



Bulletin

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CIRCULATE

Ethylene: Floriculture's Friend or Foe?



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We all know that proper plant growth requires light, water, and nutrients, but it also requires internal chemical messengers called plant hormones. Normal plant growth and development requires communication between different organs (roots, stems, and leaves) and even between individual cells within an organ. For example, if the roots are experiencing a water deficit, they can communicate this to the leaves and the plant will close the stomata to prevent water loss. This process is controlled by plant hormones. Hormones regulate plant growth and development and allow plants to alter their growth in response to environmental

stimuli or stresses. Hormones are chemicals that are synthesized in the plant and have biological activity at very low concentrations – in the ppm (parts per million) and ppb (parts per billion) range. The term growth regulator is more commonly used within the floriculture industry and includes man-made chemicals that have the same biological activity in plants as hormones. The most common plant hormones fall into five classes that include ethylene, auxins, cytokinins, gibberellins, and abscisic acid.

it is a gas. While pure ethylene has a sweet, ether-like odor, the concentrations normally found in the atmosphere are colorless and odorless. Ethylene affects all aspects of plant growth and development, from seed germination to flowering and fruit ripening.

ETHYLENE: EFFECTS ON PLANT GROWTH AND DEVELOPMENT

1. abscission of leaves, flower petals, or immature buds;
2. fruit ripening;
3. adventitious root formation (roots developing where they don't normally occur);

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THE PLANT HORMONE ETHYLENE

Ethylene is unique among the plant hormones because

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SHORT COURSE "TEASER" 2002

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July is almost here! It is time once again for 4th of July celebrations, days at the beach, and that time of year all growers get ready for – the OFA Short Course! Here is a preview of a few of the talks scheduled in the areas of poinsettia production and mixed container production.

POINSETTIA PRODUCTION

Just as growers are starting on their poinsettia crops, we will be focusing on the finer points of production. In past years you may have come to hear the step-by-step of "how to grow poinsettias," but this year we are taking a slightly different approach. Instead of reviewing everything you should know to grow the crop, our panel of experts will share some mistakes growers actually make each crop cycle. You may find some of

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OFA Mission Statement

To support and promote floriculture professionals through life-long learning career enhancement, and public awareness.

(As adopted by the OFA Board of Directors 2/24/02)



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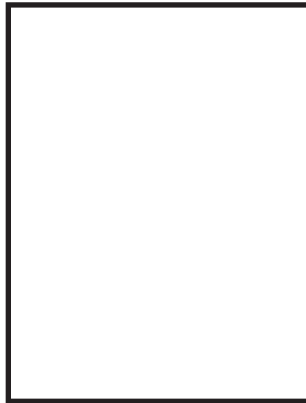
RICK YATES

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WHAT TO DO WHEN OSHA COMES KNOCKING ON YOUR DOOR



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It was late in the afternoon when I was called from the back greenhouses to the front because someone from OSHA wanted to see me. "Oh no! Not now," I thought. I took my good-natured time strolling through the greenhouses, playing several scenarios over and over in my mind. Did someone report me? What could they want? Where were all the records? This is not what I needed right now!

Finally making it to the front, I encountered a small, elderly gentleman who could not speak, but instead, handed me his credentials and a handwritten note saying what he needed to see. By now it was 4 p.m. and, as I headed to the office to retrieve the information from the office manager, my heart sank when I eyed the empty chair and was told she had gone home early for the day.

Turning to the gentleman, I told him of my dilemma. Even though I was the owner, I couldn't begin to tell him where the paperwork he was looking for was located. In essence, he wanted to see the OSHA 200 Log. He needed to know where the poster was located and where the reports were filed. I didn't have a clue, and it was the truth!

He must have believed me, because he said he would return first thing in the morning to review the records and paperwork with Mary Beth, the office manager. True to his word, he was back at our business by 7:30 the next morning.

The audit itself took about two hours. Mary Beth was able to produce everything he needed to see and to show him the posters' locations. We did well. He then asked to interview several employees. We were able to choose whom he talked to. I feel that helped tremendously.

He asked them questions such as:

- Have you been informed about what to do in an emergency?
- Do you know whom to call?
- Do you know where the posters are located giving this information?
- Do you feel comfortable reporting an accident?
- Do you know where the first aid kits are? Eye wash stations?

TAKE MY ADVICE

If I had words of advice for anyone it would be: To be open, honest, and most of all polite to whomever OSHA sends.

Have all the information centralized and make sure all management knows where this information is located. He was very kind to allow us until the next morning to produce the information.

Make sure employees truly know where to go in an emergency and where the posters are located.

Follow up on all accident reports. Get the information you need to post the correct information.



Make sure you post the information when and where it is supposed to be.

If you are doing everything honestly and to the best of your ability and knowledge correctly, there should be no problem.

Bring the information to him. We had him sit in just one spot. We did not give him the opportunity to walk around and inspect without a reason. We were with him at all times.

Final words of advice ... know your own business. I hate being in the office. I'm a grower and always will be a grower, but I almost learned the hard way how important it is to know about this kind of stuff – important stuff. Good luck! **OFA**

OSHA UPDATE

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In January 2002, OSHA implemented a new set of rules for recording occupational injuries and illnesses. It has been estimated that this new rule will affect 1.4 million establishments throughout the United States. Like the former rule, employers with 10 or fewer employees are exempt from most requirements of the new rule, as are establishments classified in a number of industries in the low-hazard retail, service, finance, insurance, and real estate sectors. The new rule updates the list of exempted industries

to reflect recent industry data. The basic requirement to report fatalities and the hospitalization of three or more employees to OSHA within eight hours has not changed.

In February 2002, the Department of Labor and OSHA joined forces and pledged to escalate their efforts to improve the safety and health of Hispanic workers. These agencies outlined plans to develop better working conditions for Spanish-speaking workers. OSHA has formed a task force to assess outreach efforts and to identify additional strategies that will work. One of those strategies was the launching of a new Spanish-language Web page and another was for a Spanish option on OSHA's 24-hour toll-free help line (800-321-OSHA).

During April 2002, OSHA unveiled a newly revised plan for dealing with workplace ergonomic injuries. The agency is going to start work immediately on developing industry and task-specific guidelines to reduce and prevent ergonomic injuries, which are also often referred to as musculoskeletal disorders, that occur in the workplace. OSHA plans to start releasing guidelines ready for application in selected industries sometime during 2002. OSHA is also encouraging all other businesses and industries to immediately develop additional guidelines of their own.

During the past fiscal year, the following items were the most frequent citations for the Standard Industrial Classification (SIC) code for Ornamental

Floriculture and Nursery Products (0181):

Standard – Description

1910.147 – Lockout/tagout program, control of hazardous energy;

1910.148 – Powered industrial trucks (forklifts);

1910.303 – Electrical systems design, general requirements;

1928.110 – Field sanitation;

1928.051 – Roll over protection for tractors

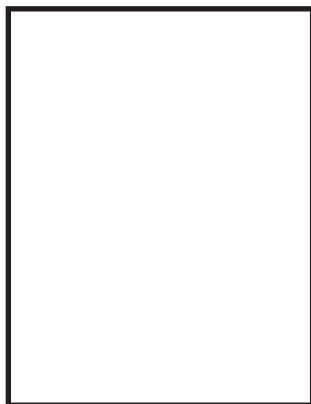
For additional information on the new OSHA recordkeeping standard, including downloadable forms, how to complete forms, FAQs, and BLS Injury and Illness Statistics, please visit our web site at www.hortica-insurance.com.

OFA

**Attention Ohio OFA members
enrolled in the Worker's Compensation Program (CCI)**

**Watch your mail for an announcement about the meeting to be held
on Monday, July 15 at the Short Course.**

Basic Training: Surfactants, Wetting Agents, or Adjuvants?



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Take a deep breath. Now let it out slowly. Thanks. You've just helped me prove an important point. You probably never considered that, if it were not for the natural surfactants that your lungs began producing just a few weeks before you were born, you'd be gasping for air right now instead of reading this. Yes, I did read the keynote paper: "Theory of Pulmonary Surfactant Dynamics," and I'll wisely spare you that lecture! Like a great many aspects of life, there are small things that make a big difference. In this case, the small things we are going to review can destroy crops or save them, depending upon how you use them.

Dr. Steve Carver has asked me to take a head-long leap into explaining the realm of adjuvants, wetting agents, and surfactants. Personally, I think Michelle Gaston put him up to this one just to test my metal. I

am, however, actually happy to write on this topic, as several growers have gotten into trouble using surfactants during the last two years. I'd like to reduce those kinds of Extension calls. Secondly, there are many new products that come from different chemical classes, meaning they have properties that are different than what we are used to. You no longer can assume that grabbing something household and common off the shelf won't harm your plants.

SO WHY DO WE USE THEM AND HOW DO THEY WORK?

There is no way around this. Make yourself a glass of cold chocolate milk using cocoa powder, find a comfy sofa, and prepare for some mental exercises. I'm about to give you another lesson in plant physiology ... but first, remember to add a tad of hot water to the powder to dissolve it before you add the cold milk ... otherwise it may take a good while to dissolve.

It all begins with water. If the drought hasn't increased your appreciation of water, perhaps this will. Each individual water molecule is dipolar, simply meaning it has a negative and a positive charge, very much like a magnet. If you put a bunch of these molecules together, the positive and negative forces attract each other. Now for the imagination exercise. These molecules don't attract each other in just one dimension, but rather all around in a circle. You can imagine this if you think of a child's homemade Christmas tree ornament with a white foam ball center and gold-painted toothpicks

sticking out all over. With water molecules, the charges radiate out like the toothpicks and join forces with opposite charges on the next molecule. The end result is a mass of interconnected molecules that stay "stuck together" pretty well, hence comes fog, raindrops, rivers, oceans, etc. So far so good? When atoms of like-substance join together, the term for this is **cohesion**. In fact, water molecules prefer to be in contact with each other, as it provides them the most energy-conservative state. In effect, they are more comfortable together as all the hydrogen bonds are matched up.

Now consider bugs that walk on water! I refer to water striders, water beetles, and mosquitoes. Alternatively, try thinking back to high school when your physics teacher floated a pin or paper clip in a glass of water. It's amazing. Mosquitoes really can walk on water, and pins do float. However, it is not the insect or the pin that is special, it's the properties of water. Let us return to our Christmas tree ornament. The previous mental image of the ornament represents the configuration of water molecules nestled safely in the center of a raindrop. However, there are millions of fellow molecules that are located at the outer edge of the raindrop. They cannot easily attach or attract molecules to that portion that interfaces with air. Now for the hard part. First, take a deep breath.

I need you to mentally cut off the toothpicks on 50 percent of the foam sphere. We now have an ornament

with half the sphere barren of toothpicks. Next, mentally restick the cut-off toothpick pieces in a circle that spans the equator between the bare portion of the sphere and the untouched spiny portion of the sphere. You now have a ring of dense gold-painted toothpicks, below which are normal-density toothpicks, and above which is a bare sphere. Congratulations! This is exactly what a molecule of water looks like when it resides on the surface of a raindrop. As it turns out, I had you restick the cut toothpicks to represent stronger bonding forces.

Now picture in your mind hundreds of millions of water molecules in a raindrop. The ones on the outside layer cling more tightly to those neighboring molecules on the surface than they do to the molecules within the raindrop. They must share twice as many bonds because there are only half as many opportunities. The "skin" of water holds together with more force than interior water molecules. In fact, that force can be formidable. This, ladies and gentlemen, is what causes surface tension. Surface tension can prevent many things from going into solution, or from getting wet, and overcoming the surface tension of water is but one of many reasons why we use surfactants in the greenhouse. If it were not for the surfactants in your lungs, oxygen and carbon dioxide could not easily diffuse through the water layer on the cell surfaces in your lungs and you'd be in big trouble.

Sorry, we are not done yet. Back to mosquitoes. Mosquitoes don't sink because they weigh so little, the force of gravity is insufficient to break the cohesive forces of the surface dwelling water molecules. Same thing applies for paper clips. Now for some kitchen fun.

Float a small paperclip in a glass of water by lowering it in horizontally on the tip end of a fork. With patience, it will float. Once it is happily floating, take a real toothpick and dip it into some kitchen dishwashing liquid. Now touch the end of the toothpick gently onto the surface of the water in the glass. The paperclip will instantly plummet. You have successfully broken the surface tension with a surfactant. Now imagine the terror experienced by an arrogant mosquito that lands on pond water treated with a surfactant! Quick, take another deep breath. I haven't explained how this happens yet.

When water molecules come into contact with unlike substances, there are several things that can happen. If they have similar charges, or no charges available, they will not react – just like magnets that repel each other. Think Columbine, leafminers, and the first time you sprayed a bench. The spray rolled right off the waxy leaves and had no effect on the miners. This is because the waxy layer had no charge compatibility with the water molecules. The water and pesticide solution could not adhere or stick to the leaf, as we all know. So sticking is a good thing because it takes time for the insecticide to penetrate the leaf to do its work. The term for this characteristic is “water repellent” or “hydrophobic.” By the way, did I mention

that mosquitoes have hydrophobic legs and feet?

However, there is an opposite case where water comes in contact with substances that do have compatible charges and they often wind up sticking together quite strongly. In fact, much more strongly than the forces caused by just surface tension. This is called **adhesion**. Water adheres to the xylem in plants ... the fibers that make up paper. Drops of water will spread out over kitchen paper very quickly. The kitchen paper had millions of compatible charge sites. The unlike substance (paper) can steal the bonding opportunities from the surface water molecules that are sharing, and thus eliminate the forces that cause surface tension. The water droplet is literally pulled apart into what resembles a very thin pancake.

The same thing happens to cocoa powder and powdered pesticides when surfactants are added. The surfactant material winds up reducing the surface tension of the water solution, and coating the particles of pesticide. This permits almost any other material (the pesticide) to be mixed with the water. This explains why chemical companies add various surfactant agents into pesticides. They are increasing the ease to which their active ingredients dissolve into water. When we added the soap to that glass of water, both the fates of the paperclip and Mr. Mosquito were sealed. Surfactants in pond water overcome the surface tension, coat the surface of the water, and coat Mr. Mosquito's hydrophobic legs.

OK, that's enough about mosquitoes. You now know

OFA Back to Basics

more about how surfactants work than you ever wanted to know. Let's cut to the quick and review why it is important to know your materials. Sadly, this is a true story. Two years ago, I received a panicked call from a grower who indicated that his pansy crop was in trouble. Earlier that day he found he was knee-deep in aphids, sprayed thoroughly, and found the effort was ineffectual as the spray just ran off the leaves. Outdoor-grown pansies can be fairly waxy. Rather than investigate or consult, he decided to use a very handy and fine horticultural oil with the insecticide and spray again. It was late in the afternoon, hot, sunny, and by 5 p.m. his pansy leaves started wilting. Panicked, he then decided to apply a commonly used household dishwashing liquid solution to the pansies to rinse off the oil, knowing soaps dissolve oils.

By the time he called me, (and I arrived at 6:30 p.m.), pansy plants in the 1,300

flats were already dissolving into small blobs of dark, black-green jelly. Had the grower read the label, the horticultural oil he used clearly indicated it was a penetrating type oil used in spraying scales on fruit trees in winter (cold) conditions and not for foliage. In hot weather, it was a deadly material and was clearly not labeled for greenhouse use either (Figure 1). Had he read the dishwashing detergent label, he would have seen the words “new formulation,” in which a new surfactant was used instead of a common salt-based detergent, clearly stating it was more effective than the old formulation ... new and improved!

The end result is that as the oil became hot and its effectiveness in penetrating doubled (Q-10 effect). It began dissolving or bypassing the waxy layers and eventually the cuticle of the leaf tissue. When it reached the inner cells, the lipid layers that hold in the cellular sap were compromised, and dissolved

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Figure 1. Horticultural oil applied in hot weather.

ETHYLENE: FLORICULTURE'S FRIEND OR FOE?

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4. flower initiation and opening in some flowers;
5. chlorosis or yellowing (senescence) of leaves;
6. wilting and color fading (senescence) of petals;
7. inhibition of root and stem elongation in some plants;
8. epinastic curvature of petioles and bracts; and
9. seed germination.

ETHYLENE: FLORICULTURE'S FOE

Ethylene is often referred to as the "ripening" hormone or sometimes the "death" hormone. While ethylene accelerates fruit ripening, it also accelerates the maturation of leaves and flowers and can cause premature death (the later stages of flower development that result in death are referred to as senescence) of these tissues. Many plants are sensitive to ethylene, and accidental exposure to ethylene anywhere in the floriculture chain will decrease the overall quality of the final product. The detrimental effects of ethylene exposure include

increased abscission of leaves, petals, flowers, or buds; increased yellowing of leaves and accelerated wilting; and petal inrolling and color fading of flowers. Ethylene also causes epinasty, a characteristic downward curving of the bracts or petioles, which is often seen in poinsettias or tomatoes.

Most plants produce ethylene at some point in their life cycle. Leaves and vegetative tissues usually produce much lower levels of ethylene than flowers or fruits. Young flowers and immature fruits produce low levels of ethylene and production increases substantially as the flowers mature and fruits ripen. The highest ethylene production from a flower usually corresponds with the first visual symptoms of senescence including petal wilting (Figure 1).

Because ethylene is a gas, it can move very rapidly; and ethylene produced by one flower can easily affect a neighboring flower. In addition to tissue type and developmental stage, environmental factors like temperature

affect ethylene production rates. At lower temperatures, all metabolic processes within the plant slow down, including the production of ethylene. Wounding of flowers, fruits, or leaves also increases ethylene production. This wounding can be from insect predation or mechanical damage during shipping and handling.

The severity of injury following exposure to ethylene is also influenced by many factors. While most plants produce ethylene, not all plants are sensitive to ethylene. Ethylene damage is observed more frequently in cut flowers and flowering potted plants than foliage plants, because flowers are more sensitive to ethylene than vegetative tissues. Immature flowers are less sensitive to ethylene than fully open flowers (Figure 2).

Among flowering plants, sensitivity varies between species and even between cultivars. Flowers like carnation, petunia, orchids, snapdragons, geraniums, fuchsia, and streptocarpus are examples of ethylene-sensitive flowers, while anthurium, gerbera, tulip, chrysanthemums, African violets, and cyclamen are insensitive to ethylene. The extent of dam-

age caused by ethylene exposure depends on both the concentration of ethylene the plant is exposed to and the amount of time it is exposed. While plants may not show symptoms of injury following a three-hour exposure to 100 ppb ethylene, symptoms may become obvious after 24 hours of exposure. Concentrations in the ppm range can easily accumulate during packaging, shipping, and in retail environments.

HOW CAN YOU PREVENT ETHYLENE INJURY?

Ethylene injury can occur anywhere in the floriculture chain, but it is most common in the postproduction stages after the plant has left the producer. Damage can be minimized by avoiding exposure to sources of ethylene, like senescing flowers, ripening fruit, decomposing materials, gas-powered fork lifts, and cigarette smoke – and by avoiding conditions that increase the ethylene production or sensitivity of a plant. Avoid high temperatures during packaging, storage, shipping, and retailing. If shipping ethylene-sensitive plants for long distances in trucks where ethylene accumulation may be a problem,

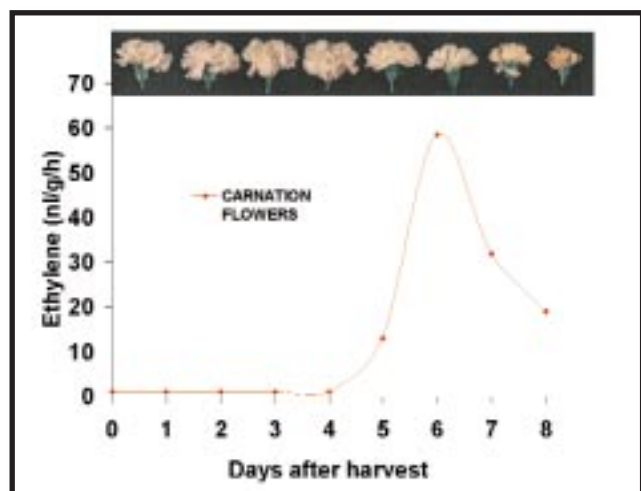


Figure 1. Ethylene production during the vase life of cut carnation flowers.

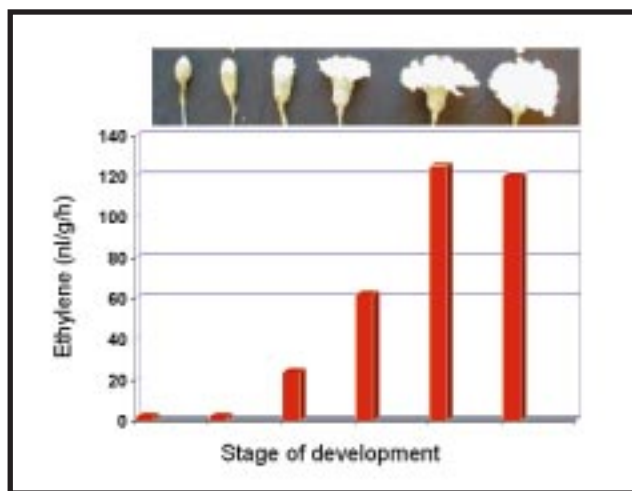


Figure 2. Ethylene production from carnation flowers at various developmental stages following treatment with 3 ppm ethylene.

ship plants with flowers at more immature stages. When shipping in boxes or sleeves, use boxes with ventilation and sleeves that are permeable to ethylene so it can diffuse away from the plant and be diluted within the larger volume of the truck.

Ethylene scrubbers can also be used to reduce the levels of ethylene in trucks, storage rooms, or shipping boxes. There must be some movement of ethylene-contaminated air through these scrubbers for them to remove ethylene from the air. If you do use an ethylene scrubber, remember that the filter has a shelf life and must be replaced regularly so it will continue to absorb ethylene efficiently.

Chemical treatments can be used to reduce ethylene production and sensitivity. Some floral preservatives include AOA or AVG, which are inhibitors of ethylene synthesis. They prevent flowers from producing ethylene, but do not protect them from external ethylene exposure. STS (Silver thiosulfate) and 1-MCP (1-methylcyclopropene) reduce ethylene production and protect plants from external ethylene by making the plants insensitive to ethylene. STS is effectively used on many cut flowers and some flowering plants, but it can be phytotoxic and is increasingly difficult to dispose of because it contains the heavy metal silver. 1-MCP is marketed as a powder (Ethylbloc, Floralife, Inc), which releases the 1-MCP gas when dissolved in a buffered solution. 1-MCP is very effective at preventing petal abscission and wilting, but when treating inflores-

cences with flowers at various developmental stages, the treated buds will not be protected from ethylene damage once they open. Treating with a gas has created logistical issues for some growers, but treatments in which the 1-MCP gas has been applied to a truckload during shipment have proven effective and convenient.

ETHYLENE: FLORICULTURE'S FRIEND

In addition to its seemingly detrimental effects, the commercial application of ethylene also has many benefits. The practical use of ethylene in floriculture was initially limited because of its gaseous nature. It is much easier to work with a growth regulator in a powder or liquid form that can be used as a spray or a drench. One compound that has made the commercial application of ethylene practical is ethephon (2-chloroethylphosphonic acid). Ethephon is a liquid that is stable at low pH (pH 4 or less). When applied to plants with higher cellular pH (greater than 4), ethephon is cleaved to release ethylene within the plant tissue.

Ethephon application during the production of floriculture crops results in higher quality crops and reduces labor costs. The application of ethylene stimulates lateral branching. Flowering is inhibited and plants are maintained in a vegetative state that allows all the energy from photosynthesis to be used for root development and vegetative growth. Ethephon application is a common part of stock plant management and results in increased cutting yield.



Ethylene also inhibits internode elongation in many plants, and multiple applications can be used to achieve plants of varying heights. Labor costs are reduced because chemical applications have the same effect as pinching by hand. Treatment with ethylene is also commonly used to ripen fruits, like tomatoes, that are picked at an immature stage to extend their life during shipment and storage.

HOW WILL THE BATTLE AGAINST ETHYLENE CHANGE IN THE FUTURE?

In the future, chemical applications to prevent ethylene damage may be unnecessary as we see the introduction of plants made insensitive to ethylene due to genetic engineering. Plants contain receptor molecules that must recognize and bind ethylene gas for the plant to respond with flower senescence or any other normal ethylene-mediated response. If that receptor function is disrupted, the plant can no longer respond to ethylene.

Currently, some floriculture crops, including carnation and petunia, have been genetically engineered to be insensitive to ethylene; and the result is a dramatic increase in the longevity of the flowers. Treating these flowers with ethylene in excess of 100 ppm does not accelerate senescence. The ethylene-insensitive petunia plants, created by Dr. David Clark at the University of

Florida, have provided a valuable tool that has reinforced the role of ethylene in normal plant growth and development. Not only do these plants exhibit delayed flower senescence, but they also have decreased seed germination, delayed flowering and fruit set, and decreased adventitious rooting. Since the entire plant is insensitive to ethylene throughout its life cycle, we have also lost the beneficial effects of using ethephon as a plant growth regulator for height control and stock plant management. These plants have provided invaluable information about ethylene's importance in regulating flower senescence, and the next step in their development will involve targeting ethylene insensitivity to the flower.

The focus of research in my lab is to identify genes that are regulated by ethylene and that function in initiating and regulating the process of senescence in flowers. The goal is to identify the best genetic targets for delaying senescence in flower petals without affecting other aspects of flower development like initiation, seed set, and seed germination. We are also investigating whether these genes have a similar role in the regulation of senescence in ethylene-insensitive flowers. The hope is that genetic engineering approaches will be developed that will increase the bloom life of both ethylene-sensitive and insensitive flowers. **OFA**

SHORT COURSE "TEASER" 2002

Continued from page 1

these scenarios all too familiar based on your own experiences, but some will be new even to the seasoned producer. Our panel of industry experts includes Karl Batschke, Jim Faust, Karl Trellinger, and Shannen Ferry. You will hear "what they would do if it were their crop" in each of these situations. The real fun will be to see if they all agree or not! In fact, as the audience, you can tell us what you think too.

Starting with propagation and continuing on through shipping, we will explore situations growers find themselves in each year and talk about the best management strategies that can be applied to save the crop. From how to prevent or solve crop disorders to how to decide if it is time to use a growth regulator, we will cover the concerns growers are faced with on a month-by-month basis with the crop. This session will be very interactive and entertaining, so do not miss it on Saturday, July 13 starting at 1 p.m.

In addition to the Saturday session, Tuesday morning, July 16, will bring together the talents of Shannen Ferry and Rick Yates. These two technical experts are in contact with growers every year about production problems as they happen. The audience will see images of and hear about crop problems happening around the country each year and learn how to avoid this in your own greenhouse. If we know what can go wrong, it is easier to plan how to avoid these problems than it is to wait and hope you don't experience them first hand.

CONTAINER GARDENS

In the world of container gardening, growers are challenged to create new and exciting mixtures of plants for their customers. Sometimes they work out, but some times they don't. The session held on Wednesday morning, July 17, will focus on how to create and plant mixed containers that are compatible both aesthetically and culturally. The importance of blending these two aspects together cannot be overstated, especially when we consider the consumer who purchases the products and expects performance to equate with the value paid. Remember, no matter what we as growers think, it is ultimately the experience had by our customers that will bring them back time after time to share with us their purchasing power.

Several aspects of what can help or hinder performance of mixed containers include size of container (soil volume), number of plants per container, and optimum performance factors of these plants. Looking at each of these variables, here is a summary of what to keep in mind when designing your combination planters.

The size and type of container used is not a decision to be taken lightly. For growers, the decision should come down to the specific market being serviced, which influences price points and product form. There is no value in creating planters that are either too big or too small for where they will be sold. So, know what sized product can be managed by your customer.

The sized pot or basket affects how many units per square foot of greenhouse space can be grown, which influences space utilization and profitability for growers. If 10-inch hanging baskets are used, it may be possible to use both hanging space and growing space on benches below. However, if 12-inch or larger baskets are used, the amount of hanging space required could limit the number of containers hanging and the products that can be grown below due to the light restriction from the baskets above.

The choice of growing container ultimately impacts the soil volume available to support water needs of the plants. For the

consumer, the size and type of container used influences how effectively they can manage irrigation needs of the planters. Most homeowners do not have drip irrigation systems for hanging baskets and patio pots, making it more critical that, as growers, we factor this into our decisions. We know and understand that it will be more difficult to keep these containers watered properly if the size of the container is too small or if the growing mix dries out too easily. This situation can be improved if the growing mix includes amendments like rock-wool or polymers to help increase water-holding capacity.

Another aspect of product performance centers on the number of plants used, once again relating back to the ability to support irrigation needs at the consumer level. More plants may equate to faster growth (increased number of turns for the grower) and enhanced visual appeal in the retail, but it also equates to greater competition for water and space in the pot. As the number of plants used in a container increases, so does the incidence of *Botrytis* and other fungal problems due to reduced air circulation around those plants. Longevity of the container will not be realized if plants begin to die out as a result of pathogens. Growers may be able to balance the profitability of these containers through a reduced number of plants per pot offset by slightly longer production times. However, the end effect for the consumer will be superior.

The final aspect of mixed container design and selection is to use plants that can tolerate cultural requirements of each species. Consider issues of production temperatures, fertilizer requirements, and garden exposure tolerance as potential combinations are being designed.

Production temperatures are probably the most critical compatibility factor to look at. Putting together plants that are unable to tolerate the extremes of cool or hot temperatures is a recipe for failure and should be avoided. A perfect example of this would be to mix something like *Osteospermum* that requires temperatures in the 50°Fs for flowering with something like New Guinea impatiens that cannot be grown at those temperatures. This is an extreme example, but the point is very clear. Select and mix crops that tolerate common temperatures.

Fertilizer requirements must be taken into account, especially for growers that create combinations using rooted cuttings rather than established, small pots. Again using extreme examples, do not plant a vegetative petunia that requires significant fertilizer inputs with something that does not tolerate high feed rates, like the 'Jelly Bean' *Mimulus*. If using established pots to create combinations, the concern over fertilizer compatibility is reduced, as it is now plant maintenance rather than production.

Garden exposure tolerance involves the ability of the entire container to survive, and hopefully thrive once in the consumer environment. When looked at from the individual species standpoint, some combinations may not make sense. But when looked at in total, the mixture may be fine. As an example, we generally do not think of *Bacopa* as a full-sun plant. However, if it is part of a mixed basket that includes full sun plants that provide some level of shade for the *Bacopa*, this species will tolerate the conditions as long as adequate irrigation is provided. However, it would not be wise to put a shade-loving plant as a key component in the container if it would be receiving the majority of full sun exposure. Use the information provided by suppliers and breeders to help lead you through these aspects of the crops.

Hopefully, growers will be able to join us at the Short Course to learn more about what combinations can be successfully grown and sold that will look good for the consumer all season long! See you there.

OFA

BASIC TRAINING: SURFACTANTS, WETTING AGENTS, OR ADJUVANTS?

Continued from page 5

(lipids are just like grease!). The cell sap leaked and the leaves wilted. He then sprayed the new surfactant solution. The new surfactant changed the properties of the water, reducing the surface tension, and allowed the oils, waxes, cuticle, and guts of the leaf to easily dissolve/suspend into the solu-

tion. Add more heat, initiate the Q-10 effect on the surfactant, and it dissolves the leaf as fast as it was designed to removed grease from a frying pan in hot water. The inevitable end result was "pansy jelly." In a final insult to the situation, it rained that night and the jelly disappeared by morning as if

the flat had never been planted. The grower and his accountant took deep breathing lessons that week.

I'm sharing this horrific account with you because, with the advent of serious insect resistance to pesticides, thrips and virus epidemics, and new improved, waxier drought-tolerant plants, many growers are desperate and easily tempted to use any handy adjuvant, surfactant, or wetting agent they come

across on the shelf to get control on those resistant bugs. However, if you are not aware of what those chemical terms mean, or why you would use one material over another, or recognize that your insecticide already has a surfactant, you are destined to have pansy or some other exotic flavor of jelly sandwich to munch on with your accountant.

Editor's Note – *This article will be continued in the August issue of the OFA Bulletin.* OFA

Creating a Profitable Fall Selling Season



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Imagine anxious shoppers arriving early at your door to buy the best selection. As the store is opened, women and men move forward in mass, steering shopping carts, filtering throughout the aisles, heading to your displays and benches. With store fliers in hand and eyes focused on "the prize," the consumers are racing each other with the frenzy of a shark feed.

Large images of brilliantly colored pansies, cold-tolerant annuals, along with colorful combinations of Fall Magic™ planters fill the end caps and the space above the benches. As gardeners jostle, it is the desire for beauty and not price that causes buyers to make their decisions. The educational information posted on shelf end caps is read and consumers make wise decisions based upon the cultural tear-off sheets, prepared to go the extra steps to ensure success. The display of blooming garden mums is drawing so much attention you wonder if the \$15 price is too low.

Obviously, you all wonder what herb the writer has been indulging in. I wonder where I lost you. Was it the image of excited fall shoppers? Was it the layout of the store dressed in fall colors? Could you see your customers reading information in order to expand their knowledge of gardening in a new season? You could even see the quality product mix, fall colors, product durability, and tough growth habit. I

bet you lost the image when a price was mentioned. You see, we all are willing to imagine a strong trade in the off-season, but the second that we talk dollars and cents, the horticultural mindset of end-of-season sale prices takes over.

Why do we operate our garden centers, greenhouses, and nurseries throughout six months of the year with less than the enthusiasm of spring? The prevalent attitude is that there are two seasons of retail horticultural business: spring and everything else. In the spring we make money; the rest of the year we hope we generate enough money to cover expenses. If gardening is the most popular leisure time activity in the United States and Canada, why do we stop targeting this market after the first of August? Ever wonder if we determine our own destiny? We advertise and price our products with a fall clearance mentality.

Let's focus on fall sales potentials and discuss multiple options to increase sales

as well as profitability. These horticultural options will allow sales to be generated within retail stores that are in transition from summer sales merchandise to full-blown Christmas displays. Tie-ins to the "dry bulb" business and Halloween sales are a natural. Store traffic will be less during the beginning stages of "build a fall business strategy," so space dedicated to fall plant sales should be limited at first, but will slowly be increased year after year as sales build. Fall garden mum business usually occupies a great deal of display space within our businesses but generates minimal profits per square foot. There seems to be a preconceived price ceiling on garden mums that does not allow any substantial margin that would even cover product slippage. This is true for the grower as well as for the retailer. We need to change this misconception and find ways to build profits into every sale.

Rather than allow the customer to focus on price, why not change the general

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CREATING A PROFITABLE FALL SELLING SEASON

Continued from page 9

perception of fall gardening? Fall is a time of new beginnings – kids are back in school, and moms have time to garden again. Focus on the cool temperatures – less stress on both the gardener and the plants. You can actually enjoy working in the yard without kids or temperature to be concerned with. Gardening can actually be accomplished in half the time it takes during the summer simply due to the lack of mosquitoes to swat or kids to chase. Emphasize the climate – bright, cool, breezy, whatever it may be. It is a different type of gardening environment than that of August! Focus on the advantage of growing plants in the garden that don't need to be consistently weeded or watered. The soil is easier to work, looser, more responsive, and not dry and parched from the summer's heat! The lower mean temperature will intensify flower and foliage color and with the decreased light levels, the flowers will last longer. This is the time to truly enjoy gardening.

Fresh new plants incorporated into upbeat displays will always draw the attention of the shopper. Brilliant pansy collections, sold in packs, pots, and bowls, should brighten any store display and make the registers ring. The prices of these plants should not be the same as pansies sold during the spring season! It is a new crop, with new potential, and great staying power. Take advantage of the many pansy promotional programs that already exist. These programs focus on the durability of fall planted pansies, and some even guarantee survivability throughout the winter. Many progressive garden centers

have pansy sales events that have gained a tremendous following over the years and attract eager gardeners to stores. Pansies planted in the autumn will bloom throughout the fall, into winter, and depending upon the severity of the cold months and the amount of snow cover, could actually bloom from September to May.

There are many other annuals, bi-annuals, and perennials that consistently flower in the fall season. As the temperatures drop, these plants really begin to shine. Proven Winners has combined many perennial plants known for their fall foliage with bi-annual pansies and violas as well as temperature-tough *Calibrachoa*s, Sundaze® *Bracteanthas*, and Symphony® *Osteospermums*. The Fall Magic™ concept revolves around the durability of the combination. Fall Magic™ bowls placed on the front porch or stoop give gardening pleasure long into the winter months. Combine fall foliage, the fragrance of lavender, sage, and *Santolina*, with the bright colors of *Diascia* and *Nemesias*, and your customers will purchase and enjoy these fall gardens with minimal care and certainly no preconceived price point.

Garden mums can regain some of their profit margins by being displayed with buds just cracking color, guaranteeing longer lasting beauty. Create artistic displays and fall centerpieces with bushel baskets, bales of straw, fall colored ribbons, grasses, and the like. Differentiate from mass merchant displays by working with growers for custom chrysanthemum varieties, different containers,

and earlier sales windows. Combine garden mums with other perennials to create new garden displays and additional sales opportunities.

Autumn annual programs focus on high performance annuals and bi-annuals that grow best during the fall. *Nierembergia*, snapdragons, *Diascia*, *Nemesia*, strawflowers, flax, ornamental kale and cabbage, English daisies, and asters are just some of the plants that take multiple frosts and continue to bloom. Container shape and size should differentiate these plants from plants sold in the spring. Many times these fall annuals never end up in the landscape, so the containers should be large enough to allow the gardener to be successful for the duration of the crop. The plants and the price should be fresh. Don't attempt to re-cycle spring plants that have not sold. Cut back or shifted up 48-cell plants do not do justice to the gardener. Start with a crop that is specifically planned for this new fall season. These plants, whether pansies, Fall Magic, autumn annuals, or some other combination, should be grown outside, treated as a cash crop, and specifically earmarked for fall sales.

Given the proper display and product mix, fall can be a very exciting time for both the consumer and the retailer. Remember, this is a new market for a wide assortment of plants; educational information is crucial! If the gardener perceives no additional value in the plants or the fall planting concept, the garden mum price ceiling will be transferred to all fall items. Educate your consumers through displays, give them

care sheets, and tell them what to expect from these products. Plant your landscape, your front easement, and your entrances with the new fall products that you are offering. If you maintain your fall landscapes with overgrown begonias and impatiens, why should your customers do anything different?

Build new displays in your retail areas that attract attention. Don't focus on price, but address plant usage and long-term enjoyment. Suggest adding these new frost-tolerant annuals or perennial plantings in conjunction with bulb plantings. The tie-in with dry bulb sales works with pansy and violas as well as Fall Magic. These fall sales items will still be growing in the spring when the tulips and daffodils break ground. Display these new items in your garden center with stable priced items, such as dry bulbs, and Halloween merchandise like pumpkins, corn stalks and scarecrows. Do not attempt to market full-priced items in your nursery perennial area where customers are already expecting your summer closeout sales. We have conditioned our gardening public to expect half-off sales or "Dutch auction sales" in the fall, so if you expect to get full price, don't display fall perennials with the material already half off.

This is a new market; gardeners will shop for new ideas. They may not re-landscape their yard in the fall, but they will redecorate their outdoor living spaces. Through education, plant selection, and a profitable mindset we can create an additional selling season.

OFA



Pest Control Outlook – Challenges and Solutions

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Few of us would argue with the concept that reasonable steps should be taken to protect the public and the environment from exposure to pesticides. However, opinions strongly differ when we attempt to implement this worthy goal without crippling the ability of growers to produce insect- and disease-free crops. When the Food Quality Protection Act of 1996 (FQPA) was passed into law, it marked an abrupt change in our country's approach to legislating pesticide exposure.

FQPA is a complex piece of legislation, so let's just take a look at the most significant changes it has produced for the greenhouse and nursery industry. "Cumulative Risk" is a relatively new term used by EPA to describe the levels of a pesticide that a person can be exposed to "with a reasonable certainty of no harm." In the past, only dietary exposure to a specific pesticide was considered in the assessment of that compound. Today, that information is added to exposures for drinking water, residential and recreational exposure, and together they all must fit in the assigned "risk cup." Furthermore, chemicals that have the same mechanism of toxicity or mode of action must now be considered cumulatively. In the case of organophosphates such as Orthene,

Dursban, and Diazinon, their cumulative risk cup must be considered as one, rather than each being calculated separately. Some carbamates such as Closure and Mesurool will also be considered together. The result is that some risk cups are overflowing. Growers have lost Knox-out, Closure, and Vorlan, while Duraplex and Duraguard became restricted-use pesticides with reentry intervals (REI) going from 12 to 24 hours. As product reviews continue, it is reasonable to assume that other products may be lost or their use patterns altered.

Positive solutions are needed. FQPA provided some much needed help with the development of a mechanism for expediting approval for reduced-risk pesticides, and the IR-4 project for establishing and maintaining registrations for "minor" crops. EPA defines a reduced-risk pesticide as one that "may reasonably be expected to accomplish one or more of the following":

- Reduce pesticide risks to human health
- Reduce pesticide risks to non-target organisms
- Reduce the potential for contamination of valued environmental resources
- Broadens adoption of IPM or makes it more effective

Examples of reduced-risk pesticides include: Compass, Conserve, Distance, Endeavor, Floramite, and Heritage. You may be using one or more of these pesticides in your operation already. (You can

read more about the FQPA on the web, www.epa.gov/opppsp1/fqpa/fqpa-iss.htm)

The loss of pesticide registrations is a cause for concern, as well as a wake-up call to our industry. We must be good stewards of the active ingredients we have, utilizing what we have learned about Integrated Pest Management and practicing sound pesticide rotation strategies. Having said that, there is good reason to be optimistic about the future of pest control in the greenhouse industry.

Those of us who have been in the industry a decade or more would all agree the products we see in our pesticide cabinets today are a lot "friendlier" than when we started our careers. Mycosteroids such as Botanigard and Rootshield/Plantshield have proven track records and are being joined by other beneficial organisms in our operations. Many of the new pesticides are not only safer for humans, they are "soft" on beneficial insects or mites. Imagine miticides that are selective enough to control harmful mites while leaving predaceous mites alone. Together with selective insecticides such as Endeavor (controls only aphids and whiteflies), the prospects for combining certain pesticides with beneficial insects, mites, and nematodes are improving.

Although space will not allow for a complete review, following are some of the effective new products:

Conserve – Outstanding thrips control that is safe on most open blooms with a 4-hour REI.

Decree – Great *Botrytis* control, low residue, excellent bloom safety with a 4-hour REI. Appears to be controlling some powdery mildew.

Distance – Long residual insect growth regulator especially effective on fungus gnat larvae, scale, and whiteflies. Also showing activity against mealybug. 12-hour REI.

Endeavor – Excellent aphid and good whitefly control, good bloom safety. 12-hour REI.

Marathon II – Sprayable form of Marathon 1%G. Outstanding aphid control with two- to four-week residual, excellent bloom safety, vegetable transplant label. 12-hour REI.

Miticides (Akari, Floramite, Pylon) – Expect two to three weeks of reliable mite control from all three. Labels require strict product rotations; you may need all three of these!

Ovation – Miticide that works primarily on the egg stage for up to 45 days. Best used in combination with an adulticide. 12-hour REI.

Potassium bicarbonate fungicides (Armcarb, Firststep, Kaligreen, Milstop) – Fast knockdown of powdery mildew, some have edible crops on the label.

Strobiluron fungicides (Compass, Cygnus, Heritage) – Broad spectrum, longer residual fungicides with good plant safety.

Feeling any better about your pest control options? Please read and follow all the label directions. The label is the law. **OFA**

ENRICHING THE EDUCATION OF FLORICULTURE STUDENTS

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Note: The author would like to acknowledge the enthusiasm and professionalism of The Ohio State University floriculture faculty involved in the following project. Peg McMahon and Bob McMahon both embraced the concept of bringing industry experience into their classrooms to enrich their students' learning experiences, even though both have full course schedules with little free lecture time.

Not long ago the vast majority of information serving U.S. floriculture came from our land grant institutions. Research, teaching, and Extension activities provided growers with the latest information on crop culture and the greenhouse environment. Today, while our academic units are still as busy as ever, private interests have also become a vital source of information on which growers depend. As a result of the significant amount of floriculture expertise operating outside traditional academic environments, the opportunity to begin integrating our public and private worlds of information in order to better train our students for tomorrow's challenges has arrived.

GIVING SOMETHING BACK

A program was recently created at The Ohio State University (OSU) that provides individuals from outside the university opportunities to participate in campus activities. The Stakeholder in Residence program is a competitive grant program designed to help industry experts bring their knowledge to the classroom. Many institutions have or are instituting similar programs allowing them to interface with their communities more effectively. With only a moment's notice, I can generate a lengthy list of well-known and not-so-well-known floriculture experts who would line up and take time from their busy schedules in order to give something back to the profession that has shaped their lives.

A Stakeholder in Residence grant was awarded under Ohio State's program for 2002-03, which allows me to interact with the floriculture faculty within the Department of Horticulture and Crop Sciences and floriculture support faculty in the departments of Agricultural Engineering, Plant Pathology, and Entomology. Through the fall and winter quarters I spent close to one week of each month in Ohio. My Stakeholder appointment involves interaction at the three levels of activity in the floriculture program: teaching, research, and Extension. Today's report will focus only on the undergraduate teaching portion of the Stakeholder grant.

PARTNERING WITH PROFESSORS

The only way this concept can succeed is if the professors teaching the undergraduate floriculture courses embrace the possibilities that the interaction offers. It takes confident individuals to bring in guest lecturers to lecture on topics they, the professors, have been teaching for years on their own. It's not at all a statement of whether the professor can teach the subject matter, but instead an opportunity to enrich the students' learning experience by exposing them to experts from outside academia. Taken to a limit, it is conceivable that a floriculture professor of the future will evolve into an enabler or facilitator who works to coordinate industry experts as well as colleagues at other institutions in teaching some of the course material through a series of guest lectures.

Electronic communication in the form of remote teaching through satellite links will undoubtedly play a key role in the future. A dream of mine is to lecture to students seated in their classrooms anywhere in the country right from my greenhouse. What a valuable experience it will be to have the plants and greenhouse at my fingertips as a living textbook or laboratory.

One of the objectives of the Stakeholder grant is to participate in the undergraduate teaching program through a series of guest lectures to the four-year floriculture students housed at the main campus in Columbus and to the two-year students housed at the Wooster campus of Ohio State's Agricultural Technical Institute. My partner in Columbus is Dr. Peg McMahon and in Wooster is Dr. Robert McMahon (no relation).

INTERACTING WITH STUDENTS

Back in the fall, Peg asked me to speak to her Senior Capstone class about my commercial greenhouse (Konjoian's Greenhouses), research and consulting business (Konjoian's Floriculture Education Services), and work with the Ohio Florists' Association. This course helps cap off the students' formal education by exposing them to career-oriented objectives rather than the science of growing crops. Peg works with them on career items such as resume development, job interviews, speaking in front of the class, etc., and asked me to speak about career opportunities in floriculture through my industry and academic experiences.

During the winter quarter Peg asked me to lecture on commercial floriculture production to her greenhouse crop production students. I covered crop scheduling, retailing, and an overview of my Florel research. She also asked me to work with her on a new aspect of the course called the Grower Challenge Activity.

Peg's vision is to work closely with central Ohio growers to provide students with real life commercial greenhouse challenges. At the beginning of the course, the students were given the topic of irrigation technology and were divided into working groups of three. Her challenge to the students was to work with an area grower to improve his or her irrigation systems. The goal was to have the students perform an irrigation audit of their client's greenhouse range, determine through communication with the grower and staff what the present limitations are and what systems may be in their plans for the future, and then make a recommendation for the next logical step the grower could take on the irrigation technology ladder.

It was important for the students to immerse themselves in their client's business in order to grasp the reality that the most sophisticated technology, such as computerized ebb and flood benches, may not be a logical step for everyone to take. For some growers, just adding drip irrigation, one house at a time, may be the most logical step.

GROWER PARTICIPATION

Aside from being a sounding board for Peg to bounce her idea off of, she assigned me the task of finding the growers who would agree to work with our students. We wanted to find a handful of growers who would make the commitment to spend time during their busy winter months of February and March to talk to the students, show them their operations and irrigation systems, and be available to take a few telephone calls as the students worked on their project back on campus.

Starting with central Ohio OFA members, it didn't take long to line up a few area growers who expressed a genuine interest in helping the students. They were in complete agreement that a project like this would add a dose of realism to the students' education by having them address a challenging commercial greenhouse problem.

We tried to identify a diverse group of growers for the student teams to work with. Enlisting small, medium, and large operators to participate shows students that the industry is made up of different size businesses that often have differing perspectives. Working with wholesale, retail, and combination growers was also a goal. Lastly, finding growers with different levels of irrigation technology was necessary.

Although this year's topic was irrigation technology, different topics will be assigned as the challenge in the future. This will allow us to call upon different grower Stakeholders and not burden the same few every year. Other challenge topics may include greenhouse structures, environment control, specific crop production, nutrition, and pH management – anything that we growers are finding particularly challenging. As the project evolves, the growers will help identify topics and make suggestions. That, in fact, is another goal of the project – to get the growers to help develop the curriculum by contributing their expertise.

THE FINAL PACKAGE

During the final week of classes, the student groups were asked to present reports to the rest of the class. We planned to have the grower-clients in class as well to hear the reports and participate in the final discussion, but weren't able to make this happen due to time constraints forced by an early Easter. A mixed session bringing all the students and growers together would be valuable for everyone. A final session such as this could easily be incorporated into a presentation during the Short Course once we get it running smoothly. For this, the students would have to document their experiences with pictures, work closely with some of the same manufacturers who exhibit in the Trade Show, and write this *Bulletin* article instead of me.

Peg and I were encouraged by what we saw after our first Grower Challenge Project. Planning the Grower Challenge for winter quarter 2003 is underway. After hearing about the project, a Cleveland grower asked if he could be involved in the future. Although the distance from Columbus may be difficult, we've noted that OSU's two-year program in Wooster is within striking distance of Cleveland. We've also learned that industry stakeholders are everywhere, industrywide and nationwide, just waiting to be given the opportunity to give something back to our students.

ATI STUDENTS ROCK

Bob McMahon asked me to lecture to his students during

their fall course on Greenhouse Environment Control and during the winter in the Bedding Plant Production class. I presented an overview of my greenhouse business to one group and then focused on growth regulation and crop scheduling to the other. A two-day irrigation technology workshop was held at OSU's research station next door, which we registered the entire class for in February. Dr. Peter Ling from the Department of Food, Agricultural, and Biological Engineering coordinated the workshop, which drew national attendance and exposed the students to nationally-known speakers – an experience we were pleased to give them.

Bob assigns his ATI students a quarter-long laboratory exercise on the topic of nutrient deficiency symptoms. Student groups were responsible for mixing and applying various fertilizer solutions, each lacking a different essential element. A range of plants was used so the students would see deficiency symptoms as they develop on different species. The day I lectured on growth regulation, Bob had the students take me out to the greenhouse and explain their project. They were as proud of the plants they grew as I have been of any commercial crop I've grown.

IT TAKES MORE THAN BOOKS

We hear over and over from growers that good employees are hard to find. Some complain that today's students are coming out of college lacking some of the skills needed to step directly into key positions in the greenhouse. I can tell you that these students don't have much freedom in terms of elective credits to acquire all the skills we may be looking for. Today's associate's and bachelor's programs aim to provide the student with a solid foundation to learn from. None of us would understand plant nutrition without preliminary coursework in chemistry, math, and soils.

Where I believe industry can make a difference is in playing a Stakeholder role for the students and volunteering time and expertise by being more actively involved in their university programs. Grower associations are key links between the academic and commercial worlds, as are Extension agents.

It takes more than textbook information to train a successful floriculturist. In comments to students, I routinely suggest that the basic difference between botany and horticulture is that botanists study plants while horticulturists study how to make money with plants. There's a commercial aspect that separates the two disciplines, and I don't believe it's possible to teach horticulture students effectively without a connection to the commercial world.

This may sound boring, but my days as an undergraduate student at the University of New Hampshire found me hitchhiking home all but three weekends over my four years to work in the family greenhouse (I hardly qualified as a party animal). However, while in the greenhouse I'd explain to my parents what professors had taught me that week in class. Upon returning to campus, I'd question my professors about what I had done over the weekend. What a realistic education I received stepping in and out of both worlds. The combination of textbooks and greenhouse was invaluable, as one made the other easier to grasp.

My Stakeholder appointment has been a wonderful experience. So positive, in fact, that I am working with my Ohio State colleagues and OFA to find a way to continue the relationship. If this experience is viewed as a model of how academia and industry can work together to enrich our students' educations, then I invite others among us to get involved and give something back to the profession that has changed our lives.

OFA

Plastic's Role in Protecting Tomorrow's Global Environment

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America's families like plastics almost as much as they like cut flowers and fresh fruits and vegetables. They like safe, unbreakable bottles for their household liquids and beverages. They like plastic food wrap that protects the safety and freshness of their food, yet still lets them see what they are buying.

They may even know that plastic helps cut the volume of U.S. packaging in half – a big reason why the volume of waste going into our landfills dropped 17 percent between 1990 and 1996.

But they probably don't know that plastic helps, along with other agricultural technologies, in protecting wildlands. I've written a book called *Saving the Planet With Pesticides and Plastic: The Environmental Triumph of High-Yield Farming* that makes an additional point: Growing more food per acre saves more land for nature, and plastic helps us grow more food per acre.

Since 1950, the world has tripled the crop yields on its good farmland. Without those yield gains, we'd have had to clear another 12 million square miles of wildlands to get today's food supply. (That's equal to 3,400 Yellowstone National Parks.)

In America, we have as much forestland as we did a century ago, and far more

wildlife preserve area. Without higher yields per acre, we'd have cleared most of the forests and wildlands east of the Mississippi to grow today's food supply.

But today's harvest will not be enough for tomorrow. The global population surge is nearly over. Third World countries have brought their births per woman down from 6.2 in 1960 to 2.7 today, and stability is 2.1. But the number of humans is still likely to rise 50 percent (to 9 billion) before it stabilizes around the year 2040.

Equally important, instead of one billion First World people eating meat and ice cream, buying fresh produce and cut flowers, and opening canned food for their cats, we'll have eight billion people, all over the world, affluent enough to do those things.

The demand for farm products may triple by 2050.

At the same time, forest product demand will soar, as billions more people learn to read, build houses, and buy furniture. The only way to meet these demands without destroying the planet's wildlands and wild species is with higher yields from our current farms and a modest amount of managed forest.

Plastics are part of that high-yield solution. They're contributing to higher crop yields all over the planet. In America, they're giving us durable, lower-cost greenhouses for intensive production of horticultural crops. Dairy farmers use plastic film to wrap today's huge, round haybales, protecting the winter food supply for

the cows. China is using millions of yards of plastic sheeting per year to extend the growing seasons on the vital North China Plain – warming the soils earlier in the spring, protecting seedlings in the cold spring nights, and then helping protect the harvested crops in storage.

Farmers use 70 percent of the water consumed by humanity at an unfortunate efficiency of only about 30 percent. Plastics are helping to raise that efficiency toward a potential 90 percent. Plastic tubes on center-pivot irrigation systems eliminate most of the evaporation that sprinkler heads used to suffer. PVC pipes and clear plastic tubes take water directly to crop roots, and then recover water that has passed through the root zone for future irrigation.

What farmer would want to handle dangerous pesticides in glass containers? The breakage would be costly, the environmental contamination dreadful, and the cleanup dangerous. But there's no breakage with the plastic containers – which are gathered up either for reuse or recycled into products such as fence posts. (The pesticides themselves protect the yields made possible by the better seeds, fertilizer, irrigation, and conservation tillage; that, too, saves millions of acres of wildlands.)

As most readers can remember, just a few years ago plastic was the hated target of every group that wanted to vilify American culture. Then the plastics industry did something agriculture has failed to do: it reminded

urban America about the benefits of plastic in their lives. Some of the plastics industry's TV commercials are classics, like the heart attack victim who's wheeled into the emergency room – and into a plastic oxygen tent. Or the little girl who drops a bottle to the tile floor and it bounces instead of shattering.

Agriculture has perversely continued to believe that farmers automatically deserve white hats from society – not realizing that farmers were only admired so long as they farmed badly and food was scarce. Now that food is abundant, farmers must explain what they do and why they do it to an urban public that cares intensely about land and water use.

I'd love to see a series of magazine ads that shows cute kids from various cultures, along with their pets and baby wild animals. The cut line would read, "Let's be sure we can feed them all in the 21st century."

Instead of bans on plastics and pesticides, the environmental movement might better worry about how they would double the world's farm and forest harvests without high-yield farming and forestry. To farm organically, the world would have to add another 8 billion cows to our current cattle population of 1.2 billion, simply for their manure as organic N-fertilizer. (Organic says we can't use the 80-million tons per year of natural nitrogen we currently take from the air.)

The United States would need one billion more cattle,

and we only have 2.1 billion acres in the whole lower 48 states. There'd be room for cities, but no room for wild forests, food production, national parks, and certainly no acreage for flowers.

What about the supposedly huge disposal problem with plastics? More than 50 percent of our landfill space is taken up by paper (13 percent of it by newspapers). Paper doesn't degrade in landfills, any more than the plastics that take up 11 percent of landfill space. But no one suggests we give up reading.

In fact, today's landfills are realistically managed to become new sites for parks and tennis courts, with the contents stable under the cover of new topsoil. The environment is protected from any toxic leakage – by huge plastic liners under the landfill. At today's rate of landfilling, U.S. wastes for the next 1,000 years could be accommodated in a landfill 120 feet deep and 44 miles square, or 0.000001 percent of U.S. land area.

Speaking of communicating with the public, two



Nobel Peace Prize winners and a Greenpeace co-founder have signed our Center's new "Declaration in Support of Saving Wildlands with High-Yield Farming and Forestry." To join with them, go to www.HighYieldConservation.org. For a bumper sticker that says, "Growing More Food Per Acre Leaves More Land for Nature," send \$3 to the

Center for Global Food Issues, P.O. Box 202, Churchville, VA, 24421.

Note: Dennis T. Avery is director of the Center for Global Food Issues, a project of the Hudson Institute. He was formerly the senior agricultural analyst at the U.S. Department of State.

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HOW TO DEVELOP A MYSTERY SHOPPING PROGRAM

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Mystery shopping has become one of the manager's most effective tools in evaluating the customer experience within a retail business. The process involves a "secret shopper" visiting your business and recording the experience on a pre-determined report. The tool can also be used to coach and develop the team, as well as reward staff for high performance. And, on a more strategic level, it is an excellent tool to identify the customer service strengths and weaknesses of your business.

1. MAKE A COMMITMENT TO THE PROGRAM

Mystery shopping is a program of events that measures the journey of customer service improvement in your business. Introduce the initiative if:

- you seriously want to improve the customer's experience in your business,
- you wish to motivate your staff,
- you wish to introduce the mystery shopping program on an ongoing basis,
- you commit to taking time to constantly review and improve the program.

2. DEVELOP THE SERVICE PROCESSES

Before you can develop the mystery shopping program, you must break down the service processes in your businesses. For many customers, the service experience begins as they

enter the parking lot to your store. You therefore need to ask yourself, "What would I want the customer to experience with in the parking lot?" Your answers will be, is the parking lot clean? Was it easy to park? Was it easy to find the store entrance? Then take this process through your whole business and develop sub-sections under each area. For example, what is the process for a customer requiring help on the shop floor? At the checkout? Or for a customer that has a complaint?

3. COMPILE THE REPORT FORM

Having analyzed the service processes, you can now develop your report form. Take the processes you wish to measure and list the questions relating to each process. You will then have developed the mystery shopping report form. The form could have a few basic questions or a number of more detailed questions. Remember that someone has to carry out the mystery shop, and too many questions can make the exercise a little daunting. Leave a space at the end of each section to allow the shopper to make comments to support his or her observations.

4. INTRODUCE A SCORING SYSTEM

When the report form is developed, devise a scoring system which allows you to identify the customer service strengths and weaknesses. For each correct answer, give one point. Thus, if you have six questions relating to the checkout experience give each question one point. To score 100 percent the shopper will mark six out of six.

5. FIND A MYSTERY SHOPPER

Now that you have your measurement tool, you need to find someone who can carry out the mystery shop. Since this person may also need to make some comments to back up their observations, they need to have the ability to clearly describe the experience in writing. Written observations allow

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HOW TO DEVELOP A MYSTERY SHOPPING PROGRAM

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the shopper to “paint a picture” of the experience. This will help you to use the report as a coaching tool with your team.

6. INFORM YOUR TEAM

It is important that you tell your team of your intentions. You have two options in this regard:

- You can tell the team in advance – in which case the customer service standard immediately lifts as staff begin to treat every shopper like a mystery shopper.

- You can wait until some visits have been carried out. The benefit of this approach is that you receive a true initial measurement.

7. INTRODUCE INCENTIVES

Incentives are very important. If a staff member or the team reach a certain score, reward them for their effort.

Some ideas are:

- Cinema tickets
- Meal vouchers
- Publicity within the store
- Certificates

If the whole team achieves the goal, then take them all out for dinner or a fun activity. It is important to ensure that all the team becomes involved in this activity.

8. DEVELOP A COACHING TOOL

Use your report as a coaching tool. Sit down with each staff member involved in the report and taking them through the shopper’s feedback. At the same meeting, set some goals

for the next visit. If you have an issue or wish to develop a particular staff member, ask the shopper to try and have a service interaction with this individual.

9. ESTABLISH AN ONGOING PROGRAM

Make mystery shopping an ongoing part of your business strategy. Depending on the size of your business, you may only have one mystery shop a month. With a larger team, you may ask for a weekly visit.

10. CONTINUALLY IMPROVE THE PROGRAM

It is important to review the questions and the program every three months. As your team improves their customer service skills, then the measurement needs to become more demanding. This ensures that the customer service is constantly being developed and your staff is forever being challenged.

MANAGEMENT MEMO

Mystery shopping keeps staff constantly challenged and gives the business manager the peace of mind that constant, unequivocal feedback is being received. It is one of the most clever retail tools that all business managers should use.

John Stanley is a conference speaker and retail consultant with more than 20 years experience in 15 countries. He regularly contributes to retail magazines around the world and has co-authored several successful marketing and retail books. John works with retailers’ marketing plans to suit their local culture and environment.

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