PURDUE UNIVERSITY

PURDUE EXTENSION

The Indiana Flower Grower

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Roberto's Message

IFGA Updates

Dr. Roberto G. Lopez,

Assist. Professor and Floriculture Extension Specialist

Dear flower growers, businesses, distributors, organizations and colleagues,

The IFGA board recently met in West Lafayette to discuss the future of the organization. We are excited to announce that beginning in 2011, the 29th Annual IFGA Conference will be held in mid-February and rotate to a different host greenhouse each year. Mark your calendars, as the conference will be held in the Indianapolis area on February 16, 2011.

For 2010, the annual conference and golf outing will remain in West Lafayette. The educational sessions will be on Wednesday, October 6th from 1 to 5 PM at the University Plaza Hotel. We have made a few changes that we hope you will enjoy. From 5 to 10 PM we will have an informal social and awards presentation at the University Plaza Hotel atrium instead of the banquet. For the golfers in the group, we will have the golf tournament at 9 AM on Thursday, October 7th at the Elks Country Club.

Due to the low turnout in 2009 and 2010, the IFGA will no longer be part of the Indiana Green Expo (IGE). However, IFGA members are encouraged to attend the Indiana Horticulture Congress on January 18 to 20, 2011 (more details to follow).

The board would also like to congratulate the recipients of the 2009 IFGA Allen Hammer Scholarship which was awarded to two Purdue Horticulture students. Alicia Aldridge, an undergraduate junior majoring in landscape horticulture and design and Ariana Torres, a graduate M.S. student in floriculture production each received a $750 scholarship and a plaque. In addition, IFGA partially funded a Purdue floriculture research project titled, "Effects of Daily Light Integral during Propagation on Rooting and Flowering of Herbaceous Floriculture Crops."

IFGA President, Steve Dewald of Dewald Gardens and I both presented the IFGA Floriculture Person of the Year Award to Tim Galema of Galema's Greenhouses in West Lafayette for his many years of dedication to the floriculture industry in Indiana.

Purdue Research Update - Bark, but Not Rice Hulls, Affect PGR Drenches

By Christopher J. Currey[1], Diane M. Camberato[2], Ariana P. Torres[1] and Dr. Roberto G. Lopez[3]

Graduate Student[1], Research Technician[2], Assist. Professor and Floriculture Extension Specialist[3]

Plant growth retardants (PGRs) are commonly applied in our industry to produce compact and marketable plants. Though there are a variety of application methods, PGRs are usually applied using sprays or drenches. Drenches involve applying a relatively large volume of a PGR solution at a low concentration directly to the growing medium. Compared to sprays, benefits associated with media drenching include more uniform results and increased, long-lasting efficacy from a single application. PGRs with active ingredients including paclobutrazol (Piccolo, Bonzi, Downsize or Paczol), uniconazole (Concise or Sumagic), ancymidol (Abide or A-Rest), flurprimidol (Topflor) and chloromequat chloride (Citadel, Cycocel or Chlormequat E-Pro) can be applied as drenches. In addition to media moisture content and volume of the drench, media components can interact with the active ingredients to reduce drench efficacy.

Growing media used in greenhouse production are commonly soilless mixes comprised of various proportions of organic components such as peat and bark, and inorganic components such as vermiculite and perlite. The question is – which media components affect the efficacy PGR drenches? Research has shown that when bark, either fresh or composted, is included as a media component, it can reduce the efficacy of PGR drenches. Other components including peat, coir, perlite, and vermiculite have been shown to have little or no effect on the efficacy of PGR drenches.

A growing trend among growers is to identify more sustainable practices and products to incorporate into the greenhouse production of ornamentals. As part of this movement, there is a desire to identify alternative media components to replace limited organic components or inorganic components with energy-intensive manufacturing.

Parboiled rice hulls are an attractive media component for growers wishing to incorporate a sustainable product into their crop production. An agricultural by-product, rice hulls can provide aeration, are safe for employees to handle and work with, and are well-suited for composting or incorporation into the garden bed by the consumer.

To our knowledge, no published research currently exists on the effects of parboiled rice hulls on PGR drench efficacy. Our objectives in this study were to identify the interaction between different media components and PGR drenches for the northern U.S. to control height or stem length of containerized bedding plants.

We planted 'Callie Deep Yellow' calibrachoa and 'Delta Orange Blotch' pansies in 4.5-inch round pots filled with three different soilless media: peat and perlite ("PP"; Fafard 1P Mix; Conrad Fafard, Inc, Agawam, MA), peat and parboiled rice hulls ("PRH"; Fafard Custom RHM), or peat and bark ("PB"; Fafard 3B Mix). Eleven days later, calibrachoa and pansy were treated with 2.5 oz. drenches per pot of clear water or PGR solutions containing Bonzi (paclobutrazol; Syngenta Crop Protection, Greensboro, NC) at 2 and 4 ppm (calibrachoa) and 0.5 and 1 (pansy) or Concise (uniconazole; Fine Americas, Walnut Creek, CA) at 1 and 2 ppm (calibrachoa) and 0.5 and 1 ppm (pansy). Plant height (pansy) or length of the longest stem (calibrachoa) was measured weekly and final measurements were made 6 weeks after treatment.

There were no differences among pansies when treated with 0.5 ppm Concise across media. As Concise concentration increased to 1.0 ppm, height of pansies grown in PP and PRH media were similar, while plants grown in PB were taller. Similarly, when 0.5 or 1.0 ppm Bonzi drenches were applied plants grown in PP and PRH media had similar heights, while plants treated and grown in PB media were 4 to 6 in. and 2.5 to 3 in. taller, respectively (Figure 1, page 3).

Results with calibrachoa followed a similar trend. Stem length was 1 to 1.5 inches longer for plants grown in PB media compared to plants grown in PP and PRH media when 1.0 ppm Concise was applied. As Concise concentration increased to 2.0 ppm, stem length was similar regardless of media. For both 2.0 and 4.0 ppm Bonzi drenches, there were no differences between calibrachoa grown in PP and PRH media, while plants grown in PB media had longer stems (Figure 2, page 3).

So what does this mean for growers? As expected, the media containing bark reduced the efficacy of Bonzi and Concise drenches. Alternatively, the media containing rice hulls did not reduce PGR efficacy compared to standard greenhouse media. Therefore, if you use media that contains bark you will want to increase the concentration of PGR solutions. If you are using a media containing rice hulls, and not bark, you can adopt the drench strategies you currently use for crops grown in peat and perlite media. We always encourage growers to do on-site trials.

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Roberto Lopez at: rglopez@purdue.edu

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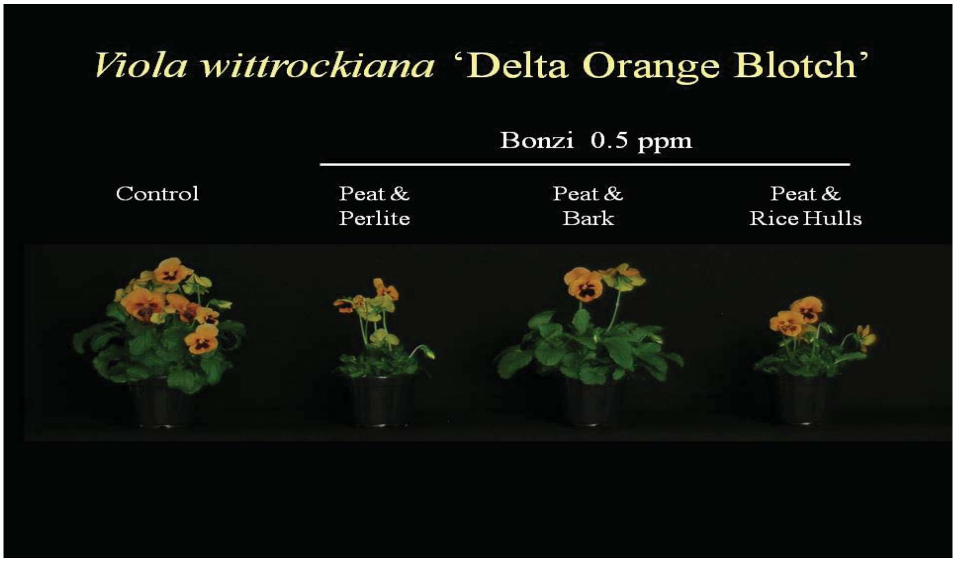

Fig. 1. Pansy 'Delta Orange Blotch' untreated and grown in a peat and perlite media (control) or grown in peat and perlite, peat and bark or peat and rice hull media and treated with a 2.5 fl. oz. drench of 0.5 ppm Bonzi solution.

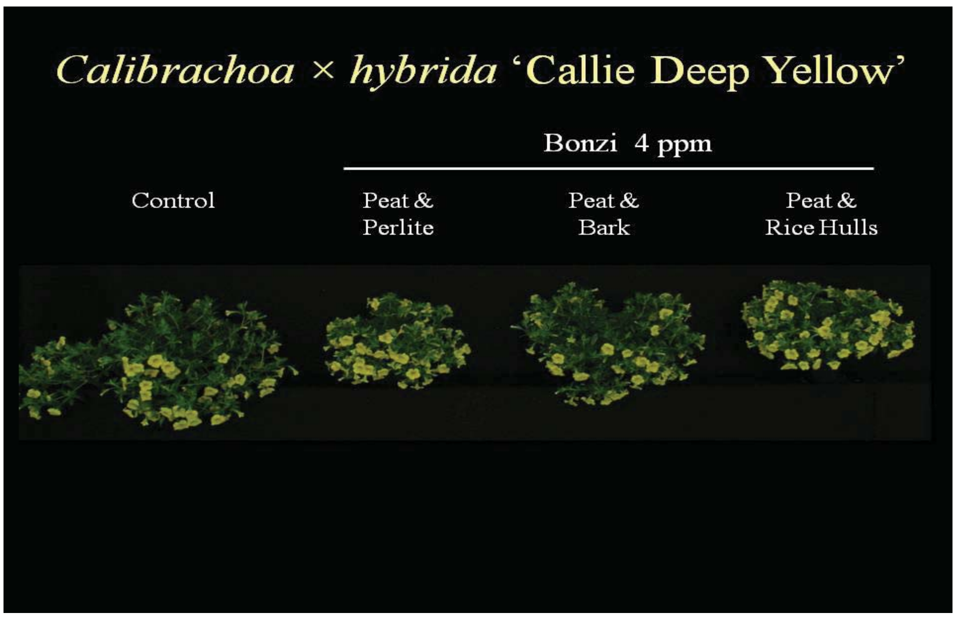

Fig. 2. Calibrachoa Callie Deep Yellow untreated and grown in a peat and perlite media (control) or grown in peat and perlite, peat, bark, perlite and vermiculite or peat and rice hull media and treated with a 2.5 fl. oz. drench of 4.0 ppm Bonzi solution.

We thank C. Rakers & Sons for plant material, Conrad Fafard Inc. for growing media, Syngenta Crop Protection and Fine Americas for plant growth retardants and funding, Scotts Co. for fertilizer, and ITML for pots.

Scheduling Bedding Plants

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Properly scheduling your bedding plant crops can have a 5-fold impact on your business; it reduces shrink, fuel consumption, plant growth regulator (PGR) usage, labor, and increases plant quality. Shrink, the plants that do not sell for one reason or another, can be reduced by ensuring that plants are at their peak quality at the times when customers demand them. On occasion, growers do not take the time to plan out their schedules, but instead error on starting the crop early, not wanting to miss the market. This not only can adversely affect plant quality by producing overgrown past-prime plants, but increases heating costs. Starting plants earlier than needed translates into heating during the coldest months of the year. These same overgrown plants will require an additional spacing, PGRs or cutting back, and/or repotting into larger pots, all of which creates a demand on labor. Finally, good quality plants practically sell themselves. When a grower plans correctly, a new batch of plants will be at peak quality each week to present to his or her customers (Figure 1, page 4).

Start with gathering a calendar (one with week numbers works best), a pen, some paper, and the culture information for the crops you are planning to grow in the spring or fall. The first step in scheduling a crop is to begin at the end; decide when you want your crop to be saleable and work backward from that date. Will the crop need to be pinched or require a PGR? These can delay flowering, so determine the number of weeks required from a pinch to your desired flower date. For example, you want crop "A" to be ready for Mother's Day, or week 19, and you know that it takes 3 weeks from pinch to flower. Subtract 3 from 19 and you know you need to pinch on week 16. How many weeks will it take from transplanting to the time you want to pinch? Again, for crop "A", you know it takes 2 weeks, so subtract 2 weeks from the pinch date to give you week 14 for your transplant date. If you are purchasing rooted liners or plugs your job is done. If you are going to sow your own seeds or root your own liners you need to take one more step. Determine how many weeks it will take from sticking a cutting or sowing a seed to obtain a plant ready for transplant and subtract that from the date you plan to transplant.

Since growers want to sell product with color but not past their prime, another strategy to use in scheduling bedding plants is to control flower induction. Many bedding plants have a photoperiodic flowering response, meaning flowering is promoted by long (LD) or short days (SD). For example, many petunias flower in response to LD, while marigolds and cosmos flower in response to SD. However, some plants, like zonal geraniums, are day-neutral and flower regardless of the daylength. When you are scheduling your crops, take the time to identify if the crop you are scheduling has a photoperiod response so you can increase the accuracy of your production schedule.

If you want to sell your plants with color on them, knowing how to induce flowering will help you get your crop ready for your target sales date. If you are growing plants under a non-inductive photoperiod, you will increase production time just waiting for them to flower! Let's say you want Crop "B" in flower for Memorial Day weekend sales, week 22. It is a SD plant that flowers about five weeks after the start of SD. To get plants flowering by the target sales date, you'd want to start SD during week 17.

Alternatively, if you are trying to bulk plant up to fill in a container, you don't want to grow them under photoperiods that result in flowering right after planting! Take a seed-propagated petunia crop in 4-inch pots. Certain cultivars flower in response to LD, so you'll want to keep plants under SD for a few weeks after transplanting to promote vegetative growth and not flowering. After plants have reached a certain size, they can be placed under LD conditions to promote flowering for sales.

Scheduling plants is easy but can take some time. However, taking time during the slow winter months to schedule your plants will allow you to take advantage of reduced shrink, fuel consumption, and labor as well as increased plant quality and customer satisfaction.

Fig. 1. An example of a geranium crop well scheduled; three different plantings to fulfill customer demand throughout the season.

Cornell Research Update - Ethylene in the Greenhouse: Symptoms of Short and Long Term Exposure

By Dr. Roland Leatherwood[1] and Dr. Neil S. Mattson[2]

Postdoctoral Research Associate[1] and Assist. Professor and Floriculture Extension Specialist[2]

Ethylene, a small colorless, odorless gas composed of two carbon and four hydrogen atoms (C_2H_4), is responsible for both beneficial and undesirable effects in greenhouse crops. It can prevent flowering, shorten internode length, increase branching, initiate fruit ripening, trigger leaf and flower senescence and abscission, cause leaf chlorosis (yellowing), and improve adventitious rooting. Some crops are relatively insensitive to ethylene while others are very sensitive. For example, Poinsettia shows little change after a 24 hour 1 ppm ethylene exposure, yet *Cuphea hyssopifolia* abscises flowers after a 24 hour 0.01 ppm exposure. There are many potential sources of unwanted ethylene such as ripening fruit, decomposing organic matter, and exhaust from furnaces and vehicles. Because several factors can simultaneously impact a plant's response to ethylene, it is easy to see why assessing a potential ethylene problem can be tricky. Some symptoms of exposure can be transient, while others show up long after the ethylene exposure has occurred, still other responses show up only after long-term exposure. To help you eliminate ethylene related crop delays and losses from your operation, this article details what short term and chronic low concentration ethylene exposure looks like, how to detect ethylene,

Fig. 1. Effects of 8 hour (short term) 1 ppm (acute) ethylene exposure. Leaf and flower abscission on portulaca (A) and cuphea (B), respectively. Leaf epinasty of tomato (C) and snapdragon (D), exposed plant is on the left.

track down the source, and fix the problem.

What do Symptoms Look Like?

A plant's response to ethylene can vary with temperature, ethylene concentration and duration of exposure. Plant responses to acute or high concentration (> 0.1 ppm), exposures are well described and studied. Many growers can readily identify these symptoms. Brief exposures may occur due to events such as shipping plants in a tightly sealed container or one-time exposure to vehicle exhaust while plants are in a loading zone. Short duration exposures at high concentrations result in flower and leaf abscission, chlorosis, and downward bent leaves that look wilted, but are turgid (epinasty) (Figure 1). Longer-term exposure to high concentrations of ethylene can result in stunted growth, deformed or chlorotic leaves, delayed flowering and plant death (senescence).

However, it can be more difficult to recognize plant responses to low concentration (< 0.05 ppm) exposures. Low concentration exposure to ethylene over extended periods of time (referred to as chronic ethylene exposure) can occur during greenhouse production such as when a furnace is malfunctioning and generates ethylene inside the greenhouse. Leaf senescence can occur in geranium due to chronic ethylene exposure from a faulty furnace (Figure 2). To develop a visual diagnostic guide of chronic low concentration ethylene exposure, an experiment was conducted at Cornell University. Thirty species of bedding and potted plants were grown in separate greenhouses and were exposed to ethylene concentrations of 0.00, 0.01 and 0.05 ppm ethylene every night for the last 6 weeks of production. Some results of these experiments are presented below.

For many plant species responses to low concentration ethylene exposures are subtle and can be easily missed. For example, petunias exposed to 0.01 ppm ethylene for 24 hours, exhibit early senescence of pollen shedding flowers (Figure 3), while verbena (Figure 4) and fuchsia show slight leaf epinasty. Zonal geraniums exhibit stipule yellowing after 48 hours when exposed to 0.01 ppm ethylene for 24 hours (Figure 5), yet the flowers do not shatter as is seen at higher concentrations.

Of course, as a grower you're not tracking the fate of individual flowers or leaves. But the effect in the greenhouse would be, for example, a noticeable and sudden loss of petunia flowers in one part of the greenhouse; typically the closer to a furnace the more frequently the symptom is observed. Longer term exposures at these concentrations result in less flowering for begonia, impatiens and lobelia (Figure 6), and petunia internode elongation and flower size is reduced (Figure 2). The figures below illustrate plant responses to low concentrations of ethylene. Complete results are summarized in Table 1.

Fig. 2. Leaf senescence in geranium due to chronic ethylene exposure from a faulty heater.

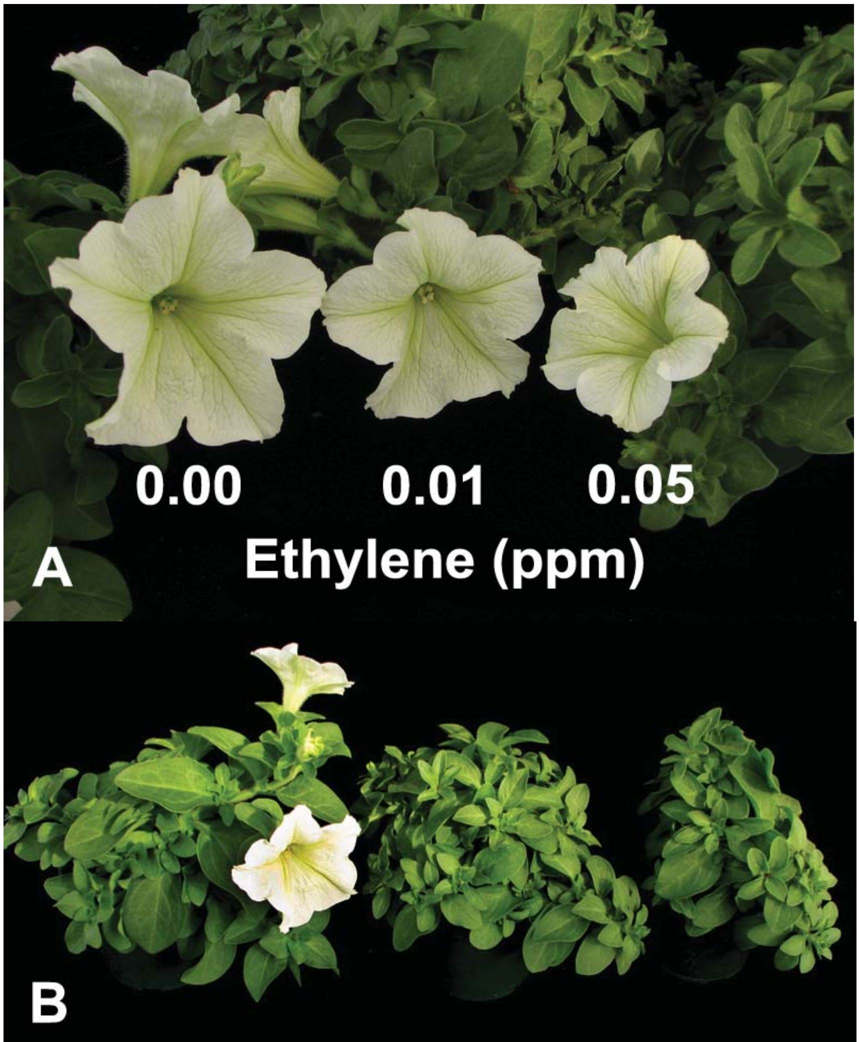

Fig. 3. Effects of low concentration ethylene on petunia. After several weeks of exposure, flower size (A) and internode elongation (B) are reduced at 0.01 and 0.05 compared with control (0.00 ppm ethylene). An indicator of brief low concentration ethylene exposure is premature senescence of mature flowers (C) within 24 to 48 hours of exposure.

Fig. 4. Leaf curling (left) of verbena exposed to 0.05 ppm ethylene for 24 hours. Unexposed plant is on the right. Early and reversible responses such as this can serve as indicators that ethylene is present and action should be taken before irreversible damage occurs.

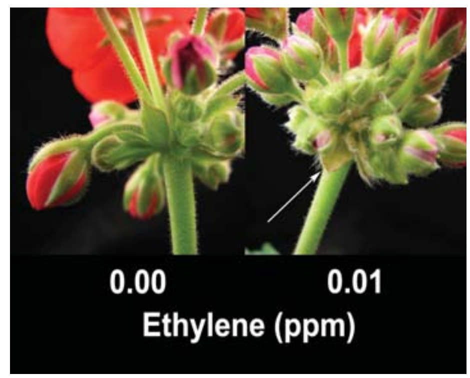

Fig. 5. Stipule yellowing on zonal geranium inflorescences at the same flowering stage exposed to 0.01 ppm ethylene for 48 hours (right side, arrow). The inflorescences look otherwise normal but eventually the ethylene exposed flowers senesce prematurely. At higher ethylene concentrations, zonal geranium flowers shatter, but these less dramatic

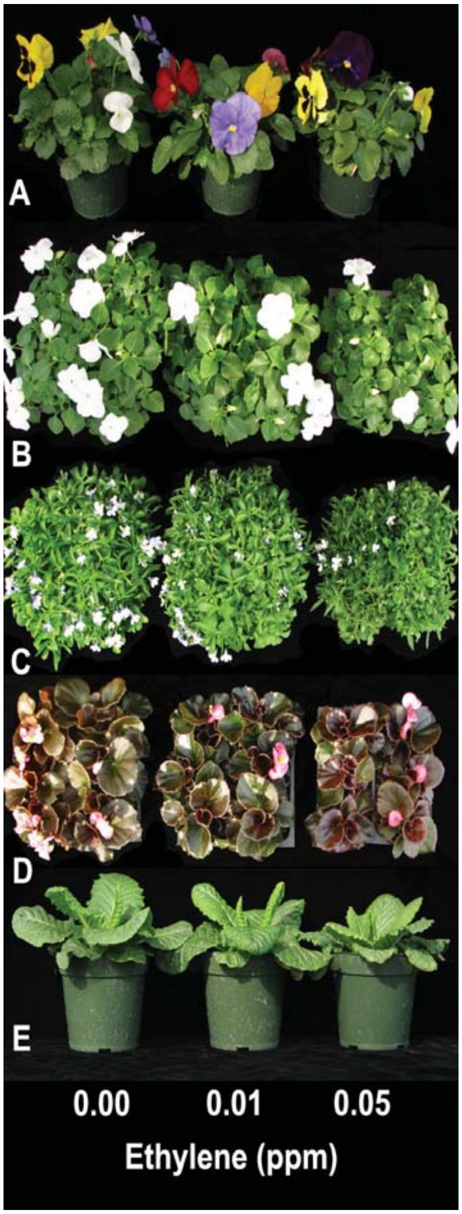

Fig. 6. Examples of the effects of long term, six week, low concentration ethylene exposure on several species of spring annuals. A) The height of pansies is reduced but flower count and size stays consistent. B) Impatiens grow more compactly while flower size and counts are reduced. Similar results are seen with C) lobelia and D) begonia. E) Primula leaves lie closer to the soil line but flowering appears unaffected.

Table 1: A complete listing of all plants tested and their responses to short term and chronic, low concentration ethylene exposure.

Plant	Short Term Response (After 72 hours)	Long Term Response (After Six Weeks)
Bacopa 'Calypso Jumbo Lavender'	Slight leaf curling	Reduced overall growth, flower counts and branching
Basil 'Sweet Large Leaf'	No Change (N/C)	Increased branching
Begonia fibrous 'Cocktail Gin'	N/C	Reduced height, overall growth, flower count
Calendula 'Bon Bon Yellow'	N/C	Reduced height, overall growth
Calibrachoa 'Callie Dark Blue'	N/C	Reduced height and overall growth, increased branching
Coleus 'Stained Glassworks Copper'	N/C	Increased branching
Cuphea 'Allyson Heather'	Complete flower shattering after 24 hours at 0.01 and 0.05 ppm ethylene	Reduced flowering, increased branching
Dahlia 'Carolina Orange'	N/C	Early flower senescence
Dianthus 'Telstar Pink'	N/C	Reduced height, branching, overall growth and flower counts
Fuchsia 'Trailing Dark Eyes'	Slight leaf curling/ epinasty which increases with concentration	Reduced branching, overall growth, increased height, flower counts
Zonal Geranium 'Rumba Fire'	Yellowing of stipules after 48 hours at 0.01 and 0.05 ppm ethylene	Increased flower counts
Gerbera 'Jaguar Formula Mix'	N/C	Leaves are flatter against the soil
Impatiens 'Super Elfin XP White'	Slight leaf curling after 24 hours at 0.05 ppm ethylene	Reduced height, overall growth, flower size and flower counts
Lobelia 'Riviera Blue Splash'	N/C	Reduced height, overall growth and flower counts
French Marigold 'Crested Bonanza Mix'	N/C	N/C
New Guinea Impatiens 'Sonic Deep Purple'	N/C	Reduced height, overall growth
Osteospermum 'Asti Purple'	N/C	Reduced overall growth, increased branching
Pansy 'Delta Formula Mix'	N/C	Reduced height
Hot Pepper 'Long Red Thin Cayenne'	N/C	N/C

Plant	Short Term Response (After 72 hours)	Long Term Response (After Six Weeks)
Petunia multiflora prostrate single 'Saguna Pastel Yellow'	Rapid senescence of open flowers 24 to 48 hours after exposure to 0.01 and 0.05 ppm ethylene	Reduced overall growth, flower size and flower counts, increased height and branching
Portulaca 'Yubi Summer Joy Apricot'	Some leaf abscission within 24 hours of exposure to 0.05 ppm ethylene. Leaf abscission does not persist long term	Reduced height and increased branching.
Primula 'Danova Select Mix'	N/C	Leaves are flatter against the soil
Rosemary 'Arp'	N/C	Reduced branching
Sanvitalia 'Sundance Yellow'	N/C	N/C
Snapdragon 'Florini Amalia Yellow'	N/C	Reduced height & flower scent at 0.05 ppm ethylene
Tomato 'Beefsteak'	Epinasty within 24 hours of exposure to 0.01 or 0.05 ppm ethylene	Reduced overall growth & height
Torenia 'Clown Blue'	N/C	Reduced overall growth, height and flower counts
Verbena 'Lannai Dark Red'	Slight leaf curling 24 hours after exposure to 0.05 ppm ethylene	Reduced height

This work was funded, in part, by a grant from the Fred C. Gloeckner Foundation, Inc. Plant material was donated by C. Raker and Sons, Inc. We also acknowledge the valuable contributions of John Dole at North Carolina State University, and the generous cooperation of numerous New York growers for sharing their insights on their own ethylene experiences. This article was originally published in Greenhouse Grower Magazine.

Financial Benchmark Analysis for Wholesale Operations Using an Internet-Based System

Dr. Alan W. Hodges

Professor of Economics and Extension Scientist

While the ornamental plant industry in the United States continues to grow in size and value, it also becomes increasingly competitive, due to maturation of the industry, consolidation in the retail sector and downward pressure on prices especially for nursery products. The economic recession worsened this situation by reducing demand for ornamental plants as a consequence of the collapse in construction and landscaping markets, and reduced disposable income for discretionary purchases of plant products. This has impacted the industry in terms of reduced profitability, increased rates of business failure (bankruptcy), increased defaults on loans, and widespread employee layoffs. There are now signs that the recession is finally coming to an end, and the economic recovery is underway. Are you prepared to meet the new opportunities in the emerging economy?

In this challenging economic environment it is imperative that owners and managers strive to make their operations as efficient and financially sound as possible. A comprehensive review of your company's operations and financial performance should be done at least quarterly, in order to determine whether the business is heading in the right direction or if corrective action is needed. The analysis should also review performance trends over the past five years. Think of this like a checkup with your doctor, except it is the health of your business that is in question.

Financial benchmark analysis is a common and longstanding method involving the use of key indicators or metrics to evaluate a company's operational and financial performance over time and in comparison to industry averages or benchmark values.

According to surveys, benchmark analysis is practiced by about two-thirds of leading global businesses. Ideally, comparisons should be made with the leading or most profitable firms in an industry that are presumably following best business practices. Comparison of an individual company to industry benchmark values can assist managers to identify their strengths and weaknesses, in order to capitalize on their competitive advantages, and to serve as a guide for important decisions such as business expansions, financing, marketing strategies, operations planning, and product selection. Benchmark analysis can assist in identifying common problems in wholesale plant greenhouses and nurseries, such as slow crop growth, low pricing, excessive costs, waste or overuse, poor cash flow, undercapitalization, and imbalanced debt structure. When used effectively, this information may help to achieve a business' goals to increase profitability, control costs, reduce the risk of business failure, enhance efficiency, boost productivity and improve management professionalism.

The Internet-Based System

Traditionally, financial benchmark information is compiled through industry surveys. With the power of the internet, this process can be made more efficient and significantly sped-up to provide more timely information to users. With this advantage in mind, we set out to develop an internet-based financial benchmark system for the greenhouse and nursery industries, as a partnership between the University of Florida and the Florida Nursery Growers and Landscape Association. The system was originally developed in 2004, but has recently been modified to incorporate new features. The system is available at http://hortbusiness.ifas.ufl.edu/analysis, and is free of charge. It consists of data entry forms, a historical database of business records, a report generator, and a security encrypted website user interface. The benchmark measures and calculations used in this system closely follow the longstanding Nursery Business Analysis Program at the University of Florida. The database was developed from financial statements and production records collected from wholesale grower firms in Florida between 1990 and 1998, and augmented with new data submitted to the internet-based system since 2004. Users of the system can choose from a series of menus to create reports that summarize benchmark information in the database for selected commodities or production systems, firm sizes, profitability levels, locations (state, county) and years. Currently, commodities or production systems represented in the database include greenhouse tropical foliage, shade house tropical foliage (South Florida), container-grown woody ornamentals, field-grown woody ornamentals, potted flowering plants, and cut foliage (ferneries). Commodity groups have also been set-up for plugs/liners and herbaceous perennials, and other commodities or production systems may be added from time to time, as requested by users. Within each commodity, information is also available for subgroups of large, small, and highly profitable firms. Large firms are defined as those having annual sales of two million dollars or greater, while small firms had sales of less than $250,000. Highly profitable firms had a rate of return on assets of 15 percent or greater. Users can also view time series information for any industry group in three separate periods (years). The system requires a minimum of five (5) valid records in the database to view averages for a selected combination of attributes (commodity/production system, firm size, profitability, location, year), in order to protect the confidentiality of user records. If the user does not specify any of these selection conditions, the system automatically defaults to all records available.

The real power of this system is that users may also enter their own financial data for customized analysis of their company in comparison to industry benchmarks. Clients using this feature must first create an account with their general company information (name, address, telephone, email, etc.) and select a username and password to enable access to the system. Security encryption prevents unauthorized access to confidential information. Clients can view reports for up to three years of their own company, or any combination of industry average benchmarks.

Reports generated by the system consist of a series of tables and charts that present information for comparison of up to three industry groups or individual firm records (years). Graphical bar charts are also available for selected key indicators to help visualize critical differences. The following information is provided:

Scope of Business Operations: annual plant sales, value of production (sales plus plant inventory change); gross nursery or greenhouse area and net usable production area; workforce (number of fulltime equivalent employees); value of owned and leased capital.

Income Statement: sales, miscellaneous income, total income; expenses for six major categories (labor, supplies, equipment/facilities, overhead, capital, management) and 32 detailed items; gross income and net income.

Monthly Sales as a percentage of total annual sales (charted).

Statement of Financial Position: current and long term assets; current and long term liabilities; net worth.

Productivity and Efficiency Indicators: sales and value produced per square foot and per acre growing space; sales and value produced per fulltime equivalent employee; capital managed per acre and per employee.

Financial Ratios: profitability (gross margin, net margin, return on assets, return on equity), turnover (inventory, asset, managed capital), liquidity (cash on hand/ current liabilities, current ratio, quick ratio, accounts receivable / sales, average collection period), and solvency (assets/ liabilities, leverage, current value /original cost of long term assets).

Cost Analysis: costs per square foot, costs per unit sales, and cost per unit value produced in major expense categories (labor, supplies, facility & equipment, overhead, capital, management).

The starting point for doing benchmark analysis is to collect the most recent available information for your business from financial statements, income tax forms, and other company records. Fortunately, because of standards regulating the accounting profession, information on financial statements has a consistent meaning that facilitates comparisons among different businesses and over time. Specific information required to use the internet-based system includes the following items. When a user enters this information, the system checks to assure that all data is complete and is within a reasonable range of values.

Income: Annual plant sales, monthly sales (optional), sales of product purchased and resold (brokered), other miscellaneous business income (rents, service charges, gain on sales of assets, etc).

Capital Owned and Leased: Capital resources managed includes both owned and leased assets in land, buildings, and equipment, and working capital in inventories, cash, and accounts receivable. Owned capital in buildings, improvements, and equipment are given as original cost and accumulated depreciation. Leased assets are taken at market value. Inventory values must be given for both the beginning and end of the year in order to calculate the change occurring during the period, which is treated as an accrual. Plant inventories are to be estimated at market value, reflecting wholesale prices, less discounts for unfinished plant material in relation to degree of completion.

Nursery or Greenhouse Area: Total area (acres) and usable growing space (square feet). Plant production area should be measured as the net available space within growing beds and fields, and excluding non-productive space in aisles, driveways, and other service areas.

Labor Work Time: The physical quantity of labor used by nurseries may be measured in terms of payroll hours, including production, administrative, sales, and management personnel, or expressed in terms of fulltime equivalent (FTE) persons, representing the number of employees working 52 weeks at 40 hours per week or 2,080 hours per year.

Operating Expenses: management salaries, employee wages and salaries, commissions, health insurance, payroll taxes, other benefits, plants, containers, growing media, fertilizer, agrichemicals, packaging, heating fuel, other supplies, facility repairs & maintenance, equipment operations, insurance, electricity, communications, taxes, advertising, rent, interest, depreciation, bank charges, postage/freight, dues/subscriptions, professional services, offices supplies, waste removal, miscellaneous other.

In conclusion, financial benchmark analysis is a proven tool for improving management and performance of enterprises. The internet-based system for financial benchmark analysis described in this article automates and speeds-up the process, and enables users to compare their performance with peer industry firms.

We invite readers to check out this tool available and see if it may help improve your business performance. As this system is being continually developed, we would appreciate any feedback you may have.

The Appeal of Biodegradable Packaging to Floral Consumers

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Currently, one of the most widely discussed topics in the floriculture industry, which is promulgated by consumers exhibiting greater degrees of environmental awareness, is the issue of environmental sustainability. This has led to a desire for products that not only solve the needs of consumers but are also produced and marketed using sustainable production and business practices. Consumers increasingly place a great emphasis on sustainable product packaging and this has carried over to the greenhouse/floral sector in the form of biodegradable pots. While various forms of eco-friendly pots have been available for several years, their marketing appeal was limited due to their less-than-satisfying appearance. With the recent availability of more attractive biodegradable plant containers, a renewed interest in their suitability in the floriculture sector and their consumer acceptance has emerged. The objective of this study was to determine the characteristics of biodegradable pots that consumers deem most desirable and to solicit their willingness-to-pay (WTP) for this type of product.

Research Methods

A recently developed analytical tool, called experimental auctions, was used to elicit the floral consumer's WTP. Experimental auctions enable researchers to distinguish what consumers "say they will do" against what they "actually will do" in making purchasing decisions. The auctions were conducted in Minnesota and Texas in order to capture any regional differences that may be present among northern or southern respondents.

For this study, we consulted with industry experts to identify the attributes and their corresponding levels that were considered to be environmentally important to consumers, while directly controlling attributes considered to be of lesser importance. Attributes (and levels) identified were container type [plastic, wheat (OP47), rice hull, straw], carbon footprint (neutral, saving, intense), and percent of waste products used to make the pots (0%, 1-49%, >49%). A fractional factorial design yielded 14 different pot combinations to be used in the actions.

We conducted eight sessions with a total of 113 participants. In each of the auctions, there was simultaneous bidding on the 14 alternatives, which were put on a large table. Beside each alternative there was a label indicating the container type, percentage of waste materials used to make the pots, and carbon footprint levels.

Participants randomly walked around the table and placed their bids on bidding forms as they studied each alternative. Afterward, each participant randomly drew his/her exclusive binding alternative. The price of an alternative was equal to the 2nd-highest bid for that alternative. If the participant had bid more than the price for their binding alternative, they had to buy the alternative.

At the end of each session, participants were given $30 to compensate for their time. If a participant won an alternative, they would get the alternative they won and get $30 minus the price for the alternative. If the participant did not win, he/she received the $30.

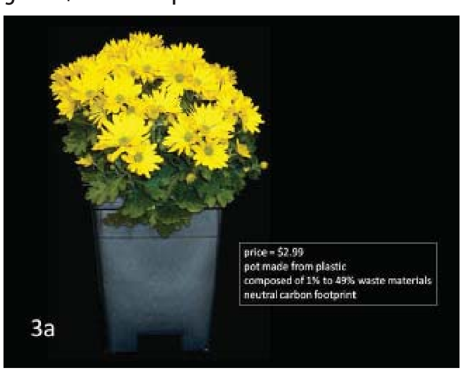

Fig. 1. Base scenario using a standard black plastic pot priced.

Result and Conclusions

Table 1. A comparison of WTP from the conjoint analysis online survey and experimental auctions in Texas and Minnesota.

	Survey Results	Auction Results
Plastic	Base	Base
Rice hull	$0.69	$0.58
Straw	$0.63	$0.37
Wheat	$0.24	$0.23
Carbon saving	-0.02	$0.17
Carbon neutral	Base	Base
Carbon intensive	-$0.96	-$0.43
No waste	Base	Base
1-49% waste	$0.09	$0.15
+50% waste	-$0.13	$0.23

Pots made from biodegradable materials each generated a positive WTP (Table 1) from consumers compared to plastic pots, with the conjoint survey results being slightly higher in each case compared to the auction results. This meant that consumers did exhibit a willingness to pay more for biodegradable pots.

Each pot type was compared against the traditional black plastic pot (Figure 1) that was used as the base to determine how much of a price premium consumers were willing to pay.

The rice hull pot generated the greatest price premium, with consumers paying, on average, an additional $.58 per 4" chrysanthemum. This was followed by a $.37/pot premium for the straw pot (Figure 2) and $.22/pot for the wheat (OP47) pot over the standard black plastic pot.

Fig. 2. Example of a straw biodegradable pot.

Consumers also exhibited a willingness to pay $.17 per pot premium for pots deemed to be carbon saving versus a penalty of $.43 for pots deemed to be carbon intensive, both relative to a carbon neutral pot. It is important to note that the pots were merely labeled as carbon neutral, saving, or intensive. This relationship has not been established by scientific research regarding any given pot type.

Lastly, consumers were also willing to pay a price premium relative to the amount of waste materials used to manufacture the pots, with pots made from more than 50% waste materials generating a $.23/pot price premium relative to the black plastic pot. Again, this was only labeled according to the research design and not based on actual waste ingredient composition. In this manner we were able to ascertain the impact/effect of price on consumer perception.

Impact to the Industry

Through intelligent packaging and system design, it is possible to "design out" the potential negative impact of floral plant packaging on the environment and society – in this case, the prominent amount of virgin plastic produced as requisite to the greenhouse industry. "Cradle to cradle" principles offer strategies to improve the material health of packaging and close the loop on packaging materials, including the creation of economically viable recovery systems that effectively eliminate waste.

The use of biodegradable pots reflects these cradle to cradle principles. This research will greatly benefit the floral consumer by ensuring that environmentally-friendly products marketed to them in the future meet their "sustainability" needs and/or expectation.

This work was funded, in part, by a grant from the American Floral Endowment (AFE), the Horticultural Research Institute (HRI), and the Federal-State Marketing Improvement Program (FSMIP).

Pest Control Materials that May be Used on Greenhouse-Grown Herbs

By Dr. Raymond A. Cloyd

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Many herbs are widely grown in greenhouses; however, the availability of pest control materials (in this case, insecticides and miticides) is limited. Despite this, greenhouse producers that grow herbs must still contend with and regulate the same insect and mite pest populations that attack commercially-grown ornamental plants. As such, applications of pest control materials are warranted in order to prevent insect and/or mite pest outbreaks. However, other than reading the label of specific pest control materials, there is currently not a comprehensive listing of those pest control materials registered for use on herbs grown in greenhouses. As such, Table 1 is a listing of those pest control materials (common name and trade name) that may be used on herbs and the labeled insect and/or mite pests. Most of these materials are contact with short-residual activity, which means that supplemental or multiple applications may be required. A number of these materials have broad-spectrum activity against different insect and mite pests whereas some are only active against one or two insect groups. The insecticidal soaps (potassium salts of fatty acids), oil-based material (paraffinic oil), and clarified hydrophobic extract of neem oil are broad-spectrum with activity against many different soft-bodied insect and mite pests; however, thorough coverage of all plant parts is essential since there is no activity once residues dry. Several materials are derived from soil-bacterium (*Bacillus thuringiensis subsp. israelensis* and B. *thuringiensis* subsp. *kurstaki*) and the target insects (caterpillars and fungus gnats) must ingest the active ingredient in order to be killed. Azadirachtin is an insect growth regulator that is active on the larval stages of insects by disrupting the molting process via inhibiting biosynthesis or metabolism of the molting hormone—ecdysone. Two products are biologically-based containing fungi (*Beauveria bassiana*) or beneficial nematodes (*Steinernema feltiae*) as the active ingredient. Always read the label prior to using any pest control material and avoid applying any pest control material when ambient air temperatures are >80 ºF. All these pest control materials must be applied before insect and/or mite pest populations reach outbreak proportions.

Table 1. Pest control materials (insecticides and miticides) labeled specifically for use on greenhouse-grown herbs (refer to product labels to make sure that the use on any specific crop is included on the product label).

Chemical Name	Trade Name	Labeled Insect and Mite Pests
Azadirachtin	Azatin XL	Aphids, beetles, caterpillars, fungus gnats, mealybugs, thrips, and whiteflies
	Ornazin	Aphids, beetles, caterpillars, fungus gnats, mealybugs, thrips, and whiteflies
	Molt-X	Aphids, beetles, caterpillars, fungus gnats, mealybugs, thrips, and whiteflies
Bacillus thuringiensis subsp. *israelensis*	Gnatrol	Fungus gnats
Bacillus thuringiensis subsp. *kurstaki*	Dipel	Caterpillars
Beauveria bassiana	BotaniGard, Naturalis-O, Mycotrol	Aphids, leafhoppers, mealybugs, thrips, and whiteflies
Clarified hydrophobic extract of neem oil	Triact	Aphids, leafhoppers, mealybugs, mites, and whiteflies
Paraffinic oil	Ultra-Fine Spray	Aphids, beetles, leafhoppers, leafminers, mites, thrips, and whiteflies
Potassium salts of fatty acids	Insecticidal Soap, M-Pede	Aphids, leafhoppers, mealybugs, mites, scales, thrips, and whiteflies
Pyrethrins (plus PBO)	Pyrethrum TR, 1100 Pyrethrum TR	Aphids, beetles, caterpillars, fungus gnats, mealybugs, mites, thrips, and whiteflies
Sorbitol octanoate	SorbiShield	Aphids, caterpillars, leafhoppers, mealybugs, scales, mites, thrips, and whiteflies
Sucrose octanoate esters	SucraShield	Aphids, caterpillars, leafhoppers, mealybugs, scales, mites, thrips, and whiteflies
Spinosad	Entrust	Caterpillars and thrips
Steinernema feltiae	Nemasys, NemaShield, Scanmask, Entonem	Fungus gnats

The Price of Fungicide Success

Dr. Janna L. Beckerman

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My grandmother introduced me to the phrase "Penny wise and pound foolish." It is a trap that many people fall into in various aspects of their lives. However, in one aspect, plant disease control, it is one trap that can be readily avoided. When managing plant disease, it is important to remember that the quoted cost of the fungicide is probably the least economically important piece of information you as a grower are confronted with.

This last fall/winter was a disastrous one for many poinsettia producers. Cooler temperatures can be managed in a greenhouse, but the lack of sun is less manageable. With less sun light, plants transpire less, resulting in wet media. As a result, many growers had tremendous outbreaks of Pythium root rot. In choosing a control, especially for something as explosive as *Pythium* sp., the first concern should be choosing the most effective fungicide. There are many possibilities here. Unfortunately for this grower, he was also battling mefenoxam-resistant *Pythium*, eliminating Subdue Maxx as a control option. This left us with following choices:

- Aliette
- Fenstop
- Segway DF
- Truban 25EC/30WP

We're all familiar with the phrase "You do the math." But how many of us actually take the time do so? And although the math is simple, coming up with the time is the problem! Table 1 shows 35 of the most commonly used greenhouse fungicides, the cost of each product for the average small grower the recommended label rate, the recommended application interval, cost per application and the most important piece of information: the per month use cost.

All too often, we don't do the math. This simple (but tedious and time-consuming) math takes into account the cost per treatment, the rate, and the number of applications. When evaluated this way, an "expensive" product that is used at a low rate once per month (or every other week) may be more cost-effective than using a high rate of a "less expensive" fungicide on a weekly basis.

Our grower blanched at the recommendation of one of the more expensive fungicides, even when faced with loss of his entire crop. I walked him through the cost breakdown, in addition to the cost of losing his entire crop. He decided to proceed using the "Cadillac" fungicide, rotated with an equally effective fungicide with a different mode of action. We also began the process of correcting some of the underlying cultural problems that predisposed the crop to Pythium root rot by removing severely infected plants, improving drainage issues and preventing the accumulation of standing water. This reduced the spread of the pathogen, and allowed the fungicides to work better by primarily preventing disease in new plants, and minimize the fungicide's role as a curative in a few lightly symptomatic or asymptomatic ones. The end results were a very happy grower and an excellent poinsettia crop.

Another area where a deeper consideration of costs should occur is when you are faced with a mixed infection— like downy mildew and black spot of florist's roses, or Phytophthora blight and Alternaria leaf spot on Catharanthus (Vinca) (Figure 1). There are many fungicides with excellent activity against only one of these pathogens. However, using a strobilurin fungicide (Pageant, Cygnus, Compass or Heritage) would be effective against both pathogens, and possess some curative/eradicant ability (cure existing infections while protecting against new ones). Tank mixing or alternating with mancozeb would also provide control for both diseases, and an excellent rotation partner.

Hopefully, Table 1 will assist you by providing the cost-benefit and cost per month rates, and also by showing growers that many of those "expensive" or "Cadillac" fungicides are more like hybrid vehicles, where savings are realized over the long haul! Keep in mind that the most expensive fungicide isn't always the best, and that proper timing of any fungicide is essential. Growers often reach for a fungicide when the crop is no longer salvageable: A fungicide may prevent future infections, but the damage may be such that the crop is no longer saleable. This is the most expensive fungicide, as it wastes time, money, and creates unnecessary environmental impact.

The Purdue Green Industry Working Group has developed a website to assist growers, and can be seen at: http://www.btny.purdue.edu/Extension/GIWG/index.html

Fig. 1. Phytophthora blight on Catharanthus (Vinca).

Table 1. Commonly used greenhouse fungicides, the cost of each product for the average small grower, the recommended label rate, the recommended application interval, cost per application and the most important piece of information: the per month use cost.

Fungicide	Quantity	Cost	Rate	Application Interval	Cost/100 gal	Cost/ 28 Days
Aliette WDG	5 lb	$160	0.4 to 5.0 lb /100 g	28 days	$13 to 160	$13 to 160
Banrot 40WP	2.0 lbs	$73	4 to 12 oz/100g	4 to 12 weeks	$9 to 27	$3 to 27
Banrot 8G	40 lb	$423	8 oz to16 /cu yard	at planting	$8 per cu yd	$8 to 36
Camelot	1 gal	$124	3pt/100g	7 to 14 days	$16	$32 to 64
Captan 50WP	50 lb	$48	1 to 4 lbs /100g	7 to 10 days	$1 to 4	$3 to 16
CHIPCO 26019 N/G	2 lbs	$95	1 to 6.5 oz/100	7 to 14 days	$3 to 19	$6 to 76
Cleary 3336G	30 lbs	$88	3 to 6 lbs/1000 sq. ft	14 days	$9 to 18/1000 sq.ft	$18 to 35
Compass O 50 WDG	0.5 lb	$263	1.0 to 4 oz 100 g	14 to 21 days	$33 to 131	$49 to 263
Contrast 70 WSP	8X 1 oz	$72	3 to 12 oz/100 gal	14 to 21 days	$27 to 107	$40 to 215
Cygnus 50 WG	1lb	$253	1 to 6.4 oz/100 g	7 to 14 days	$16 to 104	$32 to 414
Daconil Zn FLOWABLE	2.5 G	$180	2pt/100 g	7 to 14 days	$9	$18 to 36
Daconil ULTREX 82.5WDG	6.5 lb	$88	1.4 lb/100 g	7 to 14 days	$19	$38 to 76
Decree 50 wdg	2.5 lb	$271	0.75 to 1.5 lb/100g	7 to 14 days	$81 to 163	$163 to 326
Disarm O	1 lb	$100	2 to 4 oz/100 g	14 days	$13 to 25	$26 to 50
Fenstop	quart	$200	7 to 14 oz/100 g	28 days	$44 to 88	$44 to 88
Heritage	1 lb	$525	1 to 2 oz/100g	14 to 21 day	$33 to 66	$49 to 131
Medallion	8 to 1oz packs	$206	1 to 4 oz/100 g	7 to 14 days	$26 to 103	$103 to 412
OHP 6672 50WP	2lb	$49	8 to 24oz/100 g	7 to 14 days	$12 to 37	$25 to 147
OHP 6672 4.5L	2.5 g	$446	20 oz/100g	7 to 14 days	$28	$56 to 112
Pageant	1 lb	$80	4 to 18 oz/100 g	7 to 14 days	$20 to 90	$40 to 360
Pipron	quart	$380	4 to 8 oz	7 to 14 days	$48 to 95	$96 to 190
Protect DF	6 lb	$80	1 to 2 lb/100g	7 to 14 days	$14 to 27	$27 to 54
Segway	39.2 oz	$370	1.5 oz to 6 oz/100g	14-28 days	$14 to 57	$28 to 113
Spectro 90 WDG	5 lb	$124	1 to 2 lb/100g	7 to 14 days	$25 to 50	$50 to 200
Stature DM	25 oz	$165	3.2 to 12.8/100 g	10 to 14 days	$21 to 84	$42 to 253
Strike 50WDG	8 oz	$90	1 to 8 oz/100g	7 to 14 days	$11 to 90	$22 to 360
Subdue Maxx	quart	$241	0.3 to 3 oz/100g	30 days	$2 to 23	$2 to 23
Subdue G	25 lb	$133	8 to 75 oz/1000sq.ft.	At planting	$3 to 25	$3 to 25
Sulfur	30 lbs	$28	6 lb/100 g	7 days	$6	$22
Systhane/Eagle	8 oz	$75	8 to 12 oz/100 g	7 to 14 days	$75 to 113	150 to 452
Terrachlor 75WP	5 lb	$81	per 1,000 sq. ft. row: 3 to 6.5 lbs		$49 to 105/1000 sq. ft.	$49 to 105
Terrachlor 400	1 g	$92	6 to 12 oz/100 g	28 to 42 days	$4 to 9	$4 to 9
Truban 25 EC	quart	$70	3 to 8/100g	4 to 12 weeks	$7 to 18	$2 to 18
Truban 30 WP	2 lb	$70	3 to 12/100g	4 to 12 weeks	$7 to 13	$2 to 18
Zyban WSB	3 lb	$64	16 to 24 oz/100g	7 to 10 days	$21 to 32	$61 to 128

Fungicide prices vary between distributors, states, and quantities purchased. The use of specific trade names in this publication does not constitute endorsement of these products nor does exclusion constitute discrimination.

Purdue Research Update - Evaluation of Phytotoxicity of SuffOil-X and BW533

By Jeannie Ross[1], Robert Eddy[2], and Marla Faver[3]

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Introduction

SuffOil-XTM is a spray oil emulsion insecticide, fungicide, and miticide that provides a "uniform coverage to suffocate pests without causing burn or stress to the plants" (BioWorks, Inc., Victor, NY). It is a pre-emulsified oil which allows it to separate into much smaller particles so that it can coat plants in a very thin, uniform layer of oil. BW533 is a biological insecticide and nematicide. In order to further understand the effects of each of these products on the plants they would most likely be used on, an experiment was conducted to determine the specific phytoxicity at three different application rates of both SuffOil-XTM and BW533 as individual treatments. The plants used in the experiment were a variety of general greenhouse crops including impatiens (*Impatiens walleriana* 'Dazzler Violet'), zinnia (*Zinnia angustifolia* x *elegans* 'Profusion Fire'), rex begonia (Begonia rex 'Chicago Fire'), marigold (*Tagetes patula* 'Bonanza Yellow'), and fuchsia (*Fuchsia hybrid* 'Autumnale').

Materials and Methods

Ninety-six plants of each species were potted up in five-inch azalea pots using Metro-Mix 510 media (SunGro Horticulture, Bellevue, Washington) in the Purdue University Horticulture Plant Growth Facility. Each species was watered as needed with Peters Excel 21-5-20 (Scotts-Sierra Horticultural Products, Co., Marysville, Ohio).

Once most of the plants had developed suitable leaf surface area and put on sufficient flowers, twelve plants from each species were assigned to one of seven treatments (Table 1). Treatments were applied using a 1 gallon hand-pump sprayer. The treatments were evenly applied to the foliage and flowers to "run-off". Conditions during the application period were mostly sunny with an average temperature in the greenhouse of 80.9 °F. Phytotoxicity measurements and pictures were taken 24 hours after application. Evaluations were made 2-5 days post-application but phytotoxicity symptoms did not change. The following week on June 24th, 2009 a second application of each treatment was performed using the same procedure and method. Conditions during the second application period were sunny with an average temperature in the greenhouse of 84.6 °F. Measurements and pictures for this second application were taken 24 hours later. No further damage was noted 2-5 days post-application.

Results

Phytotoxicity of the plants was measured on a scale of one to six based on the amount of damage and the saleability of the plants (Tabel 2).

Table 1. Treatment List

Treatment	Rate
Control	n/a
SuffOil-XTM	1.28 oz.1 gal
SuffOil-XTM	2.56 oz/1 gal
SuffOil-XTM	5.12 oz/1 gal
BW533	.08 oz/1gal
BW533	.16 oz/1 gal
BW533	.32 oz/1 gal

Fig. 1. Effect of SuffOil-X™ and BW533 on impatiens

The impatiens showed the most severe damage after being treated with the 5.12 oz/1 gal rate of SuffOil-XTM (Figure 1). Impatiens plants in this treatment group had very noticeable curling of the flower petals and severe loss of pigment on most of the flowers per plant, as evident in Figure 2. There were also a few grease soaked spots on the leaves of the impatiens plants in this treatment. Only moderate flower damage on the impatiens was observed at the two lower application rates of SuffOil-XTM. The only other plant species to show any phytoxicity symptoms after being treated with the highest rate of SuffOil-XTM were the zinnias. Several zinnia plants in this group had grease soaked spots on their leaves. All of the other plant species showed no phytotoxicity symptoms regardless of the rate of SuffOil-XTM that was applied.

Fig. 2. Phytotoxicity on impatiens flowers after 5.12 oz/1 gal of SuffOil-XTM was applied.

In the groups treated with BW533, the impatiens treated with the .32 oz/1 gal rate showed the most severe damage to the flowers. They had curling of the flower edges and a severe loss of pigment in the petals. The two lower treatment rates showed similar damage on fewer of the flowers. The rest of the plant species showed no symptoms of phytotoxicity.

Discussion

Plants treated with both products clearly either showed symptoms of phytotoxicity or no effect at all. The hypothesis that increasing rates of either SuffOil-XTM or BW533 would show increasing symptoms of phytotoxicity was proven true. The affected plants showed increasing symptoms as the application rates increased.

SuffOil-XTM affected only two plant species out of the five crops selected for this study. Only the impatiens showed sufficient phytotoxicity symptoms to decrease their saleability. Even at the highest rate, however, they were still healthy enough to be sold and—in our opinion—after putting on new flowers would not be distinguishable from the control plants. This means that growers who over-apply this product only need to hold off selling these plants for a week or two to have a marketable crop.

BW533 phytotoxicity symptoms appeared only on the impatiens and to a lesser degree than on the SuffOil-XTM. Likewise, growers who over apply this product would only need to wait a week or two before selling the damaged impatiens crop in order to allow the plants to put on new, unaffected flowers.

Viewing these products from a grower's perspective, the SuffOil-XTM was difficult to measure out accurately due to its thick consistency. It worked well on most of the plants but should probably be used sparingly on tender annuals such as impatiens. The BW533 was much easier to measure and mix. It also seemed to have a milder effect on the impatiens. One of the main qualities of both these products that would recommend them to growers is, unlike harsher chemicals, these two products are considerably safer for beneficial insects while still killing a broad spectrum of pests. This will allow growers to integrate beneficial insect programs into their pest control methods which will create a more ecologically desirable system for managing insect pests.

Table 2. Phytotoxicity of the plants was measured on a scale of one to six based on the amount of damage and the saleability of the plants.

Rating	Damage Severity	Description	Saleability
1	No Damage	No phytotoxicity symptoms	Would sell
2	Slight	A few flowers or leaves slightly damaged	Would sell
3	Moderate	Flowers or leaves moderately damaged	Decreased salability until new flowers emerged
4	Moderate	Flowers and leaves moderately damaged	Re-growth period required for salability
5	Severe	Flowers and leaves severely damaged, plant stunted with dead tips	Would not sell
6	Severe	Plant death	Would not sell

This study was made possible by BioWorks, Inc. through their generous support of a summer intern at the Purdue Horticulture Greenhouse

Upcoming 2010 Industry and University Events

Date	Event	Location	Speaker/Topic	Web site/ Email
Apr. 29	Farmer Market Master Boot Camp	Indianapolis, IN	Merchandizing, Selling & Marketing	E-mail: tgoodale@purdue.edu
June 10	NWIFA	TBA	TBA	http://faculty.pnc.edu/emaynard/nwifa/nwifa.html
June 16-18	SE Color Connection	Greenville, SC	Education and Trade Show	http://www.sgcts.org/
June 26-28	Seeley Conference	Ithaca, NY	Education	http://www.hort.cornell.edu/seeleyconference/
July 10-13	OFA Short Course	Columbus, OH	Education and Trade Show	http://www.ofa.org/shortcourseinfo.aspx
Aug. 2-13	Michigan Garden Plant Tour	Throughout MI	Display gardens	http://planttour.hrt.msu.edu/
Aug. 10	Michigan Garden Plant Showcase	E. Lansing, MI	Educational and Garden Tour	http://planttour.hrt.msu.edu/
Sept. 8	NIFGA	Fort Wayne, IN	Educational and tour	E-mail: bernie.greenhouse@gmai.com
Sept. 28-29	OFA Disease, Insect & Plant Growth Conference	St. Louis, MO	Education and Trade Show	http://www.ofaconferences.org/
Oct. 6-7	IFGA Annual Conference	Lafayette, IN	Education and Golf	https://sharepoint.agriculture.purdue.edu/agriculture/flowers/ifga.aspx
Oct. 6-7	Canadian Greenhouse Conference	Toronto, Canada	Education and Trade Show	http://www.canadiangreenhouseconference.com/
Oct. 13	NIFGA	Fort Wayne, IN	Educational and tour	E-mail: bernie.greenhouse@gmai.com

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