

**In This Issue**

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- 2 Association News**
- 3 Welcome New Members**
- 4 U of D News**
- 5 DE Dept. of Agric. Plant Industries News**
- 7 Poinsettia Postharvest Requirements**
- 7 Fungicide Trial for Control of Powdery  
Mildew on Flowering Dogwood**
- 8 Customer Service in the Retail  
Environment**
- 10 Safe Lifting Techniques**
- 11 Nematodes That Work for Nurserymen**
- 14 Increasing Soil Organic Matter**
- 15 Use of Compost Products for Ornamental  
Crops**
- 20 Pesticide News**
- 22 Research Briefs**
- 27 Publications**
- 27 Calendar**

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

It's hard to believe the holiday season is almost upon us! As the seasons change, so does the focus of many D.A.N. members. A brief sigh of relief may be heard as the summer gardening/landscaping frenzy winds down and the Christmas flurry of activity begins. The Delaware Association of Nurserymen is also transitioning from our successful Summer Expo and Golf Tournament to our slate of fall/winter events.

The Summer Expo and Golf Tournament, held on August 20, at Joseph Wick Nurseries and Garrisons Lake Country Club was met by perfect weather, a multitude of exhibitors, three very interesting speakers, and a lot of laughs as 13 foursomes hacked away at a spot that somewhat resembled golf. All kidding aside, the D.A.N. is proud to claim some exceptional golfers as members.

On October 20<sup>th</sup>, the Certified Nursery Professional Exam took place in Dover, DE. Congratulations to our new CNPs (see list below). The next exam date is March 23, 1999.

The 25<sup>th</sup> Anniversary Celebration of the D.A.N. was held on Friday, November 13<sup>th</sup> at Wild Quail Golf & Country Club. The event was attended by more than 60 members. It gave us the opportunity to visit, reminisce, and honor the past presidents who have given their time and talents to our organization.

Our Ornamental and Turf Workshop was held on November 17<sup>th</sup> at the Hockessin Memorial Hall. More than 115 individuals joined us for an action-packed day. Attendees earned pesticide credits, visited with exhibitors, and enjoyed a delicious lunch.

On January 12, 13, and 14, 1999, the D.A.N. and Delaware Cooperative Extension will once again host the Delaware Horticulture Industry Expo. This event will be held at the Sheraton Inn and Conference Center in Dover, DE. The first day will once again be a field and container workshop. Stay tuned for more details concerning all three days.

As you can see, the D.A.N. has been very busy. We hope all of our members will take advantage of the multitude of opportunities and benefits the association has to offer.

Happy Holidays! See you in 1999!

## **CONGRATULATIONS CNPS!**

### **New CNPs:**

Brian Mattus  
Ruppert Landscape Company  
Landscape Specialist

Garth Jorgensen  
Ruppert Landscape Company  
Turf Specialist and Landscape Specialist

Jeremy Sedgwick  
Fox Run Nurseries  
Turf Specialist, Landscape Specialist and  
Greenhouse Specialist

### **New Specialties Added:**

Elmer "Skip" Bowman  
Delaware River and Bay Authority  
Greenhouse Specialist

## **WELCOME NEW MEMBERS**

### **Active Members**

#### **Lowe's of Christiana #217**

800 Eden Circle  
Bear, DE 19701  
Attn: Garden Center

#### **Landscape Design & Construction**

745 Old Wilmington Road  
Hockessin, DE 19707  
Attn: Charles Jenner

#### **Layaou Landscaping Inc.**

69 Albe Drive  
Newark, DE 19702  
Attn: Mr. Fred Layaou

#### **Northern Lawn and Landscape**

P.O. Box 7309  
Newark, DE 19714  
Attn: Mr. Eric Gatti

#### **Andrew C. Durham & Assoc.**

Box 414  
Rockland, DE 19732  
Attn: Mr. Andrew Durham

#### **Willey Farms**

4092 DuPont Parkway  
Townsend, DE 19734  
Attn: Ms. Gretchen Willey

#### **Lowe's of Dover #27**

1165 North DuPont Highway  
Dover, DE 19901  
Attn: Garden Center

#### **Tiemans Landscape and Lawncare**

P.O. Box 365  
Wyoming, DE 19934  
Attn: Mr. Scott Tieman

#### **Van's Company**

916 Sunset Terrace  
Dover, DE 19904  
Attn: Mr. Eric VanSant

#### **Shady Oak Farm, Inc.**

RD #2, Box 259A  
Milton, DE 19968  
Attn: Mr. Jim Mews

#### **Lowe's of Sussex County #334**

1312 Highway 1  
Lewes, DE 19958  
Attn: Garden Center

### **Associate Members**

#### **Pinelands Nursery**

323 Island Road  
Columbus, NJ 08022  
Attn: Ms. Jackie Fama

#### **Rineer's Nursery**

1494 Kirkwood Pike  
Kirkwood, PA 17563  
Attn: Ms. Lois Rineer

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

Four students conducted the landscape survey at the Delaware Home Show in October. They collected approximately 200 responses and the results look pretty good. Homebuyers do value landscaping. The results will be analyzed with the rest of the surveys from 6 other states. I'll let you know in detail what we find.

We have been conducting focus groups to get information about the garden center tree planting display. Garden center operators have said they want a display that promotes tree use as well as one that educates consumers about tree planting. It has to be easy to assemble, relatively inexpensive (if not free) and flexible enough for garden centers to express regional planting instructions. Most garden center operators feel they provide sufficient planting handouts, either as a fact sheet or printed directly on sales slips, so they don't think a "take-home" publication is critical. They would like a space in the display to incorporate their garden center fact sheets. Some retailers want the display to incorporate an actual tree. We will be starting the design phase of this project in early December with a goal of model presentation to retailers at the Management Clinic in Louisville. Give me a call and let me know what YOU think about this display!

Have you noticed any planting along I95? We have installed woody plants (most are pretty small) in three sites along I95. We have plans for 16 sites. Dormant seeding will occur in early December and more plants will go in this spring. We have also applied for another grant to focus on promotion of natural roadside planting, so we can keep the public informed about what we are doing.

I expect to start a new project soon that will be

funded by DNREC. We plan to look at nutrient impacts from the urban environment. We will survey the industry to get a handle on current practices, divide the urban sector into land-use categories, look at the literature to determine nutrient runoff from different land uses and use GIS models to compare impacts. My sense is that very little nitrogen and phosphorus are running off the urban landscape, but we need to document this fact. And if there are problem spots, we should identify them and discuss ways to change practices that result in excess N and P.

If you are a certified pesticide applicator, you should have received an IPM survey recently. This survey was designed with a committee of landscape professionals to best capture current practices and industry needs. Please complete the survey accurately and promptly. The best news is that you will receive a pesticide recertification credit for your efforts!

Jay Windsor, Bill Lord (1997 award winner) and I spent a long (but enjoyable) day judging nine landscape projects for the D.A.N. Landscape Awards Competition. The projects were excellent this year and picking winners was tough. Come to the Hort Industry Expo in January and congratulate those winners.

Thank you for your support of Ornamentals Hotline (weekly pest alert newsletter) and the Ornamental Short Courses. We will be developing our 1999 short course schedule soon. The short courses are only moderately well-attended. What would make you come? Please tell us and we'll incorporate that change into the new schedule.

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

The Department of Agriculture has recently become involved with its first known infestation of fire ants. A homeowner called in December about suspicious ant activity in the front yard shrubbery bed. The homeowner was a South Carolina native very familiar with fire ant behavior. Her suspicions prompted her to contact us. I visited the site the very next day and collected specimens to send to our USDA counterparts for identification. The samples were positively identified as red imported fire ants.

The exact source of the fire ants is not known. We do know they arrived with a potted azalea plant received as a Mother's Day gift about three years ago. It was thought, at first, that fire ants would not be able to overwinter in our climate. That myth has been quickly tossed out. The colony's location is well protected at the front of a house with a southern exposure and an asphalt driveway on the other side. They have survived at least two to three winters, now.

An intensive eradication program is currently in progress. We estimate that it will require at least three to four years of monitoring and treatment to get rid of this colony of fire ants. They are not easy to deal with by conventional pesticide treatments. Since they are located in a residential area, care must be taken in the selection and use of insecticides. We have already tried various chemicals, stomach poisons, and insect growth regulators, in an attempt to find the safest and most effective method of control. The chemicals applied early in the treatment sequence caused them to relocate to a different site. Fortunately, it wasn't far. The stomach poisons and insect growth regulators work, are not as fast acting. We

noticed a significant reduction in activity after repeated applications of baits containing these two pesticides. The day length was also getting shorter and nighttime temperatures were dropping. We initially monitored ant activity two to three times each week. When foraging activity began to drop with ambient temperatures, we reduced site visits to once per week. There has not been any activity for about three weeks. We do not know, at this time, whether or not the lack of activity is due to remaining colony members going dormant or to a pesticide kill. We will continue to make regular visits to the site once temperatures start to increase.

In addition to on-site pesticide treatments, a one-mile grid survey is being conducted from the initial infestation site. For several weeks this past fall, survey crews have been checking every yard in every home, every open space, field, etc. up to one mile from the fire ant site for additional infestations. To date, no additional fire ant colonies have been found within this area. We have expected to find more sites. We figured there must have been other infested potted plants from the same shipment. Even after the initial rush of contacts resulting from numerous press releases, no more mounds have turned up.

Fire ants are not to be treated lightly. They pose serious health, economic, and aesthetic concerns. They are aggressive and will sting repeatedly. The sting produces a sensation similar to a bee, wasp, or hornet sting. They attack in large numbers when disturbed. They have been known to kill small farm animals and have caused millions of dollars in crop losses. Unlike other ant species, they produce a huge mound that will range in size from six to eighteen inches in height. These characteristics can aid in the initial identification of the fire ant.

Nursery inspectors will be visiting all retail

establishments in the vicinity of the newly detected fire ant site this fall. Many businesses have already received a visit from the nursery inspector this year. Depending on the size and scope of your business, you may receive additional visits each year as your inventory changes. Plant inspections will be on-going and year-round to try to prevent other possible outbreaks. If you receive, or have on hand any plant shipments from the southeastern United States, be on the alert for aggressive, stinging ant populations. We will be able to assist you with identification of suspect specimens.

If you need additional information, you may contact the Department of Agriculture, Plant Industries Section at (800) 282-8685 (Delaware only) or (302) 739-4811, by fax at (302) 697-6287, or E-mail at [lynn@smpt.dda.state.de.us](mailto:lynn@smpt.dda.state.de.us).

## **POINSETTIA POSTHARVEST REQUIREMENTS**

**Thomas M. Blessington and David L.  
Clement Central Maryland Research and  
Education Center, University of Maryland**

- Discontinue fertilizer applications two weeks before shipping.
- All bracts need to be fully developed prior to shipping.
- Ensure that the plants are adequately watered before shipping.
- Sleeve plants and place in boxes to protect from mechanical injury.
- Be aware of epinasty: damaged stems and bracts produce ethylene that causes plants to appear wilted after the sleeves are removed.
- To reduce epinasty, minimize the length of time plants remain sleeved and store at temperatures less than 65°F.
- Most plants take 24-48 hours to recover if unsleeved and stored in a lighted area (100fc) at 65-75°F.
- Plants left for extended periods in their sleeves may never recover.
- Excessive temperatures can increase premature bract, leaf, and flower bud drop.

Reprinted from *Nurserymen's News*, Vol. 59, Number 4, Fall 1997.

**FUNGICIDE TRIAL FOR CONTROL OF  
POWDERY MILDEW ON FLOWERING  
DOGWOOD**

**Bob Mulrooney**  
**Extension Plant Pathologist**  
**University of Delaware**

Dogwood powdery mildew caused by the fungus *Microsphaera* has been increasing during the past five years. This study was conducted to test the efficacy of five fungicides for control of this important disease of landscape flowering dogwood, *Cornus florida*.

This test was conducted at the University of Delaware Botanic Garden in Newark, DE on trees that were 7-10 ft., grown from seed and locally purchased. The trees were sprayed approximately every two weeks beginning on May 15, when powdery mildew was first observed. The application dates were May 15, May 29, June 16, July 7, July 23, August 5, August 25 for a total of 7 sprays. The fungicides were applied with a CO<sub>2</sub> back-pack sprayer equipped with a single hollow cone nozzle to run-off. The experimental design was a randomized complete block with five replications.

Data show that all the treatments provided very good control of powdery mildew and would be acceptable in a landscape setting. Observations made in September indicate that powdery mildew is responsible for much of the premature red coloration of infected flowering dogwood trees in the landscape. Bayleton did not provide as much residual control as the other treatments five weeks after the last treatment, but was not aesthetically detrimental. No phytotoxicity was noted for any treatment at the rates tested.

**Results:**

| Treatment      | PM Rating <sup>1</sup> | PM Rating <sup>2</sup> | Aesthetic <sup>3</sup> |
|----------------|------------------------|------------------------|------------------------|
| Rate/ 100 gal. | 6/29                   | 10/2                   | Rating; 10/2           |

|              |                    |       |       |
|--------------|--------------------|-------|-------|
| Lynx 2.22 oz | 1.2 a <sup>4</sup> | 1.1 a | 1.6 a |
|--------------|--------------------|-------|-------|

|                                              |       |       |       |
|----------------------------------------------|-------|-------|-------|
| Cleary's 3336<br>12 oz + spreader<br>sticker | 3.2 c | 1.4 a | 1.6 a |
|----------------------------------------------|-------|-------|-------|

|                         |       |       |       |
|-------------------------|-------|-------|-------|
| Banner MAXX<br>8 fl. oz | 1.4 a | 1.1 a | 1.3 a |
|-------------------------|-------|-------|-------|

|            |        |       |       |
|------------|--------|-------|-------|
| Eagle 6 oz | 1.6 ab | 1.0 a | 1.1 a |
|------------|--------|-------|-------|

|                         |        |       |       |
|-------------------------|--------|-------|-------|
| Bayleton<br>25% WP 4 oz | 2.4 bc | 2.2 b | 1.6 a |
|-------------------------|--------|-------|-------|

|                       |       |       |       |
|-----------------------|-------|-------|-------|
| Control<br>(no spray) | 8.0 d | 4.8 c | 4.7 b |
|-----------------------|-------|-------|-------|

<sup>1</sup>Powdery mildew rating based on Horsfall-Barratt Rating 1=0%, 2=0-3%, 3=3-6%, 4=6-12%, 5=12-25%, 6=25-50%, 7=50-75%, 8=75-87%, 9=87-94%, 10=94-97%, 11=97-100%, 12=100% of leaves colonized.

<sup>2</sup>Powdery mildew rating 1-5: 1=no mildew, 5=100% of foliage affected.

<sup>3</sup>Aesthetic rating, overall appearance of plants: 1=excellent 5=poor and defoliated.

<sup>4</sup>Means within a column followed by the same letter are not significantly different, Duncan-Waller *k*-ratio *t* test, *k*=100.

| Treatment and Rate/ 100 gal. | # Terminal Affected (7/7) |
|------------------------------|---------------------------|
|------------------------------|---------------------------|

|              |                    |
|--------------|--------------------|
| Lynx 2.22 oz | 0.0 a <sup>1</sup> |
|--------------|--------------------|

|                                           |       |
|-------------------------------------------|-------|
| Cleary's 3336 12 oz +<br>spreader sticker | 2.8 a |
|-------------------------------------------|-------|

|                      |       |
|----------------------|-------|
| Banner MAXX 8 fl. oz | 0.4 a |
|----------------------|-------|

|            |       |
|------------|-------|
| Eagle 6 oz | 0.0 a |
|------------|-------|

|                      |       |
|----------------------|-------|
| Bayleton 25% WP 4 oz | 10.4a |
|----------------------|-------|

|                    |        |
|--------------------|--------|
| Control (no spray) | 185.8b |
|--------------------|--------|

<sup>1</sup>Means within a column followed by the same letter are not significantly different, Duncan-Waller *k*-ratio *t* test, *k*=100.

## **CUSTOMER SERVICE IN THE RETAIL ENVIRONMENT**

**Susan Barton  
Extension Specialist**

*The following article is a summary of a talk at the New England Greenhouse Conference, given by Bruce Baker, a jewelry retailer and craftsperson.*

Retailing in the 90's is about "YES." Always be positive. People understand reasons, but they don't understand "no." So be careful when phrasing comments or policies to customers. Think about the "lifetime value" of each customer. Never indulge in an adversarial relationship with your customers (no matter how tempting it becomes). Remember that buying something is the ultimate compliment. It validates the shopping experience. Help your customers receive that validation.

There is an entertainment value in shopping. Your store must provide that entertainment. Create a pleasant selling environment. Sell with the senses. For example, place a bouquet of the "happening plant" at the cash register. Fresh flowers inspire. Remember all the senses. Use nice-smelling flowers and herbs. Encourage customers to touch soft plants like lamb's ears or apple geranium. Show pictures that depict beauty in all four seasons. Light, appropriate music can reduce the chaos of some shopping environments. Environmental music, like wind chimes, may put some customers in the mood to buy. Use the sense of taste by offering hot mulled cider in winter and lemonade in summer. People eat when they are comfortable. When people eat together they have a shared experience. That experience makes them more likely to buy your products. One garden center used birdfeeders to dispense m&ms—what a good idea!

Consumer research shows that customers want

to be left alone from 1) pressure; 2) surveillance; and; 3) answering stupid and ineffective questions. But they do not want to be left alone entirely. Often they need help in finding products and deciding which products to buy. Acknowledge customers when they arrive and ask "If I can answer any questions, let me know?" Then back off and keep busy with appropriate work until the customer is ready for help. Don't follow customers around the store. If you are worried about shoplifting, try to discover the customer's name. Then mention their name. Few people have the nerve to steal once they have been identified.

Products have both features and benefits. Features "tell" and benefits "sell." Here is an example: This watch has a lithium battery and is waterproof to 40 meters (features). The benefit is that the watch lasts longer and you can swim or shower with it. Now go for the BIG BENEFIT—You don't have to worry about it and you never have to take it off! When customers know benefits they sell your products to their friends.

Good salespeople develop a personal relationship with their customers. If possible, remember what your good customers buy and ask them about that product the next time they visit the store. Always ask about them. Take time to train your staff and expect them to provide fast, friendly, courteous service by being an interested seller and treating their customers as individuals.

Try cute signs like—a big bouquet of sunflowers with the caption "Van Gogh shops here!" or "Your husband just called and he said you could buy anything!"

Retailing is about the product, price and story. Every customer has an angel on one shoulder and a devil on the other. The angel says "Buy it, you deserve it." The devil says "It's too

expensive.” or “It’s too small.” Be prepared to counter those concerns. Flip that devil right off their shoulder and let the angel win. Tell the story, folklore or extra details about your products. Take the time to learn those details and teach them to your sales staff. One wholesaler included a box of candy and a note about the story of his product in the packing box. As the employee unpacked the merchandise, she read the note, ate the candy and proceeded to repeat the “story” to her customers.

Only 12-15 percent of purchases are planned. So each customer provides a new opportunity for increased sales. But 20% of all sales are lost because the buyer is turned off by the seller (usually due to insincerity). Don’t tell your salespeople what to say, just tell them why they should say something. Sales are about a projection of energy and enthusiasm. Nod your head when the customer speaks. If you don’t know the answer to a question, admit it. “I don’t know.” or “No one has ever asked me that before, I’ll look it up.” are OK. Don’t be afraid to boast about your business in a modest way. Nothing succeeds like success. Never complain about poor business. When customers ask how its going, always answer “Great!” Business will happen at a happy place.

Diffuse impatience if you have customers waiting. Sometimes all it takes is an acknowledgment. Just say “I’m sorry we are so busy, I’ll be with you in just a minute.”

Avoid the big “No Nos” in retailing. Never sit down. Energy and enthusiasm evaporate if sales people sit. Never read or do paperwork while a customer is in the store. It appears that what you are doing is more important than the customer. Try not to talk on the phone and never conduct a private conversation with a friend when a customer is present. Don’t take the last customer out on the next customer.

Use body language when selling and learn to read body language in your customers. Body language is more sincere than the spoken word. By observing body language, you can usually tell if a customer is an introvert or extrovert. Deal with introverts quietly and use extroverts to magnify what you tell them for others in the store. Body language often comes in clusters. Pulling on the ear and raising an eyebrow are signs of doubt or consideration. They mean more information is needed. Eye contact is confidence building. If you avoid eye contact, you appear suspicious or insincere. Use hands in an open-handed gesture. By displaying with your hands, you show you are proud of your business. Hands in your pocket or behind your back are an indication that you are not disclosing everything. Remember male and female differences. Males talk side by side, while females talk face to face. Adjust your presentation for the person. Include all people present in the sales presentation. Keep “the friend” involved. Often a customer will ask his or her friend’s opinion. If you have included the friend, their response is much more likely to be positive. If two customers turn to each other and wall you off, leave them alone. They need time for discussion. Come back when they are finished.

One parting comment—take credit cards. Credit cards make it “Oh so easy to buy.”

**SAFE LIFTING TECHNIQUES**  
**Sharon K. VanLoon, CPCU**  
**Crosby & Henry**  
**Grand Rapids, Michigan**

Back injuries are not only painful, they often are slow to heal and can dramatically alter lifestyles. They also can be very costly to employers in terms of time lost from work and workers' compensation costs. There are some basic measures that should be taken to help prevent back injuries.

Keeping physically fit is the first step. Poor posture, lack of exercise, stress, and overeating can contribute to back injuries. People in good shape are less likely to be injured and will heal more quickly if they are injured. As an employer, you can encourage employees to keep fit through wellness programs that are available from local health care organizations. One office recently facilitated an on-site lunch hour Weight Watchers program. Employees encouraged each other, learned healthy eating habits, and lost weight! Be creative in how you can help employees and volunteers without additional cost.

Training staff on how the back works and how it responds to lifting and potential injuries is important. Workers' compensation insurance companies usually will provide educational videos as well as Loss Control Technicians to provide training without charge.

Educate your staff in the use of proper lifting techniques and encourage staff to make a habit of offering to help with lifting tasks. If they have any doubt that they can lift an object safely, they should seek help or utilize appropriate tools such as wheelbarrows, dollies, or fork lifts.

To protect your back, use the following lifting techniques:

- Analyze the load by lifting one corner. Look for sharp edges. Do you need help?
- Plan your route. Is it free from trip hazards?
- Prepare muscles by doing some knee bends and stretches.
- Get as close to the load as you can and face the direction you intend to move.
- Use a wide stance to gain balance.
- Bend at the knees and keep your back straight; leg muscles are stronger than back muscles.
- Tuck in your tummy.
- Get a firm grip on the load.
- Initiate the lift with body weight.
- Keep the load close to the center of your body.
- Avoid twisting and side bending while lifting.
- To lower the load, bend your knees. Be careful of fingers and toes and make sure the load is secure before releasing it.

Certain objects will require special handling. Carry sacks on your shoulder and consider rolling heavy barrels or drums.

Staying in shape, knowing your limitations, using proper lifting techniques, and asking for help are the best ways to keep your back strong and healthy!

Reprinted from AABGA newsletter, *The Public Garden*, September 1998.

## NEMATODES THAT WORK FOR NURSERYMEN

Stanton Gill

Regional Specialist, IPM Nursery &  
Greenhouse Cooperative Extension Service  
University of Maryland

Insect-parasitic (entomopathogenic) nematodes are readily available for nurserymen to use for control of various soil-inhabiting pests. In Maryland, we have successfully used entomopathogenic nematodes to control black vine weevil, fungus gnats larvae, clearwing moth borer larvae, scarab beetle grubs, and iris borer larvae.

Entomopathogenic nematodes are extraordinarily lethal to many important soil insect pests that attack nursery plants, yet are safe for plants and animals. This high degree of safety means that unlike chemicals, nematode applications do not require safety equipment. There are no re-entry times, no problems with residues, and groundwater contamination is not an issue. Most biologicals require days or weeks to kill, yet nematodes, working with their symbiotic bacteria, kill insects in 24-48 hours. Nematodes do not require specialized application equipment as they are compatible with standard agrochemical equipment including pressurized, mist, electrostatic, fan, and aerial sprayers.

Small bio-technical companies are producing and marketing a variety of nematodes, and many 'cottage' industries have grown up to supply grower's needs. A list of suppliers of beneficial nematodes is provided at the end of this article. Marketing of entomopathogenic nematodes has focused on *Steinernema* and *Heterorhabditis* spp. *Steinernema* spp., occur most commonly in the soil, are generally easier to rear on artificial media, and tend to be more persistent after application. The *Steinernema* nematodes are best suited to control soil pests commonly found

in the top 1-2 inches of the media or for control of clearwing moth borers. *Heterorhabditis* spp. are usually more mobile and have superior host-searching activity; they are the nematode of choice for insects that inhabit deeper regions of the soil profile, such as black vine weevil and scarab beetles. Several of the *Heterorhabditis* spp. nematodes have been labeled 'cruisers' since they cruise about searching for their insect prey.

When a susceptible host is located, the infective nematodes enter the insect's body through natural openings such as the mouth, spiracles and anus. There, they feed and release bacteria, which live symbiotically in the gut of the nematode. The bacteria rapidly multiply, killing the insect. The nematodes will then reproduce and colonize the cadaver. Once the food supply is exhausted, thousands of infective stages leave the insect's body and return to the soil in search of additional host larvae. However, this rarely occurs at high enough levels to establish long-term control in containers and re-applications are usually necessary to obtain the desired levels of suppression. Host death occurs within 24-72 hours of host penetration, depending on the nematode and pest species, and ambient conditions.

Nematodes are commonly formulated as slurries, in water dispersible granules within an inert clay carrier, gels, or in sponges. All need to be soaked to release nematodes into suspension and to ensure their rehydration and 'activation'.

Of the nearly thirty Steinernematid and Heterorhabditid nematodes identified to date, seven species are commercially available. When purchasing nematodes a comparison-shopping approach is recommended as prices vary greatly among suppliers. One billion nematodes per acre works against most soil insects such as fungus gnat larvae, black vine

weevil, and scarab beetle larvae. Containerized plant material tend to be treated at slightly higher rates.

### *Steinernema carpocapsae*

*Steinernema carpocapsae* is the first nematode that we started testing in Maryland back in the late 1980's. It is easy to mass rear and can be formulated in a partially desiccated state that provides several months of room temperature shelf life. This nematode stands on its tail in an upright position and attaches to passing hosts. They are highly responsive to carbon dioxide once a host has been contacted. The nematodes generally enter through the insects spiracles. The nematodes are most effective at temperatures ranging from 70-85 F. *S. carpocapsae* has been effectively used for dogwood borers, banded ash clearwing borer, lilac borer, oak borer, peach tree borer larvae. It has also been used for cutworm control, and armyworms.

### *Steinernema feltiae*

This nematode will operate at lower temperatures down to 50F. The nematode has been used in Maryland nurseries and greenhouses to effectively control fungus gnat larvae.

### *Steinernema kushidai*

This is the new kid on the block. This nematode was isolated in Japan and has shown to be a very effective parasite of scarab beetle larvae such as Japanese beetle and Oriental beetle larvae. If the companies can resolve how to mass reproduce this nematode, you should see it on the market in a couple of years.

### *Phasmarbditis hermaphrodita*

This is a nematode that causes mortality on a

wide range of slugs and snails, but is harmless to other invertebrates. It can be readily reared in culture, formulated and stored for use as a biocontrol agent. The nematode enters the dorsal pore, just behind the mantle on slugs, and once inside causes the slug to swell up and die rapidly. This nematode is labeled in England and distributed by MicroBio. We would love to test this nematode in Maryland but this species has to be found existing naturally in our state before it can be imported from the United Kingdom.

### *Heterorhabditis bacteriophora*

This nematode is fairly versatile, attacking lepidopterous (moths and butterflies) and coleopterous (beetle) larvae, among other insects. This nematode species is labeled a 'cruiser' that actively searches for its prey. The best control we have obtained with this species has been against black vine weevil larvae in container grown plants. The only drawback is this nematode needs warm soil temperatures of at least 50 F and has shown reduced efficacy at temperatures below 70 F. Shelf life of this nematode species is a problem and nematodes that are shipped to a nursery should be used shortly after arriving. If they must be stored, refrigerating will keep them for 2-3 months. Most infective juveniles persist only a few days following a release in field conditions. This nematode species is the most sensitive among entomopathogenic nematodes to physical stress.

Nematodes are usually applied to the soil by drenching, using coarse sprays and even overhead irrigation systems. The goal is to distribute them evenly over and through the media. Once in the soil, nematodes begin to search for a suitable host. While the nematodes can move to reach a host, the distance they can move are limited, so placement in the vicinity of the target pest(s) will promote parasitization and control. The soil must be kept moist to allow

the nematodes to move, but should not be over watered as this will wash the nematodes from the 'target zone'. If the soil dries, nematodes can die through desiccation, or, they will not be able to move in search of a suitable host.

Most nematodes can be satisfactorily stored under refrigeration for some time prior to use. The length of time varies according to their method of production and formulation. Typically, nematodes are either produced on an artificial diet (in vitro) or in an insect host (in vivo). Those produced in vitro are often formulated in a dormant state that can be stored for up to 6 months without any loss of viability. Such products need to be 're-activated' prior to application (see list). Nematodes produced in vivo may be stored for 2-3 months without any problems, living off fat reserves; healthy nematodes will be unaffected but the initial pre-storage health of the shipment should be confirmed.

Infective juveniles of entomopathogenic nematodes are compatible with most but not all agricultural chemicals and fertilizers under field conditions. Chemicals to be used with care or avoided include insecticides, bendiocarb, and chorpyrifos. The fungicides, anilazine, dimethyl benzyl ammonium chloride, and fenarimol should be avoided if using entomopathogenic nematodes.

Used correctly, these biocontrol agents are highly effective management tools, providing control as effective as, and cost-comparable to, conventional chemical treatments. Nematodes are available for greenhouses, nurseries have been successfully used in a wide variety of media, including soil, peat-lite mixes, bark products and rockwool. For example, in trials run in Maryland, fungus gnat control in a poinsettia crop with *S. feltiae* was as effective as that obtained using Knox-Out®.

Detailed recommendations on dose and use are generally provided with each shipment of nematodes or can be readily obtained by contacting the producer or supplier.

Applications must be made when susceptible stages of the target pest are present; if multiple and overlapping generations occur, susceptible stages will always be present and several applications will be required to bring the pest population under control. Otherwise, applications must be made at specific times to target susceptible developmental stages during the pest's life cycle.

Some of the suppliers of entomopathogenic nematodes:

Beneficial Insect Company: 244 Forrest Street, Fort Mill, SC 29715

BioLogic Company: Springtown road, P.O. Box 177, Willow Hill, PA 17271

Bioshield: P.O. Box 9068, Fresno, CA 93790  
Bountiful Gardens: 18001 Shafer Ranch Road, Willitits, CA 95490

Bozeman Bio-Tech: P.O. Box 3146, Bozeman, MT 59772

Crop King, Inc: P.O. Box, Medina, OH 44258

Ecogen Inc: 2005 Cabot Boulevard West, Langhorne, PA 19047

Gardener's Supply Company: 128 Intervale Road, Burlington, VT 05401

Green Spot: Depart of Bio-Ingenuity, 93 Priest Road, Nottingham, NH 03825

Harmony Farm Supply: P.O. Box 460, Graton, CA 95444

Hydro-Gardens, Inc.: P.O. Box 25845, Colorado Springs, CO 80936

MicroBio: 17 High Street: Whittlesford, Cambridge CB2 4LT, England. Sold through E.C. Geiger: Box 285, Route 63, Harleysville, PA 19438-0332.

Reprinted from *Free State Nursery News*, Vol

11, No. 3, August 1998.

## **INCREASING SOIL ORGANIC MATTER**

**Francis R. Gouin, Professor Emeritus  
University of Maryland**

There are those who believe the way to increase the organic matter of soil is to grow cover crops and/or green manure crops and plow them under every year or twice each year. However, the evidence is clear that the only effective means of increasing the organic matter in soil is to plant it into grass and legumes and leave it alone as long as possible. Top dressing these fields with animal manures or compost will add to the organic matter content. Soil injection of biosolids prior to planting that cover crop can also do much to increasing the organic matter concentration of soils.

The old theory of planting a cover crop every spring and fall and plowing it under as it matures has been demonstrated to only maintain organic matter concentrations in soils. If you understand the concept of composting, you can readily understand why it is impossible to increase organic matter of soils under such a management practice. Every time you disturb soils such as in cultivation, rototilling, plowing or discing you introduce air which contains 21% oxygen needed by microorganisms to decompose organic materials into minerals, carbon dioxide (CO<sub>2</sub>), and water. The activity of microorganisms in soils is in direct proportion to the amount of oxygen, carbon (C), nitrogen (N), and water present in the soil and is highly influenced by soil temperatures. As soil temperatures increase their activity increases. When disturbing soil you also chop organic particles into small pieces which causes them to decompose even faster because composting is a surface phenomenon. And composting is the reason why organic matter does not increase rapidly in soils.

The tops of grasses and legumes are mostly composed of cellulose, sugars, and starches, the fastest organic compounds to decompose and not leave organic residues. Materials such as hemicellulose and lignins are mostly found in the roots and woody stems and are the compounds in plants that are most resistant to decomposition and are responsible for most of the organic residues found in soils. The brown color of compost is mostly lignins.

Compost is the richest source of organic residues available other than the bark from coniferous trees and the sawdust of redwoods and cypress trees. Thus applying these materials as a top dressing and allowing grasses and legumes to grow undisturbed for as long as possible is the only way to increase soil organic matter. Planting cover crops or green manure crops that produce deep roots is also beneficial because they are capable of capturing nutrients from sub soils and improve soil drainage when they die and leave channels.

It is now a common practice in establishing orchards to plant tall fescue and allow it to grow several years before planting the orchard. Just prior to planting the trees, the tall fescue is killed using Roundup™. The trees are planted in the strip of grass that has been killed. Researchers have found that the roots of the newly planted trees follow the channels that had been created by the roots of the dead tall fescue. Had this land been plowed prior to planting, these channels would have been destroyed. The bottom of the plow would have created a plow-pan making it difficult for the roots to penetrate. Orchards planted in grass strips killed with Roundup™ are deeper rooted and are more vigorous than those planted using the conventional method of plowing and planting.

I believe that we have much more to learn about soil management. However, the evidence is clear that the more we disturb soils the more

problems we create. In addition to hastening the oxidation of organic matter, we promote soil compaction which cannot be easily corrected by cultivation alone. As nurserymen, we should probably be making greater use of floating tires or possibly developing "hover crafts" for use in nurseries.

If your soil management program calls for using green manure crops, consider a two or three-year rotation, if possible, leaving the crop to grow to maturity before mowing and allowing the residues to remain in place. Possibly top-dressing the grass with compost or animal manures to provide additional nutrients and organic matter. If you are going to be planting trees and shrubs, consider not plowing, but simply killing the sod and planting through the dead sod. The sod will act as a mulch, which will increase the amount of water soil can absorb and help control weeds. Many of today's herbicides could be effective in such a soil management scheme. Try it- you might like it.

Reprinted from *Free State Nursery News*, Vol 11, No. 3, August 1998.

**USE OF COMPOST PRODUCTS FOR  
ORNAMENTAL CROP PRODUCTION:  
RESEARCH AND GROWER  
EXPERIENCES**

**George E. Fitzpatrick, Edwin R. Duke, and  
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University of Florida, Fort Lauderdale  
Research and Education Center, 3205  
College Avenue, Fort Lauderdale, FL 33314**

Composting is believed to be as old as agriculture itself. The earliest known written reference to composting is found in the clay tablets dated to the time of the Akkadian Empire, 2700BC (Rodale et al., 1960). However, the words most commonly used to describe both the process and the products are of relatively recent invention. The noun "compost" first appeared in the English language in 1587 and the verb "to compost" in 1757 (Mish, 1988). Older references describing both the process and the product used words, such as dung and manure, without reference to processing, aging, or stabilization. Modern readers must be sensitive to the changing meaning of the various phrases used to describe the controlled decomposition of organic matter to a point where the product can be safely and beneficially used to improve crop productivity (Obeng and Wright, 1987; Poincelot, 1975).

While composting and compost use in plant production are practices that have been employed for thousands of years, two recent developments are especially noteworthy. For most of recorded history, the reported benefits of compost use in crop production were anecdotal rather than the result of controlled scientific study. In the early years of the 20th century, the results of controlled studies on both compost making and compost use in increasing crop productivity were first published (Howard and Wad, 1931). Since these early reports, numerous studies have been published

describing the types of compost products made by different kinds of technologies and their effects when used as components in plant production systems. The second recent development is the emergence of organized business enterprises that make, but do not use compost products. These enterprises earn money by accepting organic waste materials from a variety of customers who pay disposal fees to the composting business; the enterprises also earn money by selling finished compost products to plant growers. There are no complete records indicating the first commercial compost marketers, but one of the earliest ones was Kellogg Supply Inc., in Carson, Calif., which was marketing compost products as early as 1927 and is still in business (Kellogg, 1985). Thus, over the past 60 or so years, there has arisen a new class of compost users who have not been involved in the production of the compost they use. While some of them have developed significant knowledge on issues relating to compost use in horticultural production, others have not. Since compost materials sold by commercial companies are manufactured products, there can be a great deal of variation in the different parameters important to successful plant production. All growers who are interested in using compost products to increase productivity must keep in mind that use patterns associated with naturally occurring organic products, such as peat and related materials, are not necessarily the same as the use patterns associated with manufactured compost products.

### **Important Factors In A Container Growing Medium**

While there is no perfect growing medium for all ornamental crops under all growing conditions, numerous authors have described general recommendations. For example, Joiner (1981) recommends for container-grown foliage crops the following general parameters: bulk

density -  $0.30 \text{ g.cm}^{-3}$  (dry),  $0.60$  to  $1.20 \text{ g.cm}^{-3}$  (wet); pore space-5% to 30%; water holding capacity-20% to 60%; pH-5.5 to 6.5; soluble salts-400 to 1000  $\text{mg.L}^{-1}$ ; cation exchange capacity-10 to 100  $\text{meq.100 cm}^{-3}$ .

Frequently, commercially made compost products have pH levels higher than those listed above; ranges of pH 6.7 to 7.7 are not uncommon (e.g., Conover and Joiner, 1966; Fitzpatrick, 1989; Fitzpatrick and Verkade, 1991). High pH values can result from the chemical qualities of the substrates from which the composts are made, or from materials added to the substrates. For example, composts made from stabilized sewage sludge frequently have high pH values because of chemical stabilizers, such as lime, added to the sludges prior to composting. Unless milled, (see Fitzpatrick, 1989), pore space and water holding capacities of commercially made compost products are usually within the acceptable ranges. Soluble salt levels, cation exchange capacity, and bulk density may all be significantly influenced by the composition of the parent material or by preprocessing, so growers of ornamental crops should monitor these parameters regularly.

### **Issues Pertaining To Compost Use In Ornamental Crop Production**

Use in media for ornamental crop production is high on the list of priorities of agricultural use of compost products because of the relatively high value of nursery and greenhouse crops and the need for organic matter for rooting substrates (Slivka et al., 1992; Tyler, 1993, 1996). Every time a container-grown plant is sold, the rooting substrate is sold with it, necessitating the need for more substrate. Many compost products contain significant levels of certain plant nutrients, but rarely in sufficient concentrations to fulfill an ornamental crop's requirement entirely. For example, in one study in which

tropical trees were grown in containers, the compost products used did not provide sufficient nutrients when used without fertilization, especially for rapidly growing trees, such as schefflera (*Brassaia actinophylla*) and West Indian mahogany (*Swietenia mahagoni*) (Fitzpatrick, 1985). In this same study, the growth rates of slower growing trees, such as pink tabebuia (*Tabebuia pallida*) and pigeon-plum (*Coccoloba diversifolia*), did not differ whether grown in sewage sludge compost and irrigated with secondary treated sewage effluent or in a peat, pine bark, and sand medium fertilized at normal nursery crop levels. Apparently, the levels of N in the effluent (average 6.8 mg/L, SD=5.8) were sufficient to augment nutrients provided by the compost medium for these slower growing trees, but not sufficient for the faster growing species.

The attractiveness of ornamental crops as outlets for compost products does not come without cost. Since the plant's root system is in direct and continual contact with the compost, any concerns regarding compost quality are most acute with container crops and numerous factors can influence quality (Rynk et al., 1992).

*Parent material.* Compost products are made from a wide variety of materials, including municipal solid waste (commonly known as garbage), biosolids (commonly known as sewage sludge), animal manures, yard trimmings, agricultural residues, waste paper, food processing wastes, and many other materials. The composition of the parent material can have an influence on the quality of the product. For example, compost made from sewage sludge supported more rapid growth in container-grown *Viburnum suspensum* than did composts made from less nitrogen-rich materials, such as garbage, yard trimmings, and stable sweepings (Fitzpatrick and Verkade, 1991).

*Preprocessing and postprocessing.* Procedures employed before and after the active composting period can sometimes influence compost quality. For example, sludges are frequently stabilized and conditioned prior to being subjected to composting. If a sludge is stabilized by treatment with ferric chloride and lime, a common practice in many wastewater treatment facilities, the level of soluble salts in the finished product may be significantly higher than in compost made from sludge that had been stabilized using a wet-air oxidation process. When composts made from sludge, treated with ferric chloride and lime were compared with composts made from sludges not treated with these materials as media for the non-salt-tolerant container crops *Spathiphyllum* 'Mauna Loa' and *Schefflera arboricola* Hayata, plants grown in composts with higher soluble salts were significantly smaller. However, plants grown in either of these compost products were significantly larger than those grown in a control medium consisting of 40% peat, 50% pine bark, and 10% sand (Fitzpatrick, 1986). Other processing procedures, such as screening, can influence the physical quality of the compost products by making them more homogenous and, consequently, easier for the grower to mix and apply.

*Active composting time and compost product maturity.* The earliest references on composting time published in the modern era (e.g., Howard and Wad, 1931) indicate an optimum composting time of 6 months for mixtures containing 25% high nitrogen material, such as animal manure, and 75% high carbon material, such as plant debris. Many current commercial compost producers promise a stabilized end product in a much shorter period. Since many compost producers derive the bulk of their income from fees charged to the waste producers, a strong economic incentive exists to accelerate the active composting. Commercial plant producers who purchase compost products

from such sources must be mindful of the negative effects of using immature composts, such as biological blockage of nitrogen, deformity or death of plant parts caused by the ephemeral production of phytotoxic chemicals by the microflora present in immature composts, and increased mobility of certain toxic elements in the soil caused by the reduction of soil redox capacity (Jimenez and Garcia, 1989). Many growers who use compost products store newly delivered material for 6 to 12 months, allowing them to decompose further, as an insurance against any phytotoxic effect that might occur should even a portion of the compost delivered contain immature material.

*Content of inert material.* Certain types of parent materials may contain noncompostable substances, such as particles of glass or plastic, and metal objects. These materials may be unsightly and can cause hazards, particularly if they have sharp edges. If compost is made exclusively from materials such as yard trimmings, leaves, or plant debris, then inert material is usually not a problem. If, however, compost is made from municipal solid waste, inert materials may be a problem, particularly if the parent materials have not been subjected to sufficient preprocessing. Some states have passed environmental regulations limiting the amount of inert materials in compost products. For example, in Florida, state regulations mandate that inert materials may not exceed 2% by mass, in compost products marketed for unrestricted horticultural uses (Florida Dept. of Environmental Protection, 1989). In other areas, compost producers and brokers have developed self-regulation programs. For example, compost producers in Ohio will not sell a compost product for nursery use if the level of inert material exceeds 0.5% by mass (Tyler, 1993). The issue of inert material presence in composts is particularly important in container production of ornamental crops for retail markets. Dangerous, sharp objects in the

growing medium could have dire consequences.

*Regulated elements.* One of the almost universal concerns related to compost use is the question of regulated elements. The U.S. Environmental Protection Agency has issued recommendations for the maximum permissible levels in compost products of 10 heavy metals: arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc. Many states have passed their own regulations, using the federal recommendations as guidelines. Substantial differences in heavy metal concentrations can exist between different types of compost products that are attributable to the parent material and the relative level of preprocessing (Table 1).

Table 1. Residues of cadmium, copper lead, and zinc in two types of compost products.<sup>z</sup>

| Element | Average residue (N=3), mg.kg <sup>-1</sup> dry mass |                                           |                                     |
|---------|-----------------------------------------------------|-------------------------------------------|-------------------------------------|
|         | Municipal solid waste compost <sup>y</sup>          | Sludge-yard trimming compost <sup>x</sup> | Control growing medium <sup>w</sup> |
| Cadmium | 0.87                                                | 0.43                                      | <0.09                               |
| Copper  | 96.21                                               | 3.84                                      | 1.74                                |
| Lead    | 27.30                                               | 2.28                                      | 0.68                                |
| Zinc    | 127.63                                              | 39.61                                     | 7.93                                |

<sup>z</sup>Analyses conducted by the students in Principles of Horticultural Compost Technology AGG 4932. Univ. of Florida. Fall semester, 1994, using the DTPA (diethylenetriaminepentaacetic acid) method (Lindsay and Norvell, 1978).

<sup>y</sup>Bagged Agrisoil municipal solid waste compost, made in 1990 by Agripost co., Miami.

<sup>x</sup>Bulk-delivered compost made in 1989 of 1 dewatered sewage sludge: 3 yard trimmings by the Broward County Public Works Dept., Pompano Beach, Fla.

<sup>w</sup>A commercial growing medium made of 4 peat: 5 pine bark: 1 sand.

However, the overwhelming majority of compost products that are available at the present time fall well within the federal and state guidelines (Chaney and Ryan, 1993; Stilwell, 1993). The safety of compost products

has been improved by the reduction of toxic heavy metals in waste streams. Such reduction have been obtained by the implementation of industrial pretreatment programs as well as by quality control programs practiced by commercial compost producers and monitored by governmental regulatory authorities.

*Microbiological status.* A common concern relative to compost use is the possible presence of pathogenic organisms. The heat generated during active composting reduces the levels of any pathogens that might have been present in the parent material to insignificant levels (Burge, 1983; Haug, 1993). However, since commercial composting is frequently conducted on a large scale, involving hundreds of tons per day, the question of the existence of cool spots within active compost piles and the possibility of reinoculation after composting are normally addressed by examining representative samples of the product and conducting microbiological screening. Usually, the pathogens themselves are not cultured, but the compost samples are tested for the presence of indicator organisms, such as fecal coliform bacteria. Indicator organism tests are simple, reliable, and are required by both federal and state regulations. They serve as an additional safeguard to insure the maintenance of compost quality and safety.

Another microbiological issue of concern is the presence of the ubiquitous thermotolerant fungus *Aspergillus fumigatus*, a saprophyte frequently found in decaying organic materials. *A. fumigatus* is one of the relatively few fungi that can be pathogenic to humans, since the temperature of the human body, 37°C, is optimum for its growth (Oliver, 1994). However, the relatively small number of confirmed cases of aspergillosis, coupled with the ubiquity of *A. fumigatus* in the environment, suggests that the susceptibility of humans is rather low. A recent review of the literature indicates that humans that are

immunocompromised may become ill after only a minimal exposure to *A. fumigatus*, but that healthy individuals appear to show no significant health impacts from exposure to this fungus (Maritato et al., 1992). Moreover, the average horticultural worker is exposed to many substrates that contain *A. fumigatus*, such as soil, peat, sawdust, wood chips, and other products. If horticultural workers do not experience any aspergillosis symptoms from contact with these products, they probably will not do so as a result of exposure to compost products.

### **Experiences Using Compost Products For Ornamental Crop Production**

Numerous research studies have been published, some of which are described in the preceding sections of this paper, on how compost products can be used to improve production of nursery crops. In addition to these studies, several general reviews report numerous studies in summary form. Sanderson (1980) reviewed many published studies and reported significant increases in productivity across a wide variety of nursery crops. More recently, Shiralipour et al. (1992) reviewed compost use in a wide variety of crops, including nursery crops and reported significant increases in productivity as a result of using compost products.

Compost materials have been used successfully to grow a wide spectrum of nursery crops, from flowering annuals (Wootton et al., 1981) to container-grown tropical trees (Fitzpatrick, 1985). In a demonstration project conducted in 1979-80 at a commercial nursery in southern Florida, a number of container-grown ornamental species grown in a compost made from sewage sludge and yard trimmings grew to marketable size significantly faster than did plants grown in a medium composed of 6 peat: 4 sawdust: 1 sand (by volume) (Fitzpatrick, 1981). Plants of one of the species tested, dwarf

oleander (*Nerium oleander*), grown in 25-cm-diameter containers for 5 months, were 1.25x as large when grown in the compost mixture than when grown in a control medium. Moreover, compost products have been successfully used in field nurseries as soil amendments to increase productivity in various tree species (Gouin, 1977); Gouin and Walker, 1977).

Careful attention to the characteristics of the growing medium can allow faster and more economical production of ornamental crops. Since nursery crops need new growing medium as each growing cycle is completed, compost marketers have the opportunity to develop products that can be very attractive to ornamental plant growers. Provided that the compost products are made with emphasis on quality, their use in nursery crop production will probably continue to expand.

*Reprinted from HortScience Vol. 3(6), October 1998. If you would like to receive a copy of the literature cited, please call Susan Barton at (302) 831-1375.*

## Pesticide News

**METHYL BROMIDE** – This fumigant is no longer scheduled for phase out by 2001. The new schedule is: 1999 – 25% reduction; 2001 – 50% reduction; 2003 – 70% reduction; 2005 – 100% reduction.

### **Insecticides:**

**PYRIGRO** - Whitmire Micro-Gen, - has introduced an insect growth regulator designed to control whitefly, fungus gnat and scale. The insecticide is designed to inhibit larval growth and reproductive behavior in adults. It is labeled for greenhouse use and other applications.

**CITATION (cyromazine)** - Novartis - As a result of the IR-4 Project, they can now add to their label the usage on calendula.

**DIAZINON** - Novartis - As a result of the IR-4 Project, they can now add to their label the usage on wax vine, ageratum, gazania, Japanese spurge, scarlet sage and wax plant.

**FENOXYCARB** - Novartis - Due to the high cost of re-registration, they will delete from the label the indoor usages (food serving areas to food and feed handling establishments, application to pests and to premises indoors except for greenhouses, hot houses, lath and shade houses). Unless withdrawn, this will be effective on 2-1-99. (FR Vol. 63, 8-5-98)

**MORESTAN (oxythioquinox)** - Bayer - As a result of the IR-4 Project, they can now add to their label the usage on Japanese spurge.

**OFTANOL (isofenphos)** - Bayer - As a result of the IR-4 Project, they can now add to their label the usage on Christmas trees and Japanese holly.

PERMETHRIN (FMC/Zeneca - As a result of the IR-4 Project, they can now add the usage of 25 new ornamental species to their label.

TEMPO (cyfluthrin) - Bayer - As a result of the IR-4 Project, they can now add to their label the usage on balsam, calendula, carnation, chrysanthemum, geranium, poinsettia and primrose.

LINDANE -Inquinsa - Due to the high cost of re-registration this company has requested EPA delete from their label uses including: ornamental trees and shrubs, turf. Unless withdrawn this will be effective on 2-2-99. (FR Vol. 63, 8-26-98).

#### **Fungicides:**

CYGNUS (kresoxim-methyl) – BASF – This newly registered product is labeled for powdery mildew control in greenhouse ornamentals.

GOLDEN EAGLE (myclobutanil) - Scotts Co. - This is a new formulation recently introduced for usage on turf to control various diseases.

MANKOCIDE ( copper hydroxide/mancozeb) - Griffin - added to their label the usage on turf.

PENSTAR FLO (PCNB) - Scotts Co. - A new flowable formulation recently introduced for usage on turf.

BRAVO (chlorothalonil) - Zeneca - As a result of the IR-4 Project, they can now add to their label the usage on 13 new ornamental species.

CURALAN (vinclozolin) - BASF - As a result of the IR-4 Project, they can now add to their label the usage on hydrangeas.

GLIO-GARD (Gliocaidium virens) - Thermo Trilogly - As a result of the IR- 4 Project, they can now add to their label the usage on balsam,

begonia, cockscomb, marigold, petunia, scarlet sage, snapdragon and zinnia.

KOCIDE (copper hydroxide) - Griffin - As a result of the IR-4 Project, they can add to their label the usage on aglaonema, elm, honey locust, honeysuckle and iris.

#### **Herbicides:**

DIMENSION - Rohm and Haas - has received EPA approval for a new labeling of its herbicide, which is designed to control crabgrass, chickweed, goose grass and other weeds. The new label allows the use of Dimension on ornamental and landscape beds, including around more than 150 types of fl. plants, shrubs & trees.

BASAGRAN (bentazon) - BASF - As a result of the IR-4 Project, they can now add to their label the usage on holly, marigold, oak, petunia and yew.

DUAL MAGNUM (mefenoxam) - Novartis - As a result of the IR-4 Project, they can now add the usage on bleeding heart, snapdragon and stoncrop to the label.

DUAL (metholachlor) - Novartis - As a result of the IR-4 Project, they can now add the usage on snapdragon to their label.

FACTOR (prodiamine) - Novartis - As a result of the IR-4 Project, they can now add to their label the usage on over 80 new ornamental species to their label.

POAST (sethoxydim) - BASF - As a result of the IR-4 Project, they can now add the usage on English ivy to their label.

SIMAZINE - Novartis - As a result of the IR-4 Project, they can now add to their label the usage on dogwood, holly, honey locust and

varnish tree.

## Research Briefs

### *Propagation:*

**Increasing germination of indiagrass (*Sorghastrum nutans*).** J.I. Watkinson and W.G. Pill. Indiagrass is a desirable warm-season grass native to the plains and Eastern United States. This research indicated that prechilling indiagrass seeds in 0.2% KNO<sub>3</sub> containing GA<sub>3</sub> at 1000 mg/L for 2 weeks at 5 C markedly increased seedling emergence but had little effect on seedling growth.

*Excerpted from HortScience, Vol. 33(5):849-851, August 1998.*

**Storing seed and maintaining viability.** C.T. Glenn, F.A. Balzich and S.L. Warren. Seed viability of *Kalmia latifolia* (mountain laurel), *Leucothoe fontanesiana* (drooping leucothoe), *Rhododendron carolinianum* (Carolina rhododendron), *Rhododendron catawbiense* (Catawba rhododendron), and *Rhododendron maximum* (rosebay rhododendron) can be maintained relatively constant for 4 to 5 years (and probably longer) when seeds are dried to moisture contents of 4% to 7% and the seeds stored in sealed containers under freezer (0 F) or refrigerated (39 F) conditions. Viability is lost rapidly when seeds are stored at room temperature (except for *R. carolinianum*). Photoperiod and temperature requirements for optimum germination did not change with storage duration.

*Excerpted from J. Environ. Hort. 16(3):166-172. September 1998.*

### *Field Production:*

**Root pruning liners has no effect on growth.** J.R. Harris and J. Fanelli. This study tested the

effect of root pruning red maple and Washington hawthorn liners at planting on top growth and harvested root length after two years of field production. Root systems were cut back 0%, 25%, 50%, or 75%. Harvested root length was not improved, indicating no benefit from root pruning. On the other hand, top growth was not reduced and only slight evidence of a negative effect on harvested root length was found. Nursery operators may therefore trim root systems of these species as needed (e.g. to remove girdling roots) or to fit specialized production systems (e.g. to fit in containers) without negatively affecting plant growth after at least two years.

Excerpted from *J. Environ. Hort.* 16(3):135-138. September 1998.

**Effect of Gallery on burning bush.** S.Salih, J.E. Derr, K. Hatzios. Gallery is used as a selective, over-the-top, preemergence herbicide for broadleaf weed control. It is a substitute for Princep (simazine). This study showed that burning bush is susceptible to injury from Gallery if applied one month after budbreak, but tolerant when dormant or two months after budbreak.

Excerpted from *J. Environ. Hort.* 16(3):155-158. September 1998.

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

**Fertilizer rate and pot-in-pot production.** J.M. Ruter. Pot-in-pot production increased shoot and root dry weights, total biomass, and the root:shoot ratio of Heritage river birch compared to a conventional above-ground production system. Increasing fertilizer rates from 2.3 to 3.4 lb N/yd<sup>3</sup> increased shoot dry weight by 34% but decreased root:shoot ratios. Nitrate-N concentrations in the leachate were often lower for pot-in-pot grown plants compared to those above ground. Lower NO<sub>3</sub>-N concentrations

from pot-in-pot grown plants could be due to increased plant uptake or slower release rates since substrate temperatures are lower during the growing season. Analysis of total salts remaining in the fertilizer prills indicated that less fertilizer was released in pot-in-pot containers at 6 and 10 months after application compared to above-ground containers. Growers may be able to reduce the frequency of fertilizer application in pot-in-pot systems due to extended fertilizer longevity, thereby decreasing production costs.

Excerpted from *J. Environ. Hort.* 16(3):135-138. September 1998.

**Pot-in-pot production and cyclic irrigation of 'Okame' cherries.** J.M. Ruter. Pot-in-pot production and cyclic irrigation increased plant height and stem diameter about 10% over a 5-month period and increased final shoot and root dry weight by 27% and 44% respectively, compared to plants grown above-ground. Cyclic irrigation increased shoot dry weight 40% compared to a single irrigation event and reduced leachate volume by one-half and improved irrigation application efficiency by 27%.

Excerpted from *J. Environ. Hort.* 16(3):159-162. September 1998.

**Reducing irrigation volume with acceptable growth.** K.M. Groves, S.L. Warren and T.E. Bilderback. Daily volume of irrigation greater than 1.1 inches was needed to maximize growth of *Cotoneaster dammeri* 'Skogholm' and *Rudbeckia fulgida* 'Goldsturm' with most levels of controlled release fertilizer tested. But 90% of maximum growth could be achieved with a 40% reduction in water applied. Osmocote, Scotts, and Woodace produced 90% of maximum top weight over a wide range of irrigation volumes (0.8 in to 1.5 in.). This offers growers much flexibility and should encourage

reducing irrigation volumes.

Excerpted from *J. Environ. Hort.* 16(3):176-181. September 1998.

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

**Greenhouse conditioning affects landscape performance.** J.G. Latimer and R.D. Oetting. Height reduction practices in the greenhouse were evaluated for their affect on landscape performance with a variety of species.

Low N – plant height and quality of ageratum and New Guinea impatiens reduced in landscape; landscape quality of marigold also reduced

High N – increased height of ageratum in greenhouse and New Guinea impatiens in landscape

Ebb & Flow Irrigation – increased height of ageratum in greenhouse and reduced plant quality in landscape

B-Nine – persistent reduction of ageratum height in landscape

Bonzi – persistent reduction of New Guinea impatiens in landscape

Brushing – reduced height of all species except ageratum in greenhouse but had no persistent effect in the landscape

Drought – resulted in height reduction in greenhouse and landscape

Conditioning treatments that result in stress (i.e. drought, low N) had the greatest negative impact on bedding plants in the landscape. Brushing and treatment with an effective rate of plant growth regulator had the best capacity to control height in the greenhouse but result in optimum

landscape performance.

Excerpted from *J. Environ. Hort.* 16(3):138-142. September 1998.

**Western flower thrips controlled with acephate.** R.A. Cloyd and C.S. Sadof. Two systemic granular insecticides were evaluated for their effectiveness against western flower thrips on *Gerbera jamesonii*. Acephate (Pinpoint 15G) was superior to imidacloprid (Marathon 1G) and may help growers manage western flower thrips in floricultural crops.

Excerpted from *HortTechnology* October-December 1998, 8(4).

**Use of antitranspirants in treating transplant shock in the greenhouse.** M. van Iersel. This research showed that antitranspirants are not useful for minimizing transplant shock of impatiens under greenhouse conditions.

Excerpted from *HortTechnology* October-December 1998, 8(4).

**Flowering of Shasta Daisy in response to photoperiod and cold treatment.** E.S. Runkle, R.D. Heins, A.C. Cameron and W.H. Carlson. For forcing ‘Snowcap’ Shasta daisy, the authors recommend providing plants with a minimum of 6 weeks of cold treatment followed by photoperiods > or = 16 hours or a 4-hour night interruption. The only negative aspect of ‘Snowcap’, like most Shasta daisies, is that its inflorescences produce an unpleasant odor. However, the numerous positive attributes of ‘Snowcap’ merit its consideration as a cultivar for forcing as a potted plant.

Excerpted from *HortScience*, Vol. 33(6):1014-1018. October 1998.

**Nutrition affects pre- and posttransplant**

**growth of petunia and impatiens plugs.**

M.W. van Iersel, P.A. Thomas, R.B. Beverly, J.G. Latimer, and H.A. Mills. Weekly applications of fertilizers containing 16mM N resulted in optimal pre- and post-transplant growth of impatiens and petunia plug seedlings. A 20N-3P-3K fertilizer can supply adequate amounts of these three nutrients when applied at the optimal rate.

Excerpted from *HortTechnology* October-December 1998, 8(4).

**Pine bark changes efficacy of growth**

**retardants.** J.B. Million, J.E. Barrett, T.A. Nell and D.G. Clark. Growers using pine bark-based media may need to apply higher concentrations of chemical drenches than they would apply if using media not containing pine bark.

Excerpted from *HortScience*, Vol. 33(6):1030-1031. October 1998.

**Controlling rhizoctonia stem rot and root rot**

**with biocontrols.** J. Hwang and M. Benson. A strain of bacterium (*Burkholderia cepacia*) called 5.5B and a nonpathogenic strain of binucleate rhizoctonia fungus (BNR) show promise for the control of rhizoctonia on poinsettias. Since one application (of biocontrol or fungicide) is rarely effective, a combination of controls works. Treat poinsettia cuttings in rooting cubes with 5.5N to control rhizoctonia stem rot. At transplanting, amend the media with a 0.6% formulation of BNR. This sequential control worked better than repeating the same treatment.

Excerpted from *GrowerTalks*, August 1998.

**Hostas from plugs.** E.J. Holcomb, D.J. Beattie and W. Britton. Results suggest that the best overall fertilization treatment for tissue-cultured, containerized hosta is Osmocote at a rate of 3 g per six-inch pot. This is one-half the

recommended rate for general nursery stock. However, since average shoot growth was adequate for all cultivars at a rate of 3 g per six-inch pot, either Osmocote 14-14-14 or Sierrablen 17-6-12 can be used.

Excerpted from *Greenhouse Product News*, September 1998.

**Landscape:**

**Biostimulants and soil amendments on red maple and Washington hawthorn.**

M. Kelting, J.R. Harris and J. Fanelli. Humate-based biostimulants described as “non-nutritional products that may reduce fertilizer use and increase yield and resistance to water and temperature stress” have increased growth of field-grown plants in some studies. The results of this study do not support the use of biostimulants as an aid to post-transplant establishment of red maple or Washington hawthorn. No growth parameter was increased for red maple with the use of granular or liquid humate and only top dry mass (but not height, stem diameter or root length) was increased for Washington hawthorn. The lack of effect may be due to above-threshold levels of humic material already in the soil. Different results may occur in soils with very low organic matter, such as in urban soils. This study did show an increase in root length for trees of both species amended with peat moss at planting.

Excerpted from *HortScience*, Vol. 33(5):819-822, August 1998.

**Turf:**

**Drought tolerance of tall fescue cultivars.**

B. Huang, J. Fry and B. Wang. Results demonstrated that a dwarf-type tall fescue cultivar (‘MIC18’) had inferior drought resistance and recuperative capability compared to a forage-type (‘Kentucky-31’) or turf-type cultivar

(‘Mustang’). The results also indicated that watering after 14 days of dry down resulted in physiological recovery with minimal loss in turf quality for tall fescue cultivars. However, 21 days of dry down resulted in long-term negative effects on physiological activity and quality of turf.

Excerpted from *HortScience*, Vol. 33(5):837-840, August 1998.

**Preemergent herbicide to control annual bluegrass.** P.H. Dernoeden. Results from this study showed that annual bluegrass could be controlled effectively with as little as 0.36 kg/ha prodiamine applied during the first two weeks of September in central Maryland. These results may only apply to non-disturbed (i.e. no core cultivation, verticutting, etc.) turf maintained at a mowing height above 2 inches.

Excerpted from *HortScience*, Vol. 33(5):845-846, August 1998.

**Topdressing with crumb rubber.** J.N. Rogers, J.T. Vanini and J.R. Crum. Crumb rubber (ground up synthetic rubber tires) was used as a topdressing on turf to minimize wear injury and reduce surface hardness. Large particles (0.3” to 0.1”) and small particles (0.1” to 0.002”) were applied to four depths (0.1”, 0.2”, 0.4” and 0.7”) at three timings (July, September and October). Authors concluded that the greater depths of topdressing with the smaller particles provide a more effective and immediate reduction in surface abrasion thereby improving the wear tolerance of the turf.

Excerpted from *Agronomy Journal* 90:215-221.

**Dwarf turfgrasses reduce input.** K. Hatt. Dwarf turfgrasses grow to 4-6 inches (6-8 inches shorter than traditional species). They grow 33% slower than traditional species and require less water, fertilizer and pesticides.

Some cultivars include: Dwarf fine leaf fescues (Valda, Reliant and SR3000); chewings, hard and creeping fescues (Longfellow and Ensylva); and dwarf tall fescues (Shortstop and Rebel). Kentucky bluegrass and perennial ryegrass have dwarf cultivars as well.

Excerpted from *TURF*, August 1998.

### **Weed Control:**

**Control of field bindweed with the mycoherbicide (*Stagonospora convolvuli*).** D.Guntli, H.A. Pfirter, Y. Moenne-Loccoz and F.Defago. The fungus, *S. convolvuli* strain LA39 controlled field bindweed in *Cotoneaster dammeri* by causing defoliation, but there was no effect on emergence the following year, therefore the fungus (mycoherbicide) would have to be applied every year.

Excerpted from *HortScience*, Vol. 33(5):860-861, August 1998.

### **Disease:**

**Susceptibility of dogwood to powdery mildew and spot anthracnose.** A.K. Hagan, B. Hardin, C.H. Gilliam, G.J. Keever, J.D. Williams and J. Eakes. This research in Alabamba (obviously a different environment than DE) identified cultivars that were superior based on resistance to powdery mildew and spot anthracnose:

White cv. – ‘Welch’s Bay Beauty’  
                  ‘Weaver White’  
Red cv. - ‘Cherokee Brave’  
                  ‘Cherokee Chief’

Excerpted from *J. Environ. Hort.* 16(3):147-151. September 1998.

**Naturally-occurring resistance to powdery mildew.** M.T. Windham and W.T. Witte. Of the 20,000 seedlings of *Cornus florida* screened

for resistance to powdery mildew, 20 seedlings were rated as being highly resistant and will be used to develop new resistant cultivars.

Excerpted from *J. Environ. Hort.* 16(3):173-175. September 1998.

**White flowering dogwood resistant to dogwood anthracnose.** M.T. Windham, E.T. Graham, W.T. Witte, J.L. Knighten and R.N. Trigiano. ‘Appalachian Spring’ was selected from a population of dogwoods in Maryland. It has intermediate to large white bracts, prolific blooming, abundant fruiting, and is resistant to dogwood anthracnose. A number of bud sticks were distributed to four wholesale nurseries in Tennessee. Those interested in obtaining plants or bud wood should contact Mark Windham (P.O. Box 1071, Knoxville, TN 37901; phone (423) 974-7324; email: [mwindham@utk.edu](mailto:mwindham@utk.edu)).

Excerpted from *HortScience*, Vol. 33(7), December 1998.

**Dutch elm disease serum.** B. Fraedrick. Dutch Trig is a serum that consists of live spores of the fungus *Verticillium dahliae*. It is injected into puncture wounds in the stems of elms during spring. The treatment creates an immune system for the trees that fights off Dutch elm disease (DED). Of 60 treated trees, only one had substantial (40%) crown wilt by the end of the season. This product is not yet on the market in the U.S.

Excerpted from *American Nurseryman*, August 15, 1998.

## Publications

**1998-99 Pesticide Directory.** Thompson Publications, Fresno, CA. The directory is a guide to pesticide products, producers, researchers, regulators and associations in the US. Included are listings of manufacturers, formulators, key personnel at those companies and the products they have registered for marketing. National, regional and state organizations and publications that deal with pesticides are also included. Addresses and phone numbers are provided for all listings. To order, call (800) 621-5727.

**AGRICULTURAL CHEMICAL BOOK I - Insecticides -** The 1998-99 revision is just off the press. Over 25 new insecticides have been added. Order from Thomson Publications (800) 621-5727. \$24.95.

# Calendar

**November 17 & 19 - December 1, 3 & 8** -Insect IPM for Landscape Management (A five-session short course). University of Rhode Island, Kingston Campus. Fee: \$150/\$135 for RINLA members & URI Certified Master Gardeners. **Session 1:** Introduction to Landscape IPM & Insect Fundamentals, **Session 2:** Insect Pests of Ornamentals - Life Cycles & Management, **Session 3:** Insect Pests of Turf - Life Cycles & Management, **Session 4:** Beneficial Insects - From Bees to Butterflies, **Session 5:** Hands-On Insect Identification Lab. Make checks payable to: URI GreenShare, CE Education Center, 3 East Alumni Ave., Kingston, RI 02881.

**December 1, 3 & 8** - Estimating & Bidding for Landscape Installation. PennState Great Valley, Malvern, PA. Contact: Jim Sargent (215)345-3283, Rick Johnson (610)690-265. Sponsored by Penn State Cooperative Extension.

**December 2** - Building in the Green, Villanova University, Villanova, PA. Contact: Julianne Schieffer (610)489-431. Certified arborists credits are offered. Sponsored by the Penn State Cooperative Extension.

**December 2** - South Jersey Landscape Conference, New Jersey Nursery & Landscape Association, south chapter and the Rutgers Cooperative Extension. Masso's Crystal manor, Glassboro. Call:(609)863-0110 or (609)291-7070; Fax:(609)881-4191.

**December 3** - Managing a Living Collection. Morris Arboretum of the University of Pennsylvania. Contact: Julianne Schieffer (610)489-4315. Certified arborist credits are offered. Sponsored by the Penn State Cooperative Extension.

**December 10** - Grounds Managers' Winter Seminar. Warrington Motor Lodge, Warrington, PA. Contact Scott Guiser (215)345-3282. Penn State Cooperative Extension and the Philadelphia Branch of PGMS co-sponsor this event. Pesticide update credits will be offered.

**December 22, 23** - Quarterly Pesticide Applicator's Training & Exam. Contact: Susan Whitney (302)831-2526, Larry Towle (302)739-4811.

**January 5-7** - MANTS, Baltimore Convention Center, MD, Contact: (800)431-0066. (2 CEU's).

**January 5, 6 & 7** - Eastern Pennsylvania Turfgrass Conference. Valley Forge Convention Center. Contact: PA Turfgrass Council (814)863-3475, Nancy Bosold

(610)690-2655. Pesticide update credits will be offered.

**January 6, 13, 20 & 27** - Nutrient Management Training, Kent County Extension Office, 9am - 4pm. Registration fee will be charged. Register by November 1. Contact: Susan Hurt (302)831-2504.

**January 7-10** - NCAN Green & Growin Show, Winston-Salem, NC; Contact: (919)266-3322.

**January 11-15** - Advanced Landscape IPM Short Course, University of Maryland Cooperative Extension Service. Contact Jennifer Lyons-Carter, University of Maryland, Dept of Entomology, 4112 Plant Science Bldg., College Park, MD 20742; (301)405-3913.

**January 12, 13, 14** - Delaware Hort Industry Expo. Sheraton Inn, Dover, DE Contact: Val Budischak (610-274-2166).

**January 12, 14, 19, 21** - Pesticide Short Course. Penn State Great Valley, Malvern, PA. Contact: Nancy Bosold (610)690-2655, Rick Johnson (610)690-2655. Sponsored by the Penn State Cooperative Extension.

**January 13-15** -Workforce Management for Farms and Horticultural Businesses, Finding, Training, and Keeping Good Employees. Radisson Penn Harris Hotel and Convention Center, Camp Hill, PA. For more information, contact: NRAES, Cooperative Extension, 152 Riley-Robb Hall, Ithica, NY 14853-5701, call:(607)255-7654, Fax:(607)254-8770, e-mail:NRAES@CORNELL.EDU, Web Site: [HTTP://NRAES.ORG](http://NRAES.ORG)

**January 16, 23, 30; February 6, 13, 20** - Garden Design Studio II, Longwood Gardens, (610) 388-1000 ext. 516.

**January 19** - Eastern Regional Landscape & Nursery Seminar. Delaware Valley College, Doylestown, PA. Contact: David J. Suchanic (61)489-4315. This event is sponsored by Delaware Valley College, the PLNAE-1 Chapter and Penn State Cooperative Extension. Pesticide update credits will be offered.

**January 19, 20, 26 & 27** - Deciduous Tree Identification. Smedley Park, Delaware County. Contact: Rick Johnson (610)690-2655. Sponsored by the Penn State Cooperative Extension.

**January 25-28** - Professional Horticulture Conference of Virginia in Virginia Beach, VA. Contact: Professional Horticulture Conference of Virginia, Ltd., P.O. Box 64446; Virginia Beach, VA 23467; Call:(757)523-4734;

Fax(757)366-9604, e-mail:apearden@erols.com

**January 26** - Annual Pesticide Conference -Drift Control. Delaware State Troopers Social Hall, Cheswold, 8am-4pm. Registration fee will be charged. Recertification credits will be offered in all categories. Contact: Susan Whitney (302)831-8886.

**February 1 & 2**- 34th Annual Shade Tree Symposium. Host Conference Center, Lancaster, PA. Contact: Elizabeth Wertz (215)795-0411, Rick Johnson (610)690-2655. Pesticide update credits will be offered. Sponsored by the Penn State Cooperative Extension.

**February 4-7** - WNGA/NLA/GCA Management Clinic, Louisville, KY; Contact: ANLA (202)789-2900.

**February 5** – Today’s Horticulture at Longwood Gardens, Kennett Square, PA. A winter symposium and plant sale to inspire enthusiastic gardeners, horticulturists, landscape designers and nursery professionals. Contact Lisa Roper (610)688-2919.

**February 9 & 10** - Pennsylvania Landscape and Nursery Conference. Holiday Inn, Harrisburg/Hershey, PA. Contact: Dave Suchanic (610)489-4315, PA Landscape & Nursery Assoc., (717)238-1673. Pesticide update credits will be offered. Sponsored by the Penn State Cooperative Extension.

**February 17-20** -Mid-Atlantic Direct Marketing Conference & Trade Show, Ocean City, MD. Contact: Carl German (302)831-1317.

**February 17** - 1999 Winter Grounds Seminar. Kutztown Grang Hall. Contact: Judith Schwank (610)378-1327, Emelie Swackhamer (610)391-9840. Pesticide update credits will be offered. Sponsored by the Penn State Cooperative Extension.

**February 17, 18, 19** - Christmas Tree Short Course. Penn State Conference Center, Penn State. Contact: George Perry (717)622-4225, Penn State Short Course Office (814)865-8301. Pesticide update credits will be offered. Sponsored by the Penn State Cooperative Extension.

**March 10** - Pruning Workshop. Neshaminy Manor Center, Doylestown, 9am - 3pm. Contact: Scott D. Guiser (215)345-3283. Sponsored by the Penn State Cooperative Extension.

**March 12** - 1999 Longwood Graduate Program Symposium at Longwood Gardens in Kennett Square, PA.

Contact the Program Office at (302)831-2517 or e-mail James.Swasey@mvs.udel.edu

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

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

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

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

