the fresh weight of these crops tended to be numerically less with this treatment relative to the nontreated control. Ryan et al. (1981) reported that preemergence applications of simazine at 6 lb/ acre (6.7 kg·ha⁻¹) to roadside plantings were injurious to California privet (*Ligustrum ovalifolium*), staghorn sumac (*Rhus typhina*), 'Moonlight' broom (*Cytisus X preaecox*), and baltic ivy (*Heddera helix*). Ahrens (1963) reported that simazine at 3 lb/acre was injurious to 'Lynwood gold' forsythia (*Forsythia X intermedia*), weeping willow (*Salix X niobi*), 'Vanicek' weigelia (*Weigela florida*), mock orange (*Philadelphus virginialis*), and flowering pink almond (*Prunus glanulosa*). Briggs (1978) identified 2 to 3 lb/ acre as the rate of simazine necessary for weed control, and recommended that this herbicide not be used around boxwood (*Buxus*), euonymous (*Euonymous*), leucothoe (*Leucothoe*), nandina (*Nandina*), enkianthus

(*Enkianthus*), or many of the deciduous plants, and that only low rates are safe around rhododendron (*Rhododendron*) species, forsythia (*Forsythia*), and young magnolia (*Magnolia*) species (exact species were not identified in the preceding reference). Bryson James, in a speech recorded by Urbano (1985), identified oryzalin plus simazine at rates up to 3+ 1 lb/ acre, applied either in the early spring or fall, as an effective treatment for the control of annual weeds in fieldgrown ornamentals. It was recommended that this treatment be applied only once a year, otherwise an injurious buildup of simazine could result. Several other woody plants species that are simazine sensitive include catawba rhododendron (*Rhododendron catawbiense*), japanese andromeda (*Pieris japonica*) (Bing, 1981), eastern arborvitae (*Thuja occidentalis*) (Davis and Minton 1982), and ‘Greenspire’ linden (*Tilia cordata*) (Smith, 1980). A more recent field study demonstrated that simazine was noninjurious to six shrub and four tree species (Setyowati et al., 1995), however, while not specifically started, directed application was likely used instead of an over the top application.

Isoxaben, a benzamide, works by inhibiting cellulose biosynthesis in emerging seedlings (Scheegurt et al., 1994). It is marketed for field nursery crop production as a 75% active dry flowable (DF). Isoxaben is typically applied at 0.5 to 1.0 lb/acre and provides preemergence control over a wide range of broadleaf weeds. Isoxaben is labeled for use in over 400 species. Neal and Senesac (1990) reported that isoxaben provided excellent control of many broadleaf weed species but poor annual grass control. The combination of isoxaben plus oryzalin provided an expanded spectrum of weed control with excellent safety on most container and field-grown woody nursery crops. In a previous test, isoxaben in combination with oryzalin provided weed control similar to that obtained by either oxyfluorfen or simazine when combined with

oryzalin (Gilliam et al., 1989). Many nursery crops are sensitive to applications of either oxyfluorfen or simazine. And while weed control with isoxaben is no better than that provided by oxyfluorfen or simazine, the greater crop tolerance of isoxaben is an advantage where crop tolerance is marginal.

Oryzalin, pendimethalin (Pendulum; BASF, Research Triangle Park, .C.), and prodiamine (Syngenta) are used for grass control in field-grown nursery crops in the southern United States. While many herbicides have been evaluated for preemergence grass control among landscape crops these three herbicides are the most commonly used in field crop production. Trifluralin (Treflan; Lesco, Rocky River, Ohio) is another grass-active herbicides used in container nurseries; however, it is currently marketed to the nursery industry as only a granular formulation and thus is impractical for use in larger field nurseries.

Oryzalin, pendimethalin, prodiamine, and trifluralin are dinitroaniline (DNA) herbicides that act by inhibiting root formation. Oryzalin is marketed as Surflan 4AS, which is an aqueous suspension (4 lb/gal a.i.), typically applied at 2 to 4 lb/acre a.i. Oryzalin provides excellent control of grasses and some small seeded broadleaf weeds (Gilliam et al., 1989). Surflan is labeled on over 350 woody landscape species. Application to woody field-grown nursery stock is generally noninjurious (Akers et al., 1984; Gilliam et al., 1989; Reeder et al., 1944). Oryzalin is commonly combined with herbicides providing preemergence-applied broadleaf weed control, such as oxyfluorfen, isoxaben, or simazine, to provide excellent broad spectrum preemergence – applied weed control (Gilliam et al., 1989; Wehtje et al., 1986; Young 1980).

Sprayable pendimethalin is marketed under the trade name Pendulum as a 60% active water-dispersible granule (DG). Pendimethalin should

be applied at 2 to 4 lb/acre. With over 200 woody landscape plants on its label, pendimethalin is safe on field-grown stock and provides weed control similar to oryzalin and prodiamine (Reeder et al., 1994). In a study of several formulations, Pendulum 60 DG applied at 4 lb/acre a.i. was noninjurious when applied during the active growth stage of eastern hemlock (*Tsuga canadensis*) 'Plumosa' juniper (*Juniperus horizontalis*), yew (*Taxus* spp.), eastern arborvitae, boarder forsythia (*Forsythia x intermedia*) or fraser fir (*Abies fraseri*); the 4EC formulation of pendimethalin (not commonly used in the nursery industry) was injurious to new growth of several species (Ahrens, 1988).

Prodiamine is marketed under the trade name Factor (formerly Barricade; Syngenta) in a 65DG formulation. Factor should be applied at 0.65 to 1.5 lb/acre (0.728 to 1.68 kg·ha⁻¹) a.i., but the total annual amount applied should not exceed 2.3 lb/acre (2.57 kg·ha⁻¹) a.i. (C&P Press, 2001). Factor has approximately 125 woody landscape crops on the label (some of these are not labeled for use in California). Kuhns et al. (1981) reported prodiamine at rates from 1 to 8 lb/acre provided adequate weed control with no injury to 11 landscape species. Other field experiments evaluated prodiamine at rates from 1 to 8 lb/acre and in each case prodiamine provided moderate to excellent weed control and no injury to landscape species (Haramaki et al., 1980; Haramaki and Kuhns, 1981; Kauns et al., 1981; Frank, 1980).

Nutsedge-active preemergence herbicides. Nutsedge is in the family Cyperaceae and is poorly controlled by the previously mentioned grass-active herbicides. Metolachlor is the most effective herbicide labeled in nursery crops for controlling nutsedge preemergence. Metolachlor, a chloracetamide, works by retarding cell division and inhibiting meristematic growth (Ross and Lembi, 1999). It

is marketed as Pennant (Syngenta) [8 lb/gal (1.0 kg·L⁻¹) a.i.] or Pennant Magnum (Syngenta) (7.62 EC). Metolachlor provides effective control of yellow nutsedge (*Cyperus esculentus*) and annual grasses but poor control of broadleaf weeds (Wehtje et al. 1986; Setyowati et al., 1995). Metolachlor when applied alone or in combination with simazine at rates up to 16lb/acre (17.9 kg·ha⁻¹) and 16 + 4 lb/acre, respectively, has been reported to be noninjurious to newly planted nursery liners including: california privet, border forsythia, torringo crabapple (*Malus sieboldii*), red stemmed dogwood (*Cornus stolonifera*), japanese yew (*Taxus cuspidata*), andorra juniper (*Juniperus horizontalis plumosa*), japanese holly, red oak (*Wuercus borealis*), eastern arborvitae, norway maple, catawba rhododendron, hino-crimson azalea, deciduous azalea (*Rhododendron gandavense*), and eastern hemlock (Bing, 1979). Metolachlor was noninjurious to japanese holly or wards yew (*Taxus media*); however, it has been reported to cause injury to 'Emerald N Gold' euonymous (*Euonymous fortunei*) (Ahrens, 1986). A separate study reported initial foliar injury to 'Hetzi' and 'Howard' holly (*Ilex crenata*), which was outgrown by 6 weeks after application and resulted in no suppression of plant growth or marketability (Beste and Frank, 1990).

Postemergence weed control. Postemergence-applied herbicides can be classified as having either selective or nonselective activity. Herbicides with selective activity used in nursery production include products with the grass-active ingredients fluazifop-butyl (Fusilade; Syngenta), sethoxydim (Vantage; BASF), or clethodim (Envoy; Valent, Walnut Creek, Calif.). These herbicides selectively control grass weeds and cause little or no injury to broadleaf plants. Fluazifopbutyl is an aryloxphenoxy propionate. It is typically applied at 2 to 3 pt/acre [0.25 to 0.375 lb/acre

(0.280 to 0.4200 kg·ha⁻¹) a.i.] with the addition of a nonionic surfactant. Applications should be made to actively growing grasses at a growth stage recommended by the label (C&P Press, 2001). Fluazifop-butyl (Fusilade) is labeled on over 370 landscape species for over the top application with an additional 100 or more species labeled for directed spray applications. Sethoxydim and clethodim are cyclohexanediones. Sethoxydim is applied at 2.25 to 3.75 pt/acre [0.28 to 0.49 lb/acre (0.314 to 0.549 kg·ha⁻¹) a.i.] depending on grass height and species. Sethoxydim (Vantage) is labeled on over 300 woody landscape species. Clethodim (Envoy) is applied at 0.125 to 0.25 lb/acre (0.1400 to 0.280 kg·ha⁻¹) depending on prevalent grass species and grass height. There are over 100 landscape species on its label, including 40 herbaceous crops. Applications of fluazifop-butyl and sethoxydim at rates high enough to result in 90% control of common bermudagrass (*Cynodon dactylon*) caused no injury to 12 species of landscape plants with the exception of 'Hex' rhododendron (*Rhododendron x'Hex'*) (Gilliam et al., 1984). Fluazifop-butyl has been tested extensively for phytotoxicity on woody plants (Bing and Macksel, 1984; Gilliam et al., 1984; Kuhns et al., 1984) and with the exception of several red flowering azalea cultivars, no phytotoxicity has been reported. Over the past 3 years we have evaluated clethodim for postemergence grass control and found it provided control similar or better than sethoxydim (data unpublished).

Nonselective Herbicides. Non-selective herbicides commonly used in nursery production include glufosinate (Final; Aventis), paraquat (Gramoxone; Syngenta), and glyphosate (Roundup Pro; Monsanto, St. Louis, Mo.). These postemergence-applied herbicides should be limited to directed applications to avoid contact with nursery crops. Nonselective herbicides can be further classified as either contact or translocated. Contact herbicides only

injure foliage or plant parts that are contacted by the spray, with little or no movement into noncontacted tissue. Paraquat, a bipyridilium herbicide, should be applied at 0.6 to 0.9 lb/acre (0.67 to 1.01 kg·ha⁻¹). Paraquat is a contact herbicide that provides rapid death of contacted foliage, however, it is not translocated to underground tissue, which has potential to regenerate a new shoot system. For example, paraquat provided excellent kill of purple nutsedge (*Cyperus rotundus*) foliage, but by 4 weeks after treatment regrowth from roots had occurred (Wooten and Neal, 2000). Thorough coverage is necessary for obtaining control, therefore higher spray volumes are recommended. Paraquat is a restricted use herbicide due to its acute mammalian toxicity [oral LD₅₀ = 150 ppm (mg·kg⁻¹)], therefore care should be used in mixing and applying the herbicide. Glufosinate, an amino acid derivative, is also a contact herbicide and is applied at rates of 4 to 6 qt/acre [1.0 to 1.5 lb/acre (1.12 to 1.68 kg·ha⁻¹)]. Glufosinate is far less toxic to mammals (oral LD₅₀ = 2000 ppm) than paraquat, and thus can be used in similar situations to paraquat with less chance of injury to the applicator.

Translocated herbicides are absorbed by plant parts that make contact with the spray and are moved throughout the root and shoot system. Translocated herbicides are effective in providing control of perennial weeds with well-developed root systems. Glyphosate is a translocated herbicide that provides control over a broad spectrum of weeds and is commonly used in the nursery industry. A problem frequently encountered in nursery production is use of improper glyphosate rates. For annual weeds less than 6 inches (15.2 cm) in height glyphosate should be applied as a 1% solution, and for weeds greater than 6 inches in height glyphosate should be applied at a 1.5% solution (Gilliam, 1989). For perennial weeds, a 3% to 5% solution should be used. Improper

application of glyphosate causes more injury to nursery crops than any other herbicide used. The label recommends avoiding contact of spray, drift, or mist with foliage or green bark of landscape crops (C&P Press, 2001). However, studies have shown that several landscape crops, including lily-turf (*Liriope muscari*), 'Burford' holly (*Ilex cornuta*), 'Routunda' holly (*Ilex cornuta*), 'Rotunda' holly (*I. Cornuta*), dwarf yaupon holly (*I. vomitoria*), harland boxwood (*Buxus harlandii*), chinese privet (*Ligustrum sinense*), variegated waxleaf privet (*L. lucidum*), 'Recurvifolium' privet (*L. japonicum*), heavenly bamboo (*Nandina domestica*), and others have tolerance to low rates of glyphosate (Self, 1974; Self and Washington, 1977). Longterm injury was not reported from these experiments, so caution should be used before relying on their safety claims.

Nutsedge-active Herbicides. Herbicides used specifically for postemergence nutsedge control include bentazon (Basagran, BASF), halosulfuron (Manage, Monsanto), and imazaquin (Image, BASF). Yellow nutsedge is considered to be one of the most troublesome weeds in the world. Yellow nutsedge propagates by seed and tubers. A single tuber of yellow nutsedge is capable of producing about 7000 new tubers and 1900 new aerial shoots in one season (Tumblesome and Kommedahl, 1961). Cultivation or mechanical removal of yellow nutsedge often leads to spreading the tubers throughout the nursery and is therefore an ineffective control method (Wilcut et al, 1991). Container studies have demonstrated effective yellow nutsedge control using rates of bentazon, a benzothiadiazole, from 1.5 to 6.0 lb/acre (1.68 to 6.72 kg·ha⁻¹) (Fretz and Sheppard, 1978). Injury due to over the top applications of bentazon is species dependent (Wilson and Whitwell, 1993) and appears to be related to the ability of different species to metabolize bentazon into nonphytotoxic metabolites. Nonetheless, over the top applications have

proven injurious to a variety of landscape crops (Bachman et al., 1995; Wilson and Whitwell, 1993), therefore directed applications in the field are recommended.

Two container studies have demonstrated that imazaquin (an imidazolinone) and halosulfuron (a sulfonyleurea) provide effective postemergence control of yellow and purple nutsedge (Hurt and Vencill, 1994a, 1994b) with control from halosulfuron being slightly better. However, since both products may cause injury with over the top applications, directed applications are recommended.

A recent study on postemergence purple nutsedge control demonstrated that two applications of halosulfuron or imazaquin provided effective control in the same year they were applied; however, control did not carry over into the next year (Wooten and Neal, 2000). In the same study, late season application of glyphosate and glufosinate provided the most effective control through the year following application, suggesting the late post applications significantly reduced tuber formation or tuber viability.

A carefully planned weed management strategy for weed control in field production and landscape environments should include knowledge of the following: weed biology, herbicide application and calibration procedures, herbicide efficacy against target weeds, landscape and nursery crop tolerance to herbicides applies, and correct timing of applications. Information in this manuscript provides growers with a current list of herbicides and their properties to aid them in selecting the most appropriate herbicides for successful weed control in field nurseries.

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Publications

Tropical Foliage Plants by Lynn P. Griffith Jr. This 300-plus page book is filled with useful, technical information presented in a nontechnical manner. Eighty-two foliage species are carefully described, and information is given about habitat, uses, varieties, propagation, culture, nutrition, diseases, insect and mite pests, disorders, tricks, and interior care. Cost \$59.95 ISBN: 1-883052-16-5, Item #B034, 318 pages, hardcover.

Tropical Foliage Disorders by Lynn P. Griffith Jr. A guide to identification and treatment of pests, diseases, environmental disorders, and phytotoxicity in over 70 varieties of foliage plants. Arranged by genera, 352 photos highlight damage for on-the-spot diagnosis. It's an ideal tool to take into the field, greenhouse, retail area, or interiorscape. The disorders found in this volume were all diagnosed by A&L Southern Agricultural Laboratories, Lynn's consulting and diagnostic firm. Cost \$59.95, Item #B052, ISBN: 1-883052-30-09, 192 pages, softcover.

2003 Insecticide, Herbicide, Fungicide Quick Guide – This new revision is the best quick reference available! Pesticides are cross-referenced to registered usage, then the pests each individual product will control are listed in alphabetical order. A quick answer can be readily obtained to questions such as; what can be used to control mites on corn, or pigweed in cucumbers, or powdery mildew on apples. Available from Thomson Publications, P.O. Box 9335, Fresno, CA 93791, or call 559-2964, fax 559/266-0189 or www.agbook.com. \$25.95 each plus tax, if applicable, and \$5.50 for shipping.

Herbaceous Perennials Production: A Guide from Propagation to Marketing –This 220-

page book maintains a focus on production and contains information such as taxonomy and nomenclature, plant hardiness, the physical needs of crops, and types of irrigation systems – as well as cutting-edge, research-based information about perennial propagation and production. Features a lengthy 51-page appendix that details propagation methods and requirements of hundreds of species. Written by Dr. Leonard Perry of the University of Vermont Cooperative Extension System. Book is available for \$27 plus S&H/sales tax from NRAES, PO Box 4557, Ithaca, NY 14852-4557. For more information contact NRAES (607)255-7654, fax:(607)254-8770, or by e-mail nraes@cornell.edu

Establishing and Operating a Garden Center: Requirements and Costs is a newly revised book, edited by Susan Barton. It aims to better position entrepreneurs for success by helping them estimate the establishment and operating costs for a garden center centers.

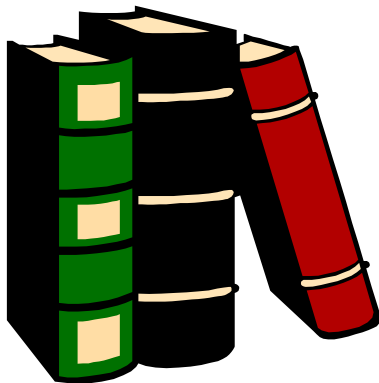
Authors of *Establishing and Operating a Garden Center* surveyed 25 garden centers across the United States and then derived two models that are discussed throughout the book: a large garden center with annual sales of \$1 million and a smaller garden center with annual sales of \$350,000. For each model, the book defines capital budgets, including investment and operations costs; provides a business evaluation based on standard business indicators; and describes a merchandising program composed of layout, pricing, advertising, cost structure, and diversification.

Establishing and Operating a Garden Center: Requirements and Costs, NRAES-161, is available for \$15.00 per copy plus shipping and handling from NRAES, Cooperative Extension, PO Box 4557, Ithaca, NY 14852-4557. Shipping and handling for one copy is \$3.75 within the continental United States. New York residents,

add 8% sales tax (calculated on both the cost of the book and shipping and handling charges). Contact NRAES by phone at (607) 255-7654, by fax at (607) 254-8770, or by e-mail at NRAES@CORNELL.EDU.

TPI Turf Shots (CD) – Turfgrass Producers International (TPI). The CD contains 48 close-up, quality images of 15 species of warm- and cool-season turfgrass swatches, cost is \$15 (plus, \$4 S&H) per CD. Contact: Turfgrass Producers International, 1955-A Hicks Rd., Rolling Meadows, IL 60008. Phone: (800)405-8873, (847)705-9898, Fax: 847-705-8347. Web site: <http://www.TurfGrassSod.org>

Pocket IPM Scouting Guide - A pocket IPM Scouting Guide for Woody Landscape Plants is now available from Michigan State University IPM Program. The 120-page, plastic-coated guide is designed to fit in a pocket for easy field use. Contains colored pictures and descriptions. It identifies common pests and their damage, beneficials, common diseases, injury caused by deer, voles, and rabbits and abiotic injury. Orders can be faxed or mailed to MSU Bulleting Office: 10B Agriculture Hall, MSU, East Lansing, MI 48824-1039. Fax: 517-353-7168. Phone orders call: 355-0240. Refer to Extension Bulletin E-2839 when ordering.



Pesticide News

Dates for pesticide training are posted at: <http://www.udel.edu/pesticide/Cal.htm>

2003 Pesticide Safety Education dates are announced on the web at: <http://www.udel.edu/pesticide/Cal.htm>

July 22 & 23 - Kent County Extension Office

September 30 & October 1 - Kent County Extension Office

December 18 & 19 - Kent County Extension Office

Insecticides:

APHISTAR (thiazamate) – Dow AgroSciences – As a result of the IR-4 Project they can now add to their label the usage on fir trees.

AZADIRACHTIN – As a result of the IR-4 Project the manufacturers can now add 19 more ornamental species to their label.

DISTANCE (pyriproxyfen) – Valent – Added to their label the control of euonymous scale, fungus gnats, stone flies and the suppression of mealybugs.

DURSBAN (chlorpyrifos) – Dow AgroSciences – As a result of the IR-4 Project they can now add to their label the usage on African Violet, azalea, geraniums, juniper, cyclamen and rhododendron.

ENSTAR ii (kinoprene) – Wellmark Int'l – The control of thrips on ornamentals has been added to their label.

OBERON/BSN (spiromesifen) – Bayer – A new insecticide/miticide being developed in Europe

to control mites and whiteflies on ornamentals.

ORTHENE (acephate) – Valent – As a result of the IR-4 Project they can now add to their label the usage on Boston daisy, dahlia, Shasta daisy and verbenas.

PITON (acequinoyl) – Arvesta – Being developed for use on ornamentals as a miticide.

QUICK SILVER (carfentrazone-ethyl) – FMC – A new formulation developed to control broadleaf weeds in ornamental lawns and established turfgrass.

SANIMTE (pyridaben) – BASF – As a result of the IR-4 Project they can now add over 50 new ornamental species to their label.

TALSTAR (bifenthrin) – FMC – Added to their label the usage on home perimeters, ornamental flowers, lawns and home vegetable gardens.

TAME (fenpropathrin) – Valent – As a result of the IR-4 Project they can now add to their label the usage on ash, crabapples, locust, hydrangea and spirea.

TRIFLOXYSULFURON – Syngenta – A new herbicide being developed for use on turf.

ULTIFLORA (milbemectin) – Gowan/Sankyo – Registration on ornamentals is expected early this year.

VINIL (fipronil) – Certis – A new formulation being introduced in Europe to use on greenhouse grown ornamentals to control vine weevils. It is applied and incorporated into the compost.

Fungicides:

ARDENT (dimethomorph) – BASF – Being developed for use on ornamentals to control downy mildew and other diseases.

BAS-510 TURF FUNGICIDE (boscalid) – BASF – Proposed to EPA to register this new active ingredient for disease control in golf course turf.

BORDEAUX – As a result of the IR-4 Project the manufacturers can now add to their label the usage on Christmas trees.

CHIPCO 26-GT (iprodione) – Bayer – As a result of the IR-4 Project they can add to their label the usage on balsam.

CHLOROTHALONIL – As a result of the IR-4 Project the manufacturers can now add pines and euonymus usages to their label.

DECREE (fenhexamid) – SePro – As a result of the IR-4 Project they can now add the usage on lilies and daffodils to their label.

FOSPHITE (potassium phosphate) – JH Biotech - A new fungicide to control downy mildew, phytophthora and pythium on ornamental plants, bedding plants, forests and Christmas trees.

KOCIDE (copper hydroxide) – Griffin – as a result of the IR-4 Project they can now add to their label the usage on hawthorn, holly, poinsettia, privet and wandering jew.

LEXX-A-PHOS (dipotassium phosphate) – Foliar Nutrient Inc – EPA approved an application to register this new active ingredient to control certain fungal diseases on woody ornamentals, turfgrass and non-bearing fruit and nut trees.

MEDALLION (fludioxonil) – Syngenta – As a

result of the IR-4 Project they can now add the use on roses to their label.

SPECTRO (chlorothalonil/thiophanate-methyl) – Cleary – As a result of the IR-4 Project they can now add the usage on phlox, dianthus and roses to their label.

TERRA-CYTE (sodium carbonate peroxyhydrate) – Bio Safe Systems – EPA approved an application to register this new active ingredient as an algacide and fungicide for use in ornamental plants and turf. (FR Vol. 67, 12-4-02)

Herbicides:

PENDULUM AQUA CAP (pendimethalin) – BASF – This is a new micro-encapsulated formulation of this herbicide for use on turf. It has a higher concentration, no odor and has less potential for staining.

DIMENSION (dithiopyr) – Dow AgroSciences – As a result of the IR-4 Project they can now add to their label the usage on Lily of the Nile and viburnum.

ENVOY (clethodim) – Valent - As a result of the IR-4 Project they can now add to their label the use on over 50 ornamental species.

HURDLE (pendimethalin) – Olympic – A new formulation that the company has acquired non-exclusive marketing rights to from BASF for use on ornamentals.

LANDMARK (chlorsulfuron/sulfometuron-methyl) – DuPont – A new combination herbicide being developed for use in forestry, unimproved turf grasses and non-crop areas.

PENDULUM (pendimethalin) – BASF – As a result of the IR-4 Project they can now add 25

new ornamental species to their label.

PENNANT MAGNUM (s-metolachlor) – Syngenta – As a result of the IR-4 Project they can now add to their label the usage on blanket flower, fir, nandina, palm, pine and sweet william.

PLATEAU (imazapic) – BASF – As a result of the IR-4 Project they can now add to their label the usage on phlox and black-eyed susan.

SURFLAN (oryzalin) – Dow AgroSciences – As a result of the IR-4 Project they can add to their label the usage on dianthus, lavender, ferns, speedwell and lagerstroemia.

TREFLAN (trifluralin) – Dow AgroSciences – As a result of the IR-4 Project they can now add 10 new ornamental species to their label.

Miscellaneous

CYCLOCEL (chlormequat) – Olympia – As a result of the IR-4 Project they can now add to their label for this growth regulator the usage on asters, coleus, Easter lily, sunflower and zinnia.

Research Briefs

Propagation:

Miccorrhizal fungi increase rooting of hick's yew. The addition of inoculum of the vesicular-arbuscular mycorrhizal fungus (VAMF) *Glomus intraradices* into the rooting substrate during cutting propagation increased rooting. At 15 and 22 weeks after cuttings were treated with root hormones and stuck, root initiation was higher on cuttings stuck in the rooting substrate containing VAMF inoculum. Increasing the quantity of inoculum in the rooting substrate increased root growth during the early stages of rooting. However the highest level of inoculum tested increased adventitious root initiation without increased root growth. Results indicate that for hick's yew, if VAMF inoculum is used during propagation from cuttings, 1:100 or 2:100 (by volume) rates of *G. intraradices* in the rooting substrate increased the number of primary roots and growth of adventitious roots on cuttings above that achieved by using rooting hormone alone. (C.F. Scagel, K. Reddy and J.M. Armstrong)

Excerpted from HortTechnology 13(1):62-66. January-March 2003.

Rooting foliage plant cuttings in compost-formulated substrates. Root initiation was not significantly influenced by physical and chemical properties of compost-formulated substrates, but root elongation and subsequent growth were affected. Substrates with a minimum air space of 10%, EC reading $< \text{or} = 3.0 \text{ dS} \cdot \text{m}^{-1}$ (based on pour through extraction method), and pH between 3.8 and 5.0 supported root growth comparable or superior to the control substrate. Five of twelve formulated substrates possessed these characteristics. This study showed that composts after being appropriately mixed with sphagnum peat and

pine bark, could be used as container substrates for rooting foliage plant cuttings. (J. Chen, D.B. McConnell, C.A. Robinson, R.D Caldwell, and Y. Huang)

Excerpted from HortTechnology 13(1):110-114, January-March 2003.

Catnip (*Nepeta cataria*) propagation from cuttings. Catnip is normally produced from seed but seeds are small, germination rate is only 50%, and 2 months are required to produce field transplants. Catnip can be propagated from terminal, tip, and single-node (subterminal) cuttings. Terminal cuttings can be rooted in 2 weeks. Success with rooting single node, subterminal cuttings is dependant upon treatment with IBA. Rooting and plant development of single-node cuttings are comparable to that of tip cuttings treated with the same concentration of IBA (1g/kg of IBA). (R.St. Hilaire)

Excerpted from J. of Environ. Hort. 21(1):20-23. March 2003.

Screening of understock for *Chamaecyparis* grafting. *Chamaecyparis* have poor adaptability in some landscape environments with extremes of heat or flooding *Chamaecyparis thyoides* demonstrated excellent tolerance to flooding and temperature and could be a desirable understock for other *Chamaecyparis* when grown in poorly draining locations. (B.T. Holland, S.L. Warren and T.G. Ranney)

Excerpted from J. of Environ. Hort. 21(1):51-55. March 2003.

Greenhouse production:

Light and vernalization temperature influences flowering of herbaceous perennials. Due to poor plant performance and low survival percentage, vernalization in the

dark at -2.5 C is not recommended for the species tested in this study (*Aquilegia x hybrida* ‘Remembrance’, *Coreopsis grandiflora* ‘Sunray’ and *Lavandula angustifolia* ‘Hidcote Blue’), unless plants are hardened and handled in special ways, e.g., sealed in plastic bags. Supplemental lighting from HPS lamps before vernalization is unnecessary and in fact should be avoided for these species, because in some cases high daily light integral (DLI) before vernalization hampered subsequent growth and flowering. ‘Remembrance’ plants flowered without vernalization or were vernalized by only 2 weeks at 0 to 5 C in darkness. ‘Hidcote Blue’ plants can be vernalized in light at 5 C for at least 8 weeks to ensure 100% flowering and numerous flowers. Flowering response of ‘Sunray’ was not uniform in most treatments; flowering percentage generally increased as vernalization duration increased. (G.Niu, R. Heins, A. Cameron and W. Carlson)

Excerpted from HortScience, 37(7):1028-1031. December 2002.

Earthworm castings as a substrate amendment for Chrysanthemum production.

Growth of chrysanthemum was positively affected by the addition of vermicompost to the substrate. Vermicompost produced from sheep manure outperformed that produced from cattle or horse manures. Substrates using vermicompost should be formulated with no more than 25% to 50% castings. Plants grown in 50% sheep or 25% cattle or horse casting substrates were of good marketable quality and were of greater size with a greater number of flowers and flowered earlier than plants grown in either the peatmoss perlite or commercial substrate controls. (P.R. Hidalgo and R. L. Harkess)

Excerpted from HortScience 13(1):1035-1039, December 2002.

Correcting iron deficiency in *Calibrachoa*. The best strategy for managing Fe deficiency is to avoid the problem in the first place, and this requires appropriate pH management for the given crop. For example, when *calibrachoa* is grown with a medium pH between 5.5 and 6.0, no special applications of Fe outside of normal fertility management were necessary. When pH management fails, application of Fe as a foliar spray or drench can be effective. Foliar sprays are easier to apply but multiple foliar applications are needed and phytotoxicity is more likely than for a single drench application. Drench application of 20 mg/L Fe from Fe-EDDHA was more effective per milligram Fe applied than foliar treatments of a drench of Fe-DPTA. (P.R. Fisher, R.M. Wik, B.R. Smith, C.C. Pasian, M. Kmetz-Gonzalez and W.R. Argo)

Excerpted from HortTechnology 13(2):308-313. April-June 2003.

Container production:

Recommendations to reduce herbicide runoff in container production nurseries. Based on a study conducted by Clemson researchers in two South Carolina nurseries, the following practices are recommended to reduce runoff:

- Use of the formulation/herbicide most appropriate for the container nursery. Less water-soluble herbicides are generally not a prevalent in runoff water and granular formulations may be transported more easily on plastic and fabric surfaces where the granule itself can be moved in the water flow.
- Vegetative strips, such as grass, may delay herbicide losses in runoff, but total water runoff should be reduced to allow more time for possible breakdown and/or adsorption.
- Irrigation practices should be altered to

reduce water runoff volume following a herbicide application. Cyclic irrigation or reduced irrigation has been shown to reduce herbicide runoff. Increases in the time interval between the herbicide application and irrigation can also have significant effects on runoff.

- Less aggressive weed control (fewer herbicide applications) should be considered since no effect was noted in the plant species evaluated when herbicide applications were reduced. However, container plant age and size may be important factors in decisions regarding herbicide usage.
- Herbicide applications and runoff reduction can be important both to the initial control obtained and length of control provided. However, and possibly more importantly, it can result in reduced environmental concerns associated with nurseries. Some plant species have been previously shown to be affected by low levels of herbicides that may be present in runoff. This is a factor that may be very subtle and hard to detect when it occurs. Our overall goal should be to reduce herbicide runoff whenever possible, and thereby reduce potential harm to the environment as well as the general public's environmental concerns. (M.B. Riley)

Excerpted from HortTechnology 13(1):16-22. January-March 2003.

Weed discs provide little weed control in containers. Intuitively, it appears that the use of weed discs should be an effective and economical non-chemical alternative for reducing weeds in container nurseries. But the persistence of weeds remains a challenge. Most weed discs introduced during the past 15 years are no longer being used or sold, largely because they have not performed to expectation. There

is the potential to improve these products and reintroduce them in the future. (C. Chong)

Excerpted from HortTechnology 13(1):23-27. January-March 2003.

Herbicide treated mulches provide better weed control in container production. In experiments in 1998 and 2000, herbicide treated mulches were superior in reducing phytotoxicity, increasing efficacy and extending efficacy. These researchers have found that herbicide treated bark provides a 1.5-fold increase in efficacy over the herbicide applied alone, a 1.8-fold increase compared to bark alone, a 2.8-fold extension in duration of efficacy and a 2.2-fold reduction in phytotoxicity compared to the herbicide alone treatments. Even though greater efficacy is achieved with the herbicide treated bark, phytotoxicity is reduced, probably because the herbicide is never directly applied on or near the plant material. Present data indicates that the bark nuggets bind the herbicides and possibly act as slow release carriers for the herbicides or reduce the leaching potential of the herbicides. Recent studies have indicated that the application of preemergent herbicides onto organic mulches reduced herbicide leaching by 35% to 74% compared with bare soil preemergent herbicide applications (Knight et al., 2001). Recent studies have also indicated that the controlled release of herbicides using lignin as the matrix offers a promising alternative technology for weed control (Oliveira et al., 2000). (H. Mathers)

Excerpted from HortTechnology 13(1):28-34. January-March 2003.

Controlling liverwort and moss in containers. The use of a Protox-inhibiting herbicide in containerized ornamentals has several benefits. In addition to activity on marchantia (liverwort) and silver thread moss, oxyfluorfen,

flumioxazin, and oxadiazon have preemergence activity against other weeds such as common groundsel and hairy bittercress. The preventative use of these herbicides provides additional strategies for managing weed resistance from weed escapes and decreases future weed infestations by reducing weed seed return. (J.C. Fausey)

Excerpted from HortTechnology 13(1):35-38. January-March 2003.

Bittercress control in creeping phlox. Hairy bittercress is a problem weed in container grown creeping phlox that are transplanted into containers in early fall to produce salable plants the following spring. No preemergent herbicides that control bittercress are labeled for use on creeping phlox. These studies show that isoxaben provides excellent control of bittercress and may be applied to newly planted creeping phlox. However optimal rates vary with isoxaben formulation.

Snapshot TG (granular)– 1.25-2.5 lb ai/A – good control and not phototoxicity
Gallery (sprayable)-0.13 lb ai/A – good control and no phytotoxicity
Pennant and RegalKade – no injury to phlox but bittercress control inadequate.
(J. Briggs and T. Whitwell)

Excerpted from J. of Environ. Hort. 21(1):24-29. March 2003.

Extended-delivery granular preemergent herbicide formulations evaluated for direct application to nursery containers. Over-the-top broadcast applications of granular preemergence herbicides result in a significant amount of loss of herbicide falling between containers. Direct application of herbicides to containers is preferable but too labor intensive when herbicides must be applied several times during the growing season. To reduce this loss

and potential source of water contamination, various herbicides have been formulated as slow-release to provide season long weed control with only one direct application required. 120 and 150 DAT (days after treatment) the experimental formulations of herbicides were providing weed control but not at a level that would be acceptable for most container nurseries. Alternative formulation methods targeted at rendering the active ingredient more soluble, especially with the oyzalin impregnated Biodac[®] carriers, might result in increased efficacy. (G.B. Fain, C.H. Gilliam, G.R. Wehtje, T.L. Grey, J.A. Osborne and K.M. Tilt)

Excerpted from J. of Environ. Hort. 21(1):1-5. March 2003.

Overcoming summer dormancy in boxwood. Promalin (a PGR that contains equal parts cytokinin and gibberellin), pruning and defoliation all show promise in overcoming summer dormancy of boxwood. Defoliation increased new shoot numbers dramatically but it may not be feasible for a commercial grower since it is time consuming and labor intensive. More research is needed to determine the feasibility of using chemical defoliant to produce the same results as manual defoliation and the level of defoliation required to induce new shoot development. (R. Wright, S. Musselwhite, J. Latimer and R. Harris)

Excerpted from VNLA Newsletter. November-December 2002.

Minimum levels of slow release and liquid fertilizer for optimal growth of boxwood in containers. The three cultivars tested reached optimal shoot dry weight at Osmocote 15-9-12 applications of 16 g per 1gallon container (consistent with the manufacturers recommendation for nursery stock of 12 to 21 g per 1-gallon container). Leachate EC levels for

optimal shoot dry weight ranged between 0.5 and 0.7 dS/m. Optimal shoot dry weight was reached by fertigation at 100 to 150 ppm N with a corresponding EC for optimal shoot dry weight from 0.7 to 1.5 dS/m. (R. Wright, S. Musselwhite and R. Harris)

Excerpted from *VNLA Newsletter*. November-December 2002.

PGRs reduce stem elongation in Hibiscus species. Three new potential commercial hibiscus species include *H. coccineus*, *H. radiatus* and *H. trionum*, however height at flowering is excessive. Plant height must be reduced in order to make shipping economically feasible and to produce an attractive plant for the consumer. Cycocel and Bonzi inhibited stem elongation of all species. Sumagic reduced stem elongation of *H. coccineus* and *H. radiatus* but not *H. trionum*. B-nine reduced *H. radiatus* stem elongation only. Growth retardants did not delay flowering in this study. (R.M. Warner and J.E. Erwin)

Excerpted from *HortTechnology 13(2):293-296*. April-June 2003.

Ecotmycorrhizal colonization in container nursery production. There was a complete lack of inoculation success with vegetative inoculum as well as inoculum rates considerably less than 100% with spore inoculum. Even with colonization, mycorrhizal fungi had no apparent benefit to the host plants during production and during initial establishment. (T.P. Martin, J.R. Harris, G.K. Easton and O.K. Miller)

Excerpted from *J. of Environ. Hort. 21(1):45-50*. March 2003.

Coir dust as an amendment in the production of Ericaceous plants. For the cultivars tested, coir incorporated with hardwood bark at either 20% or 10% by volume was a suitable media

amendment for growing ericaceous plants. Amendment of growing media for ericaceous plants with coir increased the growth and nutrient uptake of several cultivars. Coir amendment may positively influence several other aspects of plant production practices (e.g. fertilizer use), plant form, plant quality, and marketability. (C.F. Scagel)

Excerpted from *HortScience. 38(1):46-54*. February 2003.

Field Production:

Compost effects on soil properties and field nursery production. Compost application improved soil chemical properties by increasing total and available forms of critical plant nutrients. It was particularly important for increasing Zn availability and maintaining soil organic matter (or total soil C). As such, composts have the potential to ameliorate the nutrient depleting effects of mining topsoil when ornamental shrubs are harvested as balled and burlapped plants. However, not all composts had beneficial effects on soils and shrubs. Adding a compost mulch layer had a greater impact on two-year shrub production than incorporating compost into soil alone. Moreover, the shrub response to compost applications was species specific. Only barberry responded significantly to compost application in the second growing season. Barberry is considered intermediate in growth rate compared to spirea (fast growing) and juniper (slow growing). It is possible that intermediate growth-rate species could benefit most from short to intermediate improvements in soil fertility. Fast-growing spirea may be insensitive to respond to these intermediate-term changes in soil fertility, whereas juniper may grow too slow. (R.F. Gonzalez and L.R. Cooperband)

Excerpted from *J. of Environ. Hort. 21(1):38-*

44. March 2003.

Landscape:

Reducing weeds in ornamental groundcovers through mixed species installations. Long-term maintenance of established groundcovers will always include some kind of weed control. Spring application of pre-emergent herbicide may reduce weed germination significantly. It is also possible to mow mature groundcover stands, both to control the growth of invasive woody species without hand weeding, and to rejuvenate senescent patches of the groundcover itself. A more diverse plant community, even at a small scale, is generally more sustainable and resistant to disturbance or invasion than is a monoculture. Combinations of slow-growing, persistent groundcovers with faster growing, more ephemeral species may effectively reduce the level of maintenance normally necessary for the establishment of slower species. An additional benefit to groundcover design, marketing and installation may be the promotion of site-specific, customized combinations of two or more perennial groundcovers. (M.F. Quigley)

Excerpted from HortTechnology 13(1):85-89. January-March 2003.

Diseases:

Resistance of hosta cultivars to petiole rot. Petiole rot of hosta was once thought to be confined to the southern U.S., however increasing reports of the disease in the Midwest have caused concern. *Sclerotium rolfsii* var. *delphinii* is tolerant of cooler temperatures than the *Sclerotium rolfsii* usually found in the south. Eighteen cultivars of hosta were evaluated for reaction to *Sclerotium rolfsii* var. *delphinii* in a greenhouse in Ames, Iowa. 'Lemon Lime', 'Munchkin', 'Nakaiana', 'Platinum Tiara' and 'Tadiflora' had the most severe symptoms. 'Halcyon' showed the least disease. The

following cultivars had intermediate levels of susceptibility and are listed in order from more to less susceptible: 'Serendipity', 'Pee Dee Goldflash', 'Floradora', 'Harmony', 'Pearl Lake', 'Vera Verde', 'Gold Drop', 'Takudama', 'Tall Twister', 'Snow Mound', 'Honeybells', and 'Zounds'. (B.A. Edmunds, M.L. Gleason and S.N. Wegulo)

Excerpted from HortTechnology 13(2):302-305. April-June 2003.

New Introductions:

'Rosita' Ornamental Hazelnut. 'Rosita' is a new red-leafed hazelnut (*Corylus* hybrid) cultivar for the ornamental market. 'Rosita' has a more desirable upright but compact growth habit and darker leaf color, and the leaf edges have a ruffled appearance. The leaves are dark maroon early in the season but the color gradually fades to dark green by midsummer. 'Rosita' produces few catkins and nuts. It has moderate resistance to eastern filbert blight and big bud mites. 'Rosita' is easily propagated by grafting using a hot-callusing system. It forms a good graft union with either Turkish tree hazelnut (*C. colurna*) seedlings or 'Dundee' or 'Newberg' clonal hybrid rootstocks. 'Rosita' was released as a public cultivar and may be propagated with no restrictions. Limited quantities of scion wood may be obtained by writing to the authors (David C. Smith and Shawn A. Mehlenbacher, Dept. of Horticulture, 4017 Agricultural and Life Sciences Building, Oregon State University, Corvallis, OR 97331).

Excerpted from HortScience 37(7):1137-1138. December 2002.

'Maurine Twilight' and 'Maurine Daylight'—heat-tolerant lisianthus with bi-colored flowers. 'Maurine Twilight' is white with dark violet-blue rim and 'Maurine Daylight' is white

with light violet-blue rim. Heat tolerance is comparable to 'Maurine Blue' a successful cultivar released in 1995. None of the heat-stressed plants rosetted. The similarities in flower form and display, branching habit and in number of days from sowing to flowering make these two new cultivars appropriate for the Maurine groups of hybrids. Maurine cultivars are intended to be used as flowering potted plants. They are shorter with more basal branching than cut-flower lisianthus making them more suitable for pots. Plugs of the Maurine cultivar group will be offered for sale through Earl J. Small Gowers, Pinellas Park, Fla. (B.K. Harbaugh and J.W. Scott)

Excerpted from HortScience. 38(1):131-132. February 2003.

Marketing

***Campanula carpatica* 'Blue Chips' sold as indoor flowering plant.** *Campanula carpatica* 'Blue Chips' is an acceptable indoor flowering potted plant and herbaceous garden perennial in its traditional use. Consumers purchased these 4-inch plants at a notable rate. *Campanula* 'Blue Chips' is just one species of herbaceous perennials that can be sold as an indoor potted plant. Marketers are looking for compact perennials that perform well indoors as well as outdoors to offer as new products to floral-department consumers. (K.M. Kelley, B.K. Behe and E.H. Moore)

Excerpted from HortScience. 38(1):121-123. February 2003.

Calendar

May 29-30 – First North American Green Roof Conference and Trade Show. Congress Plaza Hotel, Chicago, Ill. For information, call (416)971-4494, e-mail speck@cardinalgroup.ca, or visit www.greenroofs.ca.online

June 3-4, 2003 – NCSU Nursery Short Course – Raleigh, NC, bgelvin@ncan.com
Contact: (919)816-9119.

June 11 – Ornamentals Short Course - Insect ID and Control, 4-7 PM, Kent County Extension Office

June 12 – Ornamentals Short Course - Plant Stress Management, 6-8 PM, Fischer Greenhouse, Newark

June 17 - Ornamentals Short Course - Safety Training, 5-8 PM, Kent County Extension Office

June 18-21, 2003 – Southeast Greenhouse Conference, Greenville, SC. Phone (877)927-2775, www.sgcts.org

June 23 – ANLA's Retail Workshop. Long Island, NY – Call (202)789-2900; or e-mail sstill@anla.org or mstrickland@anla.org

June 25 - Ornamentals Short Course - Plant Stress Management, 4-6 PM, Sussex County Extension Office

July 1-2 – Better Nursery Container Production – Central MD Research Station. Clarksville, MD. Contact Stanton Gill (301)596-9413.

July 5-8 – ANLA Convention and Learning Retreat – Boston, MA. Contact Melanie Hinkle (202)789-2900.

July 8 & 10 - Ornamentals Short Course -Water Garden Basics for Landscapers, 6-8 PM, New Castle County Ext. Office

July 14-15 – PLCAA’s 14th Annual Legislative Day on the Hill & Cemetery Project. Holiday Inn Capitol, Washington DC. To volunteer, call (800)458-3466, or visit www.plcaa.org online.

July 16-17 – American Nursery & Landscape Association’s Garden Center University Class of 2005 Second Semester. Boston, Mass. Call 202-789-2900; or e-mail sstill@anla.org or mstrickland@anla.org for details.

July 16-20, 2003 – ANLA Convention & Executive Learning Retreat, Boston, MA www.anla.org

July 22 & 23 – Pesticide Safety Training - Kent County Extension Office

July 27 – August 3, 2003 – Perennial Plant Symposium 2003, Sacramento & San Francisco, CA. Contact: (614)771-8431, ppa@perennialplant.org

July 29-31, 2003 – Penn Allied Nursery Trade Show (PANTS) Fort Washington Expo Center, PA www.pantshow.com

July 30 – August 2, 2003 – SNA Conference & Trade Show, Georgia World Congress Center, Atlanta, GA; (770)953-3311, mail@mail.sna.org, www.sna.org

August 20 – Summer Landscape Expo. Jonathan’s Landing Golf Course. Contact Valann Budischak 888-448-1203.

September 8 - Ornamentals Short Course Plant Stress Management, 6-8 PM, Kent County Extension Office

September 16 - Ornamentals Research Expo, 5-8 PM, UDBG

September 22 - Ornamentals Short Course Pruning Workshop , 4-6 PM, UDBG

September 30 - Ornamentals Short Course - Urban Wildlife Control, 6-9 PM, Kent County Extension Office

September 30 & October 1 - Pesticide Safety Training Kent - County Extension Office

October 7 - Ornamentals Short Course - Groundcovers , 6-9 PM, Kent County Extension Office

October 9 - Ornamentals Short Course - PDA Training, 6-9 PM, New Castle County Extension Office

October 14 & 16 - Ornamentals Short Course - Integrated Landscape Management, 4-6 PM, NC County Extension Office

October 15 - Ornamentals Short Course-Ornamental Grasses –, 6-8 PM, Kent County Extension Office

November 13 – Ornamentals and Turf Workshop, Hockessin Memorial Hall, Hockessin, DE. Contact Valann Budischak 888-448-1203

December 18 & 19 - Pesticide Safety Training - Kent County Extension Office

