

# Greenhouse

## MANAGEMENT

May 2024 GreenhouseMag.com

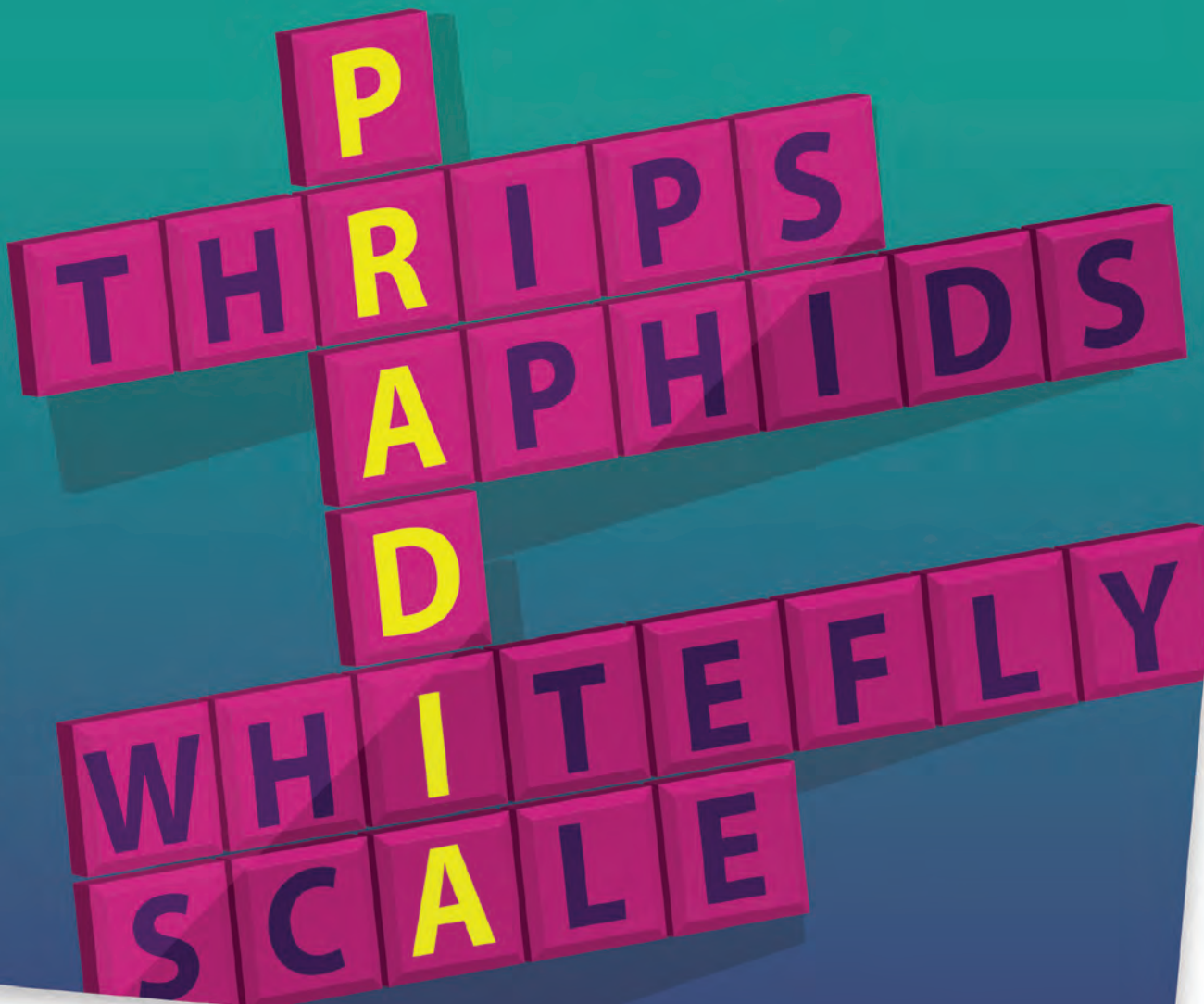
LEAP OF

*Faith*

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14

## LEAP OF

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With demand for workers at an all-time high, green industry businesses may consider formerly incarcerated laborers seeking an opportunity for personal and professional redemption.

## Departments

- 4 **Editor's Note**
- 6 **Production Pointers:**  
Poinsettia propagation
- 8 **Tech Solutions:**  
Pointers for better irrigation
- 10 **Meet the Breeder:**  
Dariusz Malinowski
- 65 **Classifieds/Ad Index**
- 66 **Culture Notebook**

## SPONSORED

### Ask the Experts

Green industry experts answer questions on topics crucial to growers' success.....**pg.39**

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# TOP 10

## THINGS TO KNOW

Here are the top 10 things to know about working with AdeptAg to build productivity solutions for your operation.

**pg. 12**

## Features

- |   |  |  |
|---|--|--|
| <b>18 pH got you down?</b><br>Here is a foolproof way to achieve your optimal pH.   | <b>28 Planting for biocontrol</b><br>How conservation biocontrol can help you keep pests at bay through thoughtful planting. | <b>62 <i>Spigelia marilandica</i></b><br>Bright red trumpet-shaped flowers attract attention from a distance with this native perennial. |
| <b>22 New blood</b><br>A new program at York College of Pennsylvania is training the next generation of horticulturists.                                  | <b>32 Are you covered?</b><br>Protect yourself along with your business by ensuring you have the right insurance.            | <b>64 The importance of measuring light</b><br>Light meters can help growers extend and often speed up production of certain crops.      |
| <b>26 Webpage refresh</b><br>How to take a fresh look at your website to ensure your customers and users are getting the most from your digital presence. | <b>36 Creating a resilient company culture</b><br>How to navigate change and thrive amid challenges.                         |  |



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# Growing grace



I'm not proud to admit that my teenage years were troubled. I was a lost kid. In the absence of adult authority figures, I sought solace in a crowd that was equally unstable. Some of those guys did time. But I was lucky. My family moved to Alaska when I was 16 years old, and things got better. I've stayed on the right side of the law since. Now, nearly 50, I have a good life with a wife and two kids. I'm an attentive parent, active in my community and I love my work, which feels important and fulfilling.

But I think about the guys I came up with sometimes. Not one of them was capital-B bad. They were all just struggling, lacking support and guidance. They made mistakes I'm sure they regret. And though I haven't heard from any of them in many decades, I hope and pray that they came through alright.

The odds that their outcomes have been positive aren't that great. That much is apparent in some of the startling facts you'll find in this month's cover story about formerly incarcerated persons. Consider that 1 in 3 adults in America has a criminal record, and more than half a million people are released from incarceration every year. Now consider the fact that nearly three-quarters of those individuals remain jobless a year after their release. Is it any wonder the recidivism rates remain astronomical? Not in my mind.

The statistics are grim. But our cover story is about hope. It's also about grace. Some formerly incarcerated people are finding incredible opportunities in the horticultural industry. And not only are they finding a way free from the burden of difficult pasts, but some of them are also thriving.

Plants can heal. That's often what we tell the consumers who ultimately bring your goods to their gardens. We should also consider that the greenhouse can heal, too, and we have an opportunity to extend grace to those who could benefit from green work.

How much growth and learning could come from figuring out how to accurately measure substrate pH [pg.18]? Is it possible that today's formerly incarcerated person could become tomorrow's horticultural expert answering questions in our Ask the Experts supplement [pg. 39]? I think so. I hope you do, too.

Formerly incarcerated persons could use a break. It's better for them, and, in the end, it's better for our society as a whole.

Here's to growing grace and an industry that can heal.

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# Poinsettia PROPAGATION

It's never too early to start thinking about propagating poinsettias.

**Spring is spinning**, but it is not too early to be thinking about poinsettias. They are coming up soon enough. Previous Production Pointers have focused on both establishing and finishing containerized poinsettias. This month, we focus on propagation.

First, start with a clean facility. Take the time after spring, before cuttings arrive, to clean the areas where cuttings will be propagated — from Stage 1 (sticking) through

Stage 4 (toning). While this is important for every crop, eliminating the potential for soft rot (*Erwinia*) starts here. But it isn't just diseases we are preparing for — we want to minimize insect pests, too. A clean greenhouse goes a long way, but before cuttings are stuck, they can be completely, but quickly, submersed in low concentrations of horticultural oils or insecticidal soap.

When poinsettia cuttings arrive, prepare space in a cooler



**There is not much to compete with poinsettia cuttings in the greenhouse in the summer, and there are opportunities to be had with your space.**

for them. This can help serve a few purposes. First, it can help to cool cuttings and reduce the plant temperature — and it can also help rehydrate them. Second, it can buy you a little time to make sure you have everything ready in the headhouse or a shaded place in the greenhouse to stick cuttings. When getting cooler space sorted out, be sure it is going to be at the right temperature for poinsettias. Air temperatures in coolers should be between 50 to 55°F to sufficiently cool them while avoiding damaging cold-sensitive poinsettia.

In addition to preparing cooler space for cuttings, you'll also want to prepare your substrate for propagation early, too. Stabilized substrates such as phenolic foam or physically bound loose substrates are excellent choices for poinsettia propagation. Plus, stabilized substrates allow for cuttings to be transplanted earlier than loose-filled substrates. And if loose-filled substrate is being used to pre-fill propagation trays, be sure not to stack trays on top of each other. Whether the pH of soilless peat-based mixes is adjusted with limestone, or phenolic foam adjusted with fertilizer solution, use a target of 5.8 to 6.2 for poinsettia.

Rooting hormones should be used to improve rooting in poinsettia, hastening root growth and improving uniformity across crops. The most common rooting hormone is indole-butyric acid (IBA), though some formulas will also include naphthalene-acetic acid (NAA). Hormones have traditionally been suspended in a talcum powder or water solution, and the basal end of cuttings were dipped prior to sticking them. While this is certainly still an effective means of applying rooting hormone to poinsettia cuttings, newer auxin formulations are available to apply as a foliar spray after cuttings are stuck. Compared to dipping cuttings, spraying reduces the labor required to stick poinsettia cuttings by eliminating a step.

Use high-quality water for misting poinsettia cuttings. The frequency of mist during the summer — and resulting volume of water applied to cuttings — is not insignificant. To improve the efficiency of misting and enhance hydration, non-ionic surfactants — also called spreader-stickers or spray adjuvants — can be used to reduce the surface tension of water on the leaves, breaking water beads and droplets and improving coverage on foliage. Misting frequency and duration interact with the growing environment and stage of cutting development. Keeping facilities shaded will reduce air and

plant temperatures and reduce mist requirements. As cuttings proceed from Stage 2 (callusing) into Stage 3 (root development), the frequency of misting will decrease. Close monitoring of root development will help manage mist strategies and help avoid excessive moisture, leading to soft rot (*Erwinia*).

One of the most important factors when propagating poinsettias is managing light intensity. Poinsettia cuttings are sensitive to excessive light, and it is ideal to keep the intensity between 150 and 250  $\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ , a target daily light integral (DLI) of 4 to 5  $\text{mol}\cdot\text{m}^{-2}\cdot\text{d}^{-1}$ . Light intensities higher than this can damage foliage. Shading will be needed, and there are a variety of options. Shading is essential to diminish the summer sun's intensity and can range from more season-long options such as whitewash or black saran to retractable aluminized shade cloth. As cutting progresses through root development and toning, light intensity can be increased incrementally to acclimate cuttings to light intensities and DLI approximately twice what they were in callusing. This can be achieved by changing shading programs to increase light intensity (for retractable shade) or moving cuttings to areas with less or no shade (for permanent shade).

Warm temperatures can improve callusing and root initiation for poinsettia cuttings. Keep temperatures below 82°F, if possible. But the summer can be too hot. As mentioned earlier, shade is useful in reducing excessive heat, as well as light. Excessive heat can stress cuttings or, worse, promote soft rot. Throughout propagation, as cutting progresses through Stage 3 and Stage 4 (toning), air and substrate temperatures can be reduced to the mid-70s — if outdoor temperature will allow it.

Fertilizing during propagation is a great way to avoid nutrient deficiencies and produce healthy liners for transplanting. Low concentrations (50 to 75 ppm nitrogen) of water-soluble fertilizer can be used, applied in mist or other means of overhead irrigation. Poinsettia leaves are sensitive to phosphorous and can be damaged, and growth can become hardened. A light rinse with clear water to get fertilizer off foliage — without leaching substrate of nutrients — can help avoid foliar damage.

There is not much to compete with poinsettia cuttings in the greenhouse in the summer, and there are opportunities to be had with your space. Take that time to focus on the best management practices you can provide poinsettia cuttings and start your crop with the best rooted liners possible. GM





# Pointers for better irrigation

How to make your irrigation system more efficient.

**With warm weather here**, watering plants becomes more important and time-consuming. Here are a few ideas that can make the irrigation system more efficient.

## 1. Undersized pipes can affect flow

Whether it is by hand-watering or an automatic system, the correct supply pipe size is important to get good coverage. Water flow in a pipe is affected by the pressure, pipe length and number of fittings. Most systems should have

a pressure switch and pressure tank that provides water at between 40-60 pounds per square inch (psi) of pressure. Lower pressure reduces flow, and higher pressure may damage the plants.

A 1-inch plastic supply pipe will provide about 13 gallons per minute (gpm) without losing too much pressure to friction loss. This is not adequate to supply two ¾-inch diameter hoses to full capacity. It is also not adequate to provide water for more than a dozen 1-gallon/minute nozzles

in an overhead irrigation system. The generally recommended flow rates for 100 feet of plastic pipe are shown in the table (left). For longer runs, the flow rate decreases more.

Pipe size	Flow rate	Friction loss
¾"	8 gallons/minute	5.8 psi/100 feet
1"	13	4.4
1 ¼"	22	3.1
1 ½"	30	2.6
2"	50	2.0



## 2. Use shorter hoses

Friction loss in rubber hose is considerably more than in plastic pipe. For example, at 8 gpm, friction loss in ¾-inch plastic pipe is 5.8 psi/100 feet, whereas in ¾-inch hose, the loss is 8.8 psi. It is better to pipe the water supply to the ends and middle of a 100-foot greenhouse and then use 50-foot hoses to get the coverage.

## 3. Install a hose cart or Hi-Hose cable support

These devices keep hoses out of the aisle, where they can be damaged or tripped on. They also keep the nozzle clean, reducing the chance of spreading plant diseases while watering.

## 4. Add an intermediate water storage tank

When an adequate water supply for peak irrigation needs is not available, an intermediate storage tank should be installed. This is located between the well and the pressurized distribu-

tion system. This reservoir can be a non-pressurized concrete, wood or steel tank that serves as a primary source of supply for the pressure pump. It should be sized to make up the difference between the well yield and the maximum demand. The intermediate tank is filled during the evening or night when irrigation is not needed.

For most systems, supplying the water from the intermediate tank to a pressure tank is desirable to keep the pump from starting too frequently. In larger greenhouses, pumping directly from the intermediate tank to the more extensive irrigation system may be best.

There is another advantage to an intermediate reservoir. If the tank is located aboveground in the greenhouse or headhouse, the water can be tempered before irrigating the plants. It could also be heated from a hot water heater or boiler.

## 5. Protect your water system with a good filter

Suspended solids in the water source need to be removed to prevent clogged piping, valves, nozzles and emitters. Screen or disk filters work well for most applications. A 100-mesh filter is fine enough for most hand and overhead sprinkler applications. A 200-mesh filter is usually recommended for micro-irrigation. The filter should be sized so that the flow rate is large enough to handle the peak demand.

Maintenance on a filter is also important. Installing pressure gauges on both sides of the filter will indicate when it is becoming clogged. When the pressure variation between the two gauges exceeds about 10%, the filter should be cleaned.

## 6. Save labor with an irrigation controller

Electronic controllers are available from one to 20 or more zones. Features available include easy programming, manual override of any zone, variable start and run time, activation during daylight, battery backup and remote control. Special controllers are available for misting, boom irrigation and locations where power is not available. A controller will operate your irrigation system when you are not available.

## 7. Design the automatic watering system for uniform coverage

The most uniform watering is achieved with flood benches, flood floors or a boom system. Drip systems do a good job if pressure compensating nozzles are used and the supply pipes are not too long. In overhead systems, the design should include double or triple overlap of nozzle patterns.

Nozzle selection should be based on the water pressure and desired irrigation rate. Select a nozzle that has a droplet size that will penetrate the foliage and minimize drift. Follow the manufacturer's recommendation for spacing and coverage. Monitor pressure at the nozzle. Look for variations in the pattern that indicate plugging or wear. Run a cup test which involves measuring the irrigation water caught in a series of cups laid out on a regular grid system throughout the growing area.

## 8. Avoid waste

Design and operate the irrigation system to limit the amount of wasted water. Avoid watering the aisles and walls. This will save on pumping costs and extend the water supply. Use anti-drip nozzles and repair any system leaks.

As water supplies become smaller due to drought and over-development, conservation becomes more important. Good system design and control can extend the water source and provide more uniform watering. **GM**





# COLORevolutionary

Dariusz Malinowski, Ph.D., brings never-before-seen hues to hardy hibiscus flowers at Texas A&M. **By Brooke Bilyj**

**Dariusz Malinowski's groundbreaking hibiscus breeding work** began as a personal quest to bring more color into his own landscape. A plant physiologist who earned his master's degree in horticulture in Poland and a life sciences Ph.D. in Switzerland, Malinowski bought a house in Vernon, Texas, in 2004 while researching forage grasses at Texas A&M AgriLife Research and Extension Center. While filling his new backyard with plants, he discovered winter-hardy hibiscus.

"I fell in love with them immediately," Malinowski says. "I wanted to buy more colors, but I quickly figured out that only cultivars with pink, red and white flowers were available on the market. So, I decided to create more colors."

Malinowski spent three years hybridizing winter-hardy hibiscus at home before he caught the attention of Steve Brown, then-director of Texas Foundation Seed Service, who walked by his office one day and spotted pictures of his cutting-edge color palette. Brown encouraged Malinowski to make his hobby an official part of Texas A&M AgriLife Research, leading to the launch of his winter-hardy hibiscus breeding program in 2010 and a tropical hibiscus breeding program in 2014.

## Colorful objectives

Malinowski's first goal was creating blue flowers.

"It was quite challenging because blue pigment did not exist in winter-hardy hibiscus," he says. "It took four generations of hybrids for the first mauve-bluish flower colors to appear. It took another 60 parents and nine breeding cycles to finally create a plant with almost blue flowers. Using the gene-stacking method, we've been able to



With intense purple flowers, **Plum Flambe** is a cultivar from Dariusz Malinowski's breeding program commercialized by J. Berry Nursery as a part of the Summer Spice series.

create a hybrid with bluish flower color and dark purplish foliage."

Early on, Malinowski's novel colors captivated home gardeners and commercial growers. While hobbyist gardeners were eager to acquire his rare colors, Malinowski quickly learned that commercial partners were looking for different traits "such as compact growth and natural branching," he says, "traits related to the production and transport of plants, not necessarily to the beauty of the flowers."

To satisfy consumers and commercial partners alike, Malinowski had to balance beauty and utility. His first bluish-hued hybrid, Blue Angel, didn't have the most stable color or desirable growth characteristics. But it led to more than 30 blue-flowering lines, producing hybrids like Bleu Brulee and Cordon Bleu, which were both commercialized by J. Berry Nursery in 2018.

Malinowski's program has disclosed more than 480 unique winter-hardy hibiscus hybrids to the Texas A&M Innovation office, about a dozen of which have been commercialized by J. Berry through the Summer Spice Hardy Hibiscus series, and 240 tropical hibiscus hybrids, one of which has been commercialized.



**Dariusz Malinowski, Ph.D., with his tropical hibiscus hybrids.**



## Rebuilding the research program

At the program's peak, Malinowski's research team planted about 2,500 hibiscus hybrids every year — judiciously selecting the most promising flower colors and growing habits to cross. Initially, he grew everything in a 2-acre field, but heat impeded the cross-pollination process.

"The pollen of winter-hardy hibiscus is only viable in temperatures around 80 to 85 degrees [Fahrenheit], so I had to do the crossings very early in the morning, because by 11 o'clock in the summer, we're already over 90 degrees," he says. To better control the breeding environment, Malinowski began propagating cuttings in greenhouses around 2016.

By May 2022, his hibiscus breeding program filled about 8,000 square feet of greenhouse space in addition to the 2-acre field. But then a tornado ripped through the area, destroying all three greenhouses and the Texas A&M AgriLife Research and Extension Center headquarters. Malinowski saved about 200 tropical and 150 hardy hibiscus from the debris and temporarily moved them into a greenhouse at a nearby high school. The Texas A&M administration also set up a hoophouse as a temporary home for the breeding program.

The field-grown winter-hardy hibiscus survived the storm — sparing most of Malinowski's genetic collection, which spans about 20,000 plants. He has seeds of another 2,500 tropical hybrids and 1,000 hardy hybrids currently frozen, awaiting the new greenhouses. The new research headquarters should be completed by the summer of 2025, he says, "and we hope the greenhouses will be rebuilt by then, too."

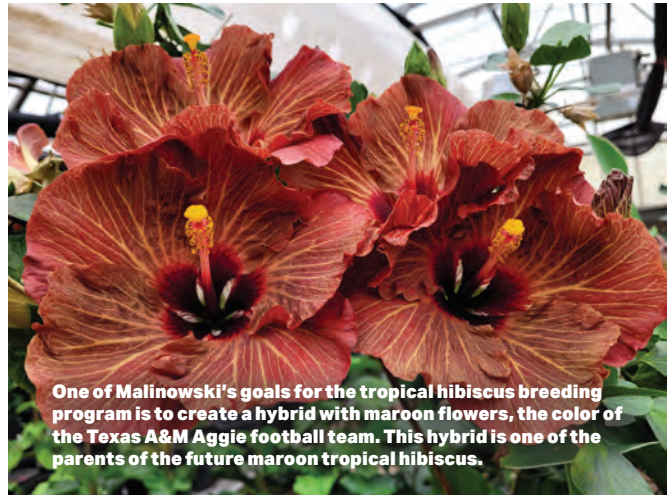
## The next frontier

Having pioneered many novel hardy hibiscus colors including magenta, silver, maroon and purple, Malinowski's next goal is creating orange and yellow pigments that don't exist in this species.

"It seems even more difficult than creating blue flowers, but we have succeeded in achieving the first hybrid with a coral flower color," he says, noting that it will be further bred for improved shape and dark foliage. "This is just the first step, but we're headed in the right direction."

He's also working on serrated petals and multi-petal flowers, with the goal of transferring both traits to his colorful palette of winter-hardy hybrids. Since tropical hibiscus already feature myriad color combinations, that program focuses instead on "novel plant characteristics," like extended blooming time and growth habits suited for hanging baskets.

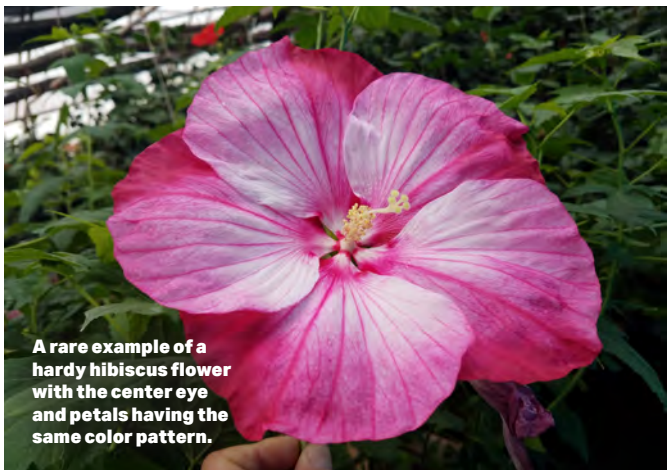
"I still have a few goals I want to complete before retirement," which is about 10 years away, Malinowski says. "Plant enthusiasts keep asking for new cultivars, which ensures that my work is important, noticed and appreciated." **GM**



One of Malinowski's goals for the tropical hibiscus breeding program is to create a hybrid with maroon flowers, the color of the Texas A&M Aggie football team. This hybrid is one of the parents of the future maroon tropical hibiscus.



Bleu Brulee was one of Malinowski's first hardy hibiscus cultivars with bluish flowers commercialized by J. Berry Nursery as a part of the Summer Spice series.



A rare example of a hardy hibiscus flower with the center eye and petals having the same color pattern.

Brooke Bilyj owns and operates Bantamedia, a national award-winning content, PR and SEO firm based in Cleveland. She is a frequent contributor to GIE Media's horticulture publications.

# TOP 10

## THINGS TO KNOW

Here are the top 10 things to know about working with AdeptAg to build productivity solutions for your operation.

1.

### Industry leader

AdeptAg is the leader in Indoor Agriculture Productivity Solutions: helping our customers integrate sustainable solutions to maximize yields and ROI.

2.

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3.

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4.

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5.

### Attractive financing

AdeptAg provides attractive financing options that can provide our customers with significant returns before or during payment terms.

6.

### Industry's best technology

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7.

### Beneficial across horticulture sectors

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8.

### A true partner

AdeptAg is a true partner: listening and collaborating with growers to develop the right solution. We succeed when you succeed.

9.

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10.

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AgrinOmix  
+ Bellpark  
+ Plantech  
+ Zwart  

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= AdeptAg



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# LEAP OF *Faith*



**With demand for workers at an all-time high, green industry businesses may consider formerly incarcerated laborers seeking an opportunity for personal and professional redemption.**

*By Mike Zawacki*


**S**ix years ago, Greater Atlanta nursery owner Eric Hill looked past the records of felony convictions, incarcerations and substance abuse. He saw not burdens but individuals eager for a second-chance opportunity to rebuild their lives, prove their worth and forge a brighter future.

“I needed the help,” says Hill, the owner of Autumn Hill Nursery, a full-service garden center and residential landscape design/build firm, since 1992. “They were just looking for a second chance, and doesn’t everyone deserve a second chance?”

At the time, the Vision Warriors Church had opened down the street from Hill’s Woodstock, Georgia-based business. The nondenominational Christian group caters







to recovering addicts and works with them to find jobs, housing and support in their ongoing recovery while holding them accountable for their actions. Many of these individuals have also been incarcerated at some point in their histories for drug-related crimes.

Hill had always enjoyed mentoring and coaching employees to bigger and better things. This seemed like a similar scenario. After careful consideration, he told Vision Warriors that he needed laborers at his nursery if anyone was interested. Since then, Hill has employed nearly two dozen formerly incarcerated persons (FIPs) from Vision Warriors. Generally, these individuals have been excellent employees who show up every day and do their jobs without incident. Some have even maximized their opportunity at Autumn Hill and excelled beyond expectations.

For example, Drew showed up at Hill's doorstep with personal baggage, a criminal record and zero experience. Three years later, Hill was subsidizing Drew's education to earn a computer sciences degree from the local community college. Then there's Jessie, whose desire to immerse himself in the landscape side of the business impressed Hill so much that he helped him graduate from a local horticultural program. Now, Jessie runs Hill's landscape program.

Hill acknowledges the challenges associated with employing people with criminal records. And while he's never experienced any security or safety concerns with formerly incarcerated workers, some individuals have struggled to integrate. "It's not always easy," he says. "Recovering from addiction is a complex process, and for some, this may not be the right fit at this point in their journey."

Hill's experience is a power-

ful testament to the win-win of second-chance hiring. His formerly incarcerated employees, eager to rebuild their lives, have consistently impressed him with their dedication and work ethic. These success stories offer valuable lessons for the green and horticultural industries facing a seemingly chronic labor shortage. Multiple national studies showcase the undeniable benefits of employing individuals with criminal records, presenting compelling evidence for business owners to tap into this available reservoir of forgotten talent.

First, consider that an estimated 1 in 3 American adults — more than 70 million people — carry a criminal record, and more than 600,000 men and women are released from incarceration each year. Burdened by the stigma of a felony conviction, nearly 75% of formerly incarcerated individuals remain unemployed a year after release, according to the ACLU. Many people with criminal records are underemployed or in insecure jobs, and talented, motivated workers who are widely available are being ignored and stigmatized by the broader workforce.

However, when provided with a second chance, these laborers tend to thrive, benefiting the individuals, the companies that employ them and the communities around them.

The impact is transformative for formerly incarcerated persons. Employment offers a fresh start, allowing them greater opportunities to provide for themselves and their families successfully. Research from the U.S. Chamber of Commerce shows that employed individuals are twice as likely to avoid arrest two years after release compared to their unemployed counterparts. This highlights the critical role employment plays in reducing recidivism.

And the benefits extend far beyond the individual. The U.S. Chamber report, "The Business Case

for Criminal Justice Reform: Second Chance Hiring," emphasizes that connecting ex-offenders with employment strengthens communities by lowering recidivism and fostering a more skilled workforce. This translates to a significant economic impact, and the report estimates the U.S. GDP loses \$78 billion to \$87 billion annually by excluding formerly incarcerated people from employment opportunities.

Real-world success stories, like those experienced at Autumn Hill Nursery, demonstrate the potential for the green and horticultural industries. For example, Nehemiah Manufacturing, a Cincinnati-based consumer packing firm, provides a compelling testimonial to the value of employing the formerly incarcerated. Since 2009, 80% of its workforce (180 employees) has had criminal backgrounds. Yet its annual turnover rate is just 15%, significantly lower than the industry average of 38.5%.

Despite the positives, substantial barriers persist, says Melissa Dickerson, chief of staff at Honest Jobs, a leading national job board dedicated to connecting individuals with criminal records with second-chance employers who value skills and potential and provide opportunities without discrimination and bias. Hiring people with criminal backgrounds includes concerns about legal liability, safety, risk and the potential impact on the company's brand and culture if it is discovered that some employees are "ex-cons."

If a green industry business owner plans to tap into the formerly incarcerated labor pool, Dickerson suggests making it a component of their company's culture. This includes educating their teams and communicating what fair-chance hiring means to the company and what offering employment regardless of criminal background represents.

## PROS ON CONS

There are several benefits to hiring formerly incarcerated persons (FIPs) that can contribute to a positive value proposition and return on investment (ROI) for green industry businesses. Here's a breakdown of seven key points to consider.

- **Talent Pool.** FIPs represent a significant and untapped pool of potential employees. They often have valuable skills and experience gained through previous work experience or vocational training programs while incarcerated.
- **Diversity and Inclusion.** Hiring FIPs can help diversify your workforce, leading to increased creativity, innovation and problem-solving abilities.
- **Loyalty and Work Ethic.** Studies have shown that FIPs can be highly motivated, loyal employees with a strong work ethic due to their appreciation for the opportunity and a second chance at achieving success.
- **Reduced Turnover.** Lower turnover rates can lead to significant cost savings for businesses.
- **Tax Credits and Incentives.** Many government programs offer tax credits and incentives to businesses that hire FIPs.
- **Reduced Recidivism.** Hiring FIPs can help reduce recidivism rates, leading to cost savings for communities.
- **Positive Public Image.** Committing to social responsibility can enhance your company's public image and brand reputation.

"A lot of people assume that an employer who participates in fair-chance hiring is going to hire anybody with any type of record," Dickerson says. "And that's very rarely the case. Even with fair-chance hiring [practices], employers are still looking at people's backgrounds to ensure a person is suitable for the job and that there isn't anything in their background that might conflict with the job, their duties or the company's mission."

"It's important to communicate to employees that not everybody with a criminal record is dangerous or should be concerned about," she adds. "They're just human beings who made mistakes, wound up with criminal records and now can't find jobs."

Neal Glatt has had extensive experience employing and working with formerly incarcerated persons during his time in the professional landscape and snow and ice management industries.

"Our industries are ignoring many talent pools — the uneducated, the inexperienced, part-time workers, retirees and those who were incarcerated and have felony records," says Glatt, who is now a business coach and management consultant with GrowTheBench, which caters to the landscape and snow industries. "I'm very passionate about creating high-quality employment and high-quality outcomes for people, and that means viewing [formerly incarcerated persons] as people and giving them the benefit of the doubt."

While Glatt advocates second-chance hiring in the green and horticultural industries, he is also a strong proponent of "open hiring," which eliminates questions about an individual's personal history that could bias an employer during the hiring process.

"Cosmetics retailer The Body Shop famously asks only three questions: Can you work legally in the U.S.? Can you stand on your feet for eight hours? And can you lift 50 pounds? If the answers are yes, yes, yes, then when a job comes up, they employ you," Glatt says. "Of course, their cost to hire was like 90% cheaper, and their employee retention and performance rates [were above average], too."

Like Dickerson, Glatt emphasizes integrating these fair-chance hiring practices into a company's overall culture. This shift fosters a more inclusive and supportive work environment for everyone. Moreover, many positions in nurseries, greenhouses and garden centers don't require extensive training and often involve minimal customer interaction. This presents a unique opportunity to tap into an alternative talented pool of individuals eager to contribute and rebuild their lives.

Glatt and Dickerson are clear: Safety remains paramount. They don't advocate hiring anyone who could threaten colleagues, customers or clients. However, it's essential to consider the context of many criminal records. Many jobseekers with past offenses committed them as young adults, often involving drug-related mistakes or substance abuse issues. Today, they're focused on rebuilding their lives and becoming productive members of society.

Glatt reinforces this point: "The idea of 'once a felon, always a felon' is being proven wrong." While there's a moderate return-to-incarceration rate upon release, studies show that providing the formerly incarcerated with employment opportunities significantly reduces that number, bringing it below 10%, Glatt says. This highlights the power of second chances in breaking the cycle of recidivism.

Studies show that more than 80% of employers report that their formerly incarcerated workers perform the same or better than the average general population worker, Glatt says. In addition, these workers are proving to be prime candidates for education, development and management training. In the end, he adds that formerly incarcerated employees make significant contributions and stick around with their employers for the long term.

"The performance and retention opportunities [with the formerly incar-



cerated] are really significant,” Glatt adds. “There are really positive outcomes happening out there if you’re willing to overlook [an individual’s] background and invest in some skills training. All I’m asking is to judge people for who they are now and how they’re acting today rather than what’s happened to them in their past.”

With second-chance hiring, businesses gain access to a motivated, dedicated and often untapped talent pool, while formerly incarcerated individuals get a structured path to begin rebuilding their lives. The key lies in creating a fair and inclusive hiring process.

However, navigating the legal landscape is crucial. Hiring laws regarding criminal background checks and what questions can or must be asked vary by state. Dickerson emphasizes the importance of staying informed about employment laws to ensure compliance. Beyond legal compli-

ance, there’s an important human element. Dickerson acknowledges that employers must shift their perspective to move beyond traditional hiring philosophy and embrace a leap of faith with second-chance candidates.

“Personally, I think anything that helps to provide opportunities for people to prove themselves as the best candidate before that bias is introduced is a good thing,” Dickerson says. “Unfortunately, [a felony conviction] does lead to a lot of rescinded offers because people go through the interview process and are selected as the best candidate, but then the background check is done, and the offer is rescinded.

“If an employer sees that they’re consistently rejecting the best applicants because of their backgrounds, then maybe they need to look at the types of background they’re excluding people for,” she adds.

Autumn Hill’s Eric Hill bristles at the notion that hiring formerly incarcerated people somehow labels him a “Good

Samaritan.” He admits his need for labor drove his initial decision. And he would not have jeopardized his nursery and brought someone on board if they’d been involved in a violent crime. But a lot of the guys who came to him over the years did time as young men because of drug-related offenses. Recognizing the potential for rehabilitation and growth, Hill felt he could look past those transgressions. Over time, the majority of those he hired proved him right.

“Yes, the risk has been well worth it, and I would encourage others to do it, too,” he says. “I’m 60 years old, and I’m still trying to learn how to be more empathetic [toward others] and how to put myself in their shoes. And sometimes, when you’re in the position to help, well, you help.” GM

Mike Zawacki is a Cleveland-based writer and editor who has spent the last 20 years covering various aspects of the green and horticultural industries.



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By James Owen Jr.  
and James Altland

# pH got you down?

Here is a foolproof way to achieve your optimal pH.

**D**oes your substrate pH have you on a rollercoaster with unwanted ups or downs? This article is for the greenhouse or nursery manager responsible for substrate mixing. Below is a simple procedure for more accurately predicting the necessary lime rate to reach a target pH for any substrate. The A+ method is a modification of a procedure developed by James Altland, refined by Erin Lowe, biotechnician extraordinaire, and further modified by Drs. Altland and James Owen Jr. at the USDA Agricultural Research Service Application Technology Research Unit Laboratory in Wooster, Ohio.

This procedure works with any combination of substrate components and amendments. It starts by accurately preparing 8 liters of your amended substrate. That 8-liter batch is moistened before being divided into 1-liter batches and amended with a range of lime rates. Finally, pH is measured, allowing you to accurately predict any lime rate to reach a target pH. Below is the step-by-step process to optimizing your pH using the “A+ method.”

## **Making and measuring unamended substrate using your components (2 options)**

**Option 1:** Premade substrate: Loosely fill a 4-liter pitcher (Photo 1) to the 4-liter (or 4000 mL) mark using unamended substrate comprised of your components (i.e. peat, bark, coir) in its correct proportions. Lightly tap or drop the container to set bulk density before filling again to the 4-liter mark. Repeat filling the 4-liter pitcher so that you have a substrate pile containing a total of 8 liters of substrate.

**Option 2:** Making your own substrate: Construct a pile of your substrate in the correct component proportions (i.e. peat, bark, coir). For example, a 30% (by volume) peat amended bark substrate would be three scoops of loose, moist peat and seven scoops of moist bark. Then mix the substrate until it visually appears and feels the same as your typical substrate before measuring the 8 liters of substrate as described above.

## **Amend your substrate with pre-plant fertilizer amendments (e.g. micronutrient packages, water soluble nutrients, etc.)**

1. Dump your container on the potting table or concrete.
2. Spread out substrate into an approximately 6-foot by 4-foot square.
3. Using any digital scale, weigh out 4.7 grams of your amendment for each pound you would add to a cubic yard (27 cubic feet). For example, if you normally add 1.5 pounds per cubic yard of granulated micronutrients, you will add 7.1 grams of micronutrients to 8 liters of substrate ( $1.5 \times 4.7 = 7.1$  grams).
4. Apply the pre-measured amount of each amendment (e.g. mineral nutrients, aluminum sulfate), except lime or dolomite, by “salt and peppering” the surface of your 6-foot by 4-foot square of substrate.
5. Incorporate your amendments by table mixing; this is accomplished by moving the pile three times from one location to another in small scoops, pouring atop the pile to let it homogenize.

PHOTOS COURTESY OF JAMES OWEN JR. AND JAMES ALTLAND



6. Add irrigation water to substrate and continue mixing until moist, but no free water is visible. The substrate will feel relatively moist in your hand but not make your hand wet when handling.

### Adding multiple rates of lime or dolomite

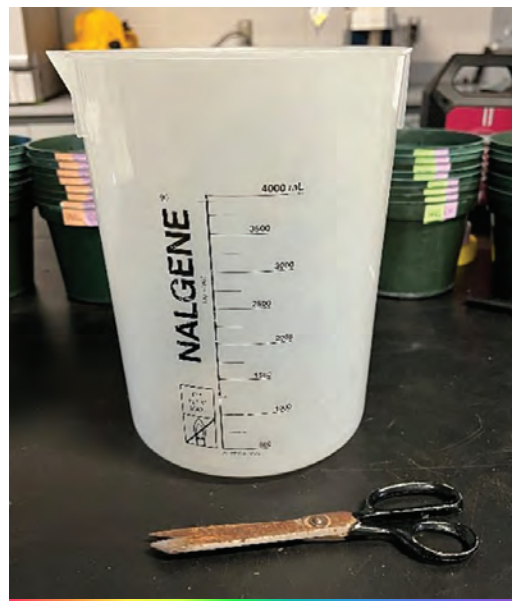
7. From your 8-liter pile of amended substrate, create sub-batches by accurately dividing the larger pile into 8 separate 1-liter piles.
8. Gather eight 1-gallon Ziploc bags. Using a permanent, water-resistant marker, label one bag "0 pound per cubic yard." Fill the bag with 1 liter of substrate and set aside. After testing, this will reveal the baseline pH of your substrate blend without added lime.
9. Label an additional four (or up to seven) 1-gallon Ziploc bags with a permanent, water-resistant marker to indicate the lime rate. This rate can be anywhere from 1 pound per cubic yard and up. Place each bag beside its own sub-batch pile.
10. Using the data in Table 1 (lower right), add lime or dolomite for each individual rate to a corresponding substrate sub-batch pile. For example, adding 1.2 grams of dolomite to a 1-liter sub-batch will give you an effective rate of 2 pounds per cubic yard.
11. Mix in the lime or dolomite into the 1-liter sub-batch pile for 30 seconds to a minute or until thoroughly blended.
12. Further moisten the lime or dolomite amended sub-batch pile with irrigation water as needed to ensure you have consistently moist (not wet) amended substrate mix.
13. Place each mixed 1-liter sub-batch pile of substrate into its own appropriately labeled 1-gallon Ziploc bag.
14. Let sit for 72 to 96 hours.

### Measuring pH

15. Add 1 liter of your irrigation water to each prepared Ziploc bag.
16. Let sit for a minimum of 60 minutes and no more than two hours.
17. Calibrate your pH probe while waiting.
18. Stick your pH probe into the Ziploc bag holding your prepared slurry of one part substrate and one part water.
19. Record pH from each Ziploc bag, noting rate of lime or dolomite added.
20. Rinse pH probe before moving to next Ziploc bag and repeat steps 18 to 20.

### Identifying your lime or dolomite rate to achieve your desired pH

21. Enter data into Microsoft Excel (or Google Sheets) using two columns: one column for the substrate lime rate and one column for the corresponding measured pH.
22. Plot data in Excel by first clicking on "Insert" at the top left, highlighting data and choosing the charts icon with only dots. Then, right click



**Photo 1:** Pitcher used to measure out 8 liters of substrate in 4-liter increments.

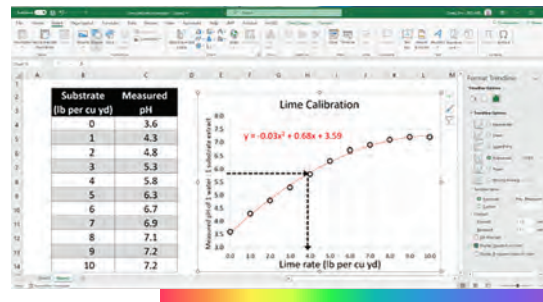
<b>Lime/Dolomite (g per 1000 mL)</b>	<b>Substrate lime rate (lb. per cu. yd.)</b>
0.6	1
1.2	2
1.8	3
2.4	4
3.0	5
3.6	6
4.2	7
4.7	8
5.3	9
5.9	10

**Table 1:** Lime or dolomite rate to apply to each liter or sub-batch of substrate to achieve desired lime rate on pound per cubic yard basis.

## Substrates

and add trendline. Choose a linear or polynomial trendline from format trendline on the right side of your screen. Data will typically “best fit” with polynomial. If wanted, you can also add the equation from the trendline.

23. Find the optimal pH on the y-axis (left vertical axis) and follow



**Figure 1:** Example of a Microsoft Excel spreadsheet to illustrate data entry, chart and trendline lime or dolomite rate and subsequent pH of 1 substrate to 1 water extract. In this example, the desired pH of 5.8 would be obtained with approximately 3.9 pounds per cubic yard of lime.

parallel to the x-axis (horizontal bottom axis) to where it intersects your curve on the graph. Then move straight down to the x-axis to determine the optimal lime rate. An example is provided in spreadsheet image (Fig. 1), with intersecting dashed lines indicating an optimal pH of 5.8 using 3.9 pounds of lime per cubic yard.

### Utilizing the data

Now you have a standard operating procedure. Keep records of the substrate composition, amendment labels and rates, as well as the label for lime or dolomite used. Repeat the A+ method to identify optimal liming rate when any changes occur to your substrate composition, source, texture, age or chemistry of amendments, including lime or dolomite. Track changes of pH curves and corresponding in-field monitoring (e.g. pour-through method) over time. The combination of these factors will allow you to track the consistency of your substrate pH throughout the season. GM

Drs. James Owen Jr. and James Altland have worked together for two decades to understand and improve soilless substrates utilized in greenhouse and nursery production. Together, they run one of the most advanced soilless culture labs in the United States, located at the USDA ARS Application Technology Research Unit Laboratory in Wooster, Ohio, where they optimize existing or create new methods to measure and monitor the physical, chemical, biological and hydrological properties of soilless substrates. USDA ARS Bio-technicians Erin Lowe, Hannah Blice and Leslie Morris are integral to employing these methods and their ultimate success.

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Education

A new program at York College of Pennsylvania is training the next generation of horticulturists.

BY **MATT MCCLELLAN**

APPELL HORTICULTURE CENTER

NEWB



**O**n the campus of York College of Pennsylvania, students in green polo shirts walk to and from classes. They're the first group of students enrolled in the college's Environmental Horticulture Program, and they've been learning through classroom work and hands-on experiences since the program began in the fall of 2021.

"This is a brand-new kind of program for

our college," says Charles MacVean, dean of the Kinsley School of Engineering, Sciences and Technology at York College. "We've been strong for many years in the sciences and in engineering, and now we're adding this new program in horticulture, and the aim is to provide a program that is somewhat different than a traditional land-grant program."

There are a few differences MacVean points to with York College's program, such as an emphasis on sustainability

and global impacts of horticulture. Students will study how global phenomena like climate change, water scarcity and energy resources impact horticulture.

"Traditional horticulture has focused on production and yields," he says. "Programs have been changing somewhat, but it's much harder for them to change than us, because we're designing it from scratch."

Another difference between the Environmental Horticulture Program York College has designed and a traditional program is that York has an emphasis on urban and greenhouse production, which is compatible with urban landscapes. York College as a whole has committed to "experiential education,"







Students get hands-on experience at Millbourne, the Appell estate.



MacVean says, which is a perfect fit for horticulture and today's student.

"Students aren't just looking for a degree as a credential, the old way many of us went to school, which was you get a degree from a well-ranked institution, and you're going to be in good shape," he says. "Now, students want to know a lot more about what the experience is going to be like day in and day out. They want to see themselves at a particular campus and what their life is going to look and feel like."

### The Appell legacy

The fully endowed program was the gift of Louis Appell Jr., who was a wealthy businessman in York with a love for horticulture. He and his wife maintained a 50-acre estate, known as Millbourne, with gorgeous formal gardens. It was their intention that their inheritance in the estate endow a program that would promote horticulture in York.

After Louis passed away in 2016, this plan was set into motion. York College provided a proposal to the Powder Mill Foundation, which is funded by the Appell estate. The foundation decided to fund it, and York College's Environmental Horticulture Program was born.

The environmental horticulture major offers a broad level of training for careers both in landscaping and production, with a strong environmental focus and a component of global awareness.

"We want our graduates to be quite versatile as to where they go next," says Jason Smith, an assistant professor for the Environmental Horticulture Program.

The major also includes some requirements in entrepreneurship, because the college believes that business skills are going to serve its graduates well.

"A lot of people find their way into this work because they love plants, but probably a smaller proportion come into the industry because they love business and see the potential here," Smith says.

When the college performed initial feasibility studies before designing the program, trends suggested that enrollment in this kind of program is increasing in the U.S. And if student interest is growing, there may be enough interest to support the program.

"There's certainly a lot of data today, especially since the pandemic, suggesting that we have a public right now, a consumer base that values the products of the green industry more than they did 10 years ago," Smith says. "So the combination of these things gave them the confidence (to create the program)."

### A fresh start

Construction was completed in the fall on the Appell Horticulture Center, a 10,700-square-foot addition that houses the program. Funded with a multimillion-dollar commitment from the Powder Mill Foundation, the Appell Horticulture Center was built to accommodate the growing Environmental Horticulture Program.

The college celebrated the opening of the new building at an Oct. 12 ribbon-cutting ceremony. Jody Appell, Louis' 99-year-old widow, attended the event. The first cohort of students who enrolled in the major were also in attendance, and junior Hannah Zinn of White Hall, Maryland, addressed the audience.

"The horticulture program at York offered exactly what I was looking for with engaged and passionate faculty, great opportunities and fantastic connections to be made," she said at the event. "It's

been a great experience thus far, but I'm beyond excited for what this new building has to offer."

The two-story building includes spaces for teaching, research and student collaboration. The center features three laboratories: one for studying soils, another for plants and insects and a third devoted to student research.

"We have specialized places for those disciplines," MacVean says. "The building is designed around a really high-quality, hands-on experience for students and faculty."

The building also has study spaces, meeting rooms and faculty offices, as well as a living wall and plant display area where students can learn more about plants and their role in the environment.

The Environmental Horticulture Program also offers hands-on learning opportunities at Millbourne, the Appells' 50-acre private estate in York.

"It's a beautifully landscaped living laboratory for ornamental horticulture," MacVean says.

The students in the program have already visited the estate several times, observing plants alongside the professional groundskeepers of the estate's ornamental gardens and working with faculty to connect the dots between classwork and the real world.

MacVean says there are plans to build some specialized lab space on the Millbourne estate.

### A rich curriculum

The concepts behind the York College Environmental Horticulture curriculum map aren't terribly different from traditional horticulture programs. Students will still learn the basic scientific underpinnings of plant production.



"We've certainly maintained the coursework that spans everything from introductory plant science to advanced plant biotechnology with soil science and plant pathology and entomology in the mix, along with greenhouse management and ornamental and landscaping plants," MacVean says.

The four-year bachelor's degree program starts by building the foundation, like most horticulture programs. Courses include plant science, botany, plant pathology, entomology and integrated pest management. Once students have completed the foundational courses, they move into more industry-specific higher-level courses, like greenhouse and nursery operations and sustainable horticulture. But the secret sauce that differentiates York College's program from others is the business education element, like courses on entrepreneurship and small business management.

"Several decades ago, it became apparent that programs in agriculture were becoming noncompetitive," MacVean says. "They were not attracting students because the graduates didn't have any kind of business skills. Employers and the ag industry as a whole were looking for graduates who could do some management and handle some financials."

Another difference between typical horticulture programs and the York College model is that instead of requiring multiple semesters of chemistry, for example, students would take an introductory course, then continue learning chemistry in the context of their horticulture courses.

Jason Smith provides an example of a project his students did as part of their coursework.

They visited a local vegetable farm, talked with the growers and learned about fields that are performing well and fields performing not as well. Their goal was to figure out what set the best fields apart from the worst ones.

Next, the class brought soil samples from the farm to their lab. They performed standard soil tests, using parameters like soil pH and mineral content, then looked further into non-traditional soil health metrics, like soil activity and restoration and soil aggregate stability under a rainstorm.

After analyzing this research and determining how well the soil was structured, its aggregation and how well it held together, the students compiled that with the mineral and pH information and generated a report with recommendations for the local farmers.

"I think that was a great project," Smith says, "because in a way, it encapsulates that what we're trying to do here is not just study the science of soil and plants, but do so in a way that's relevant to horticulture that's going on in an industry around us."

### Finding students

Recruitment is one of the biggest challenges for York's fledgling Environmental Horticulture Program. There are currently 12 students enrolled, and MacVean expects another 10 next fall if the trend continues. The program was not designed to ever be a big program, but MacVean says it could accommodate higher numbers of students, especially now that the Appell Horticulture Center has opened.

While plant production is vital, the college opted for a major with what they hope has broader appeal.

"We are hoping that the environmental message will help with recruitment and then obviously help with the kinds of graduates we send out to the world who are going to impact the ecosystems around them professionally," Smith says.

"I think one of the realizations they had is they probably weren't going to be able to sell it as a straight ornamental horticulture program, and that actually was Louis Appell's first love: ornamental horticulture. But I think they felt like to make this a program that would appeal to as many students as possible, including edible horticultural production was going to round that out. And there is demand

for horticulturists who can work internationally in food production. There's a lot of job opportunities there."

MacVean says there has been an increase in the number of students coming to open houses.

Staff has been visiting local high schools and planning outreach for the region to develop its reputation. York College isn't yet known for agricultural programming, let alone horticulture.

"We knew it would start small," MacVean says. "Both the consultants we hired and our own admissions department told us with any new major, it would take three years to start seeing growth."

In that way, growing the next generation of horticulturists has something in common with growing plants at a nursery. **GM**

**FOR MORE:** [bit.ly/YCPenvhort](http://bit.ly/YCPenvhort)

Matt McClellan is editor of *Nursery Management* magazine. Contact him at [mmcclellan@gie.net](mailto:mmcclellan@gie.net).



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# Webpage refresh

*How to take a fresh look at your website to ensure your customers and users are getting the most from your digital presence.*

**By Wendy Hatoum**

It's natural to think that everyone who uses your website will experience it as you do. But because you're so familiar with it, you may be missing some easy ways to improve its usability that could boost sales *and* make sure it is ADA compliant.

## Look at common website user tasks

When was the last time you actually tried using your website as if you were a customer? I challenge you to write out three or four of the most common tasks your customers accomplish every day. Some examples:

- Search for all the lavender/salvia/insert-your-product-here currently available.
- Create an account.
- Figure out when something will ship, before purchasing.
- Add three flats of one product and two items of another product to your cart.
- Find and review your guarantee policy.
- Check out using PayPal, Apple Pay or other alternative payment types.

Now, try doing all of these tasks on your cellphone. If you

find it frustrating, you can expect your customer will find it doubly so. After this process, I suspect you'll quickly get a short list of mobile fixes for your web developer.

Next, ask a friend who is not familiar with your website to do those same tasks on the desktop version while you watch them. (Make sure to reward them with some plants or a nice bottle of their favorite beverage!) Note where they struggle and add this to your list of website fixes.

## Consider professional usability testing

If you have the budget, you can outsource professional testing. There are several tools to do this, but I'm most familiar with Hotjar. You give them tasks to complete (like those above), select the level of website competence (choose the middle, neither expert or novice) and they provide video feedback from users. You may want to specify that users have some familiarity with gardening/plants — or not. These recordings of site interactions can be especially illuminating, particularly when someone who isn't familiar with your site is using it. What seems second nature for you may be insurmountable for them.



## Sluggish site? The number one reason is...

If you're routinely uploading images that are in the 10MB range (easy to do with cellphone photos), your site will eventually slow to a crawl. Your images should be optimized for size (shoot for around 600KB), so your site loads quickly. The tool Canva makes it straightforward to optimize online images.

Include alt text (text that explains the image) to make sure that a screen reader can parse the page for people with visual disabilities.

## Optimize your text and stop centering it right now!

Multiple studies point to left-justified text as being easier to read — just like this article! Avoid using center-justified text, except for headlines or short subheads.

Text needs to be large enough to be easily readable — 14-point text is typically the smallest you'll want to use. Users will spend more time on your website if the text size doesn't strain their eyes.

## Understand CTAs and know what makes them pop

You'll want to make sure your links and buttons stand out. Known as CTAs (Calls to Action) — a.k.a. “the thing you want people to do” — they should draw attention, directing the user to act. Make sure you have one on every page. Examples are: Log In, Learn More, Shop Now, Add To Cart, Buy Now or Checkout Now. Ideally, links and buttons should all be the same color, signaling to the user that they are clickable. Try adding a caret > to the CTA: Buy Now >. When testing, we've been seeing higher click-through rates with this character added.

## Examine the colors you use

Examine the colors you use and make sure there is enough contrast. Dark websites were all the rage once, and while white text on a black background can look dramatic, studies have shown that it is more difficult to read than dark text on a light background.

Make sure to account for those users with red/green color blindness. One of my clients was using lime green buttons with hot pink headlines. For someone with color blindness, there wasn't much of a difference in the contrast — the buttons blended into the page. Here's a great resource to check text contrast: [webaim.org/resources/contrastchecker](http://webaim.org/resources/contrastchecker)

## Why ADA compliance matters

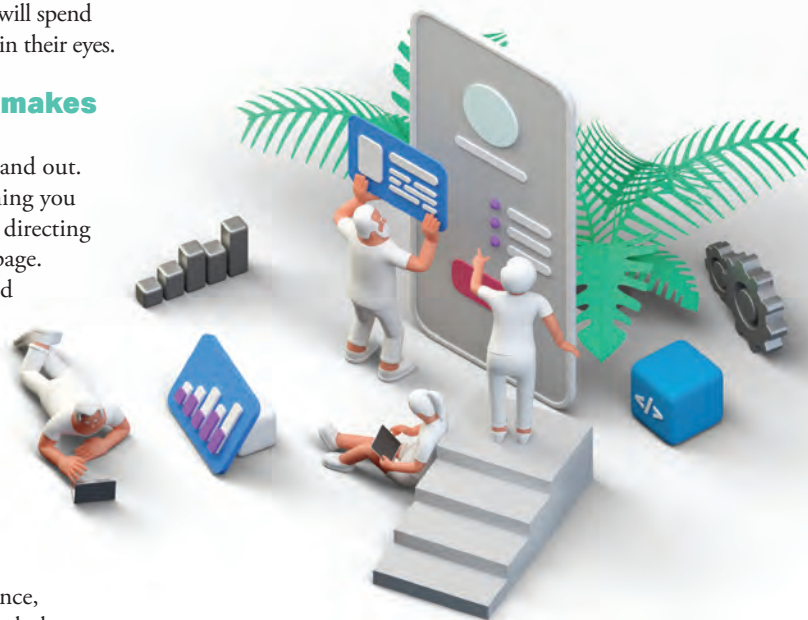
Making your website ADA compliant won't just benefit people with disabilities — it will make it more usable for *everyone*. If that isn't reason enough, consider that you could be fined tens of thousands of dollars for a non-compliant website, a potentially huge liability. I personally know of a company that was

fined \$50,000 for ADA violations. I've heard of several similar stories within the green industry. Check accessibility here: [accessibilitychecker.org](http://accessibilitychecker.org)

## Prioritize your list

Regarding ADA compliance, oftentimes usability issues can be resolved by making small tweaks to the CSS (the single stylesheet that controls how the entire website looks). In less than an hour of dev time, you could change the background color, text color and font size to meet standards.

Next, look at the list and ask yourself: What changes will deliver the most impact? Often, that means revenue. Definitely focus on the “low-hanging fruit” that leads directly to more dollars in the door. It might also mean gathering email addresses at the checkout/site footer so you can continue to engage with your customers in the future.



## Don't make me think

Last, I would recommend an excellent book: “Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability,” by Steve Krug. Now in its third edition, it is one of the original sources on web usability. I first read this book about 15 years ago, and the lessons are still with me. The premise: Don't add any friction to the experience of using your website. Users only have so much mental bandwidth, and if your site isn't intuitive, they often will give up in frustration. It's a slim book that can be read in an afternoon, but it will change your perspective on websites and the digital world. **GM**

Wendy Hatoum is the email marketing director for The Garden of Words agency. She has worked in digital marketing for more than 15 years.

# Planting for biocontrol

*How conservation biocontrol can help you keep pests at bay through thoughtful planting. By Suzanne Wainwright-Evans*

**T**he advancements in augmentative biocontrol have been truly remarkable over the decades. However, today, numerous growers, whether indoor or outdoor, are actively exploring methods to utilize their local beneficial populations through conservation biocontrol.

## Conservation versus augmentative

Conservation biocontrol is a term used when growers use local beneficial populations by planting insectary plants that attract and sustain beneficial insects. These plants provide food resources such as pollen and nectar or other resources. Additionally, growers are very selective about pesticide applications, selecting products that will have minimal impact on these local beneficials yet provide control or suppression of target pests.

The process of conservation biocontrol differs from the augmentative biocontrol practices of indoor growing facilities that buy beneficial insects and mites from commercial insectaries and release them into their system. But recently, many growers are now adopting a combined program that integrates both of these strategies to get the best of both worlds.

There are several benefits to the conservation biocontrol approach. One is that regional beneficials are well-adapted for the local environment, and research has shown they tend to be more pesticide-tolerant than commercially reared beneficials. Another benefit to having the insectary plants around is they provide a habitat for mating, egg laying and refuge to hide from other predators beyond the pollen and nectar they provide.

## Beneficials that can be attracted with insectary plantings



**Flower flies (Syrphidae)**  
-Adult pollinators, predatory larvae



**Ladybird beetles (Coccinellidae)**  
-Predatory and pollen feeders



## Overcoming conservation biocontrol challenges

It can be challenging to learn to identify the local beneficials and make sure you are not rearing pests. But one of the harder challenges is selecting the right insectary plants.

The first thing to consider is site selection. Find a place where these plants have the right environment to grow, including adequate irrigation. Think about pesticide application, too. Will the plants be in an area where drift could be an issue? Often, outdoor grassy strips will be selected for conversion, or maybe a berm on the edge of the property. These planted areas are referred to as insectary strips.

For the inside of a greenhouse, this can be done in large containers placed on benches or hanging planters. You may think that this may not work in the greenhouse environment, but many greenhouses have openings to the outside that allow local beneficials to come in. Greenhouses can also plant these resource plants outside of their greenhouses. Studies have shown that this can increase beneficials inside the greenhouse.

## The art of insectary plant selection

When it comes to plant selection, there's no easy, go-to list to use. You're going to have to do some homework. So, search for plants that can provide pollen and nectar resources but don't turn into a breeding ground for key pests of your crops. If possible, select insectary plants that are from different families than your crop to try to prevent sharing pests.

We know that pollen can be an important part of some beneficial insects' diets, but not all pollen is the same. Pollen can vary greatly in its percentage of protein and amino acids de-

pending on the plant. Also, some of today's cultivars may have had the pollen bred out of them, resulting in sterile plants.

We see this with *Lobularia*. This is a very popular insectary plant indoors and out. It is used outdoors in field vegetable production and indoors in pots for floriculture. It feeds beneficials like the minute pirate bug (*Orius* spp.) and parasitic wasps. The seed varieties have pollen, whereas the vegetatively produced plants do not. In the greenhouse, growers often like the plants without pollen because it reduces western flower thrips (WFT) reproduction.

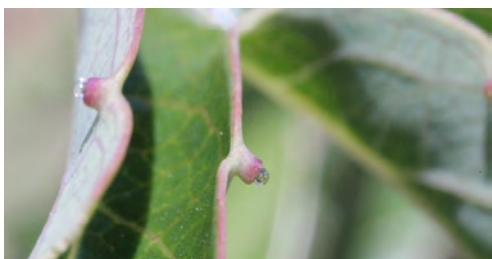
Sometimes it is better to look at heirloom or seed varieties of plants that may provide better pollen resources. A word of warning, though: You don't want to select plants that can easily go to seed and then become a weed problem. Also, some heirlooms can grow quite tall and may not work in a container situation.

Bloom time should also be looked at when making plant selections. It is best to have a continuous bloom cycle if possible. Some plants can bloom all season (this is why *Lobularia* is so popular). Others have shorter bloom times, but do not discount plants that are not in bloom. Studies have shown that just having plant diversity will attract beneficials. Having diverse flower sizes, from very small, like Queens Anne's lace, to large, like sunflowers, will also attract different beneficials.

Beyond just flower structures, some plants have what are called extrafloral nectaries (EFN). These are glands found on plants outside of the flower structures that provide nectar. They are like mini-feeding stations. According to the University of Florida, more than 2,000 plant species in 64 families have EFNs. Passion flowers, hibiscus, sunflowers, peonies, buckwheat and



**Minute pirate bugs (Anthocoridae)**  
-Predatory and pollen feeders



**Extrafloral nectaries are present in numerous plant species. Here you can see them on a passion vine producing nectar.**

many others have these useful structures. Using plants with EFNs can provide nectar even when flowers are not present.

### Planting tips

One way to get a head start on pests is to “seed” these insectary plants with commercially produced beneficials. If choosing to do this, make sure there is food for the beneficial you are putting out, or they will just starve to death.

If planting strips outdoors, perennials may be more expensive upfront but in the long run can be more economical. They will also provide an overwintering site for beneficials. Once again, you also have to make sure that they do not also provide an overwintering site for pests, but more and more research is showing the benefits of habitat for beneficials outweighs the risk.

One group that has been working with many outdoor agricultural systems is The Xerces Society. Looking at the work they have done in outdoor agricultural systems, growers can try to adapt this information to the ornamental market. On their website ([xerces.org](http://xerces.org)), you can search regional plant lists of native species that will support pollinators and beneficials.

Additionally, some universities have been trialing plants. Penn State found in their 2013 pollinator trials that Clus-

tered Mountain Mint (*Pycnanthemum muticum*) had some of the highest numbers of insect visitors, with a very high number of flower flies (Syrphid spp.). Often, people think of beneficial insects as meat-eaters, not recognizing that many are actually omnivores. The flower flies are amazing pollinators because in their adult stage, they feed on pollen and nectar, but in their larval stage, they are predatory. Another example is ladybird beetles (ladybugs). They are known to be excellent predators, but some species require significant amounts of pollen in their diet.

What to do if you cannot find a plant list for your environment? Try planting an assortment of plants, including different sizes and shapes of flowers with different bloom times. Keep in mind plant size if planting in pots. Then do some simple observation. Take a few minutes each day to watch the plants and see which ones are getting visitation by beneficials.

Insectary plantings may not suit every facility, but when the conditions are right, they can significantly enhance your pest management program. Planning is crucial, as is dedicating time to their care and observation to prevent them from becoming problematic. GM

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# Are you *covered?*

Protect yourself along with your business by ensuring you have the right insurance.

*By Wendy Helfenbaum*



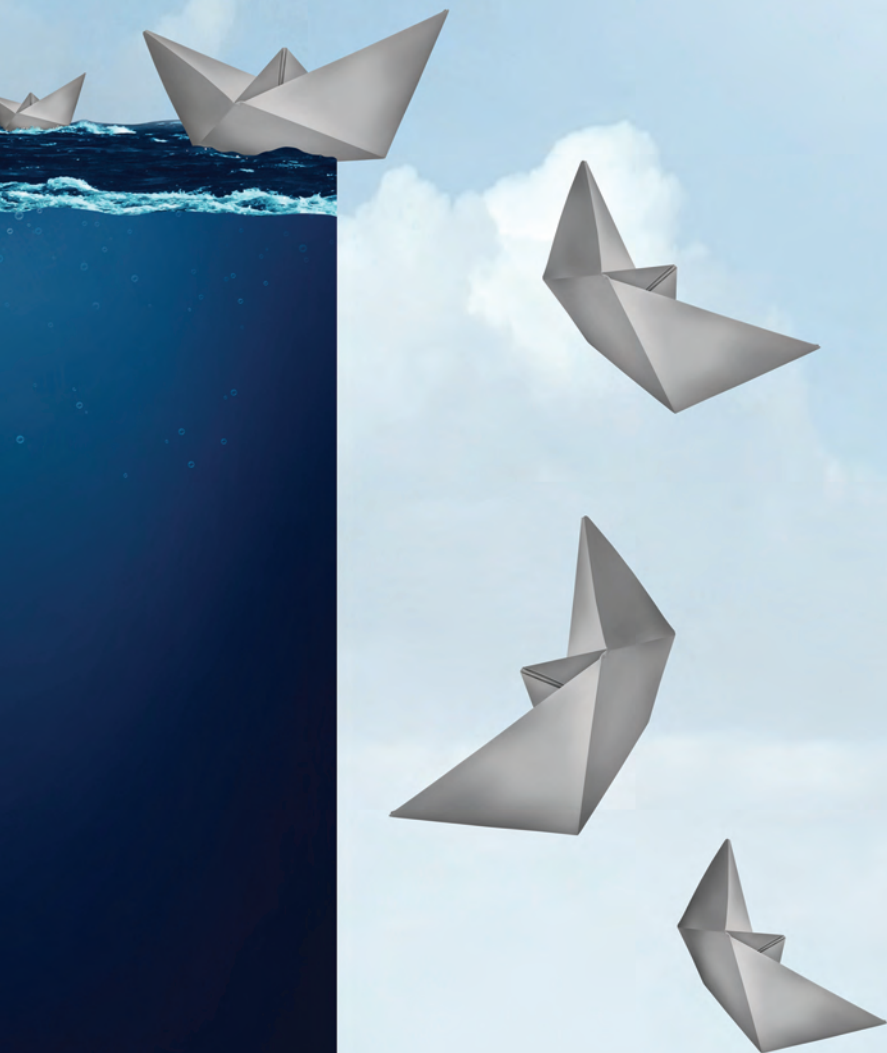
**G**rowers worry about fire, theft, floods and hurricanes, so commercial insurance is one of the first things that gets ticked off the to-do list when buying or launching a business. But did you know that most business insurance policies won't cover you, the owner, if you get injured, fall ill or must take a leave of absence to care for a loved one? And depending on where you live, workers' compensation won't pay out if you fall off a ladder or are in a car accident, so you can't make a claim to replace lost income. Here's how to get peace of mind.

## **Beyond the basics**

When you call an insurance broker, they'll begin by advising you about what policies the laws in your state require you to hold, such as property, liability, business, auto and workers' compensation (in states where that's mandatory).

Growers often don't realize that while a commercial liability policy protects your premises, stock and operations against most natural disasters and lawsuits, it doesn't cover the people who are most important to the business, says Traci Dooley, national agency sales director for Hortica, part of the Sentry Insurance Group, in Edwardsville, Illinois.

That's why experts advise purchasing a "key person" or "key man" life insurance policy in





tandem to your commercial one that will cover you, your spouse — if they work with you — and any essential employees should any of you become incapacitated or die suddenly.

“Key person life insurance premiums are paid for by the business and can be a great retention tool to keep a good employee. It’s a benefit to them because it could pay their absent salary to their family should something happen to them,” explains Dooley.

This type of insurance can cover anywhere from three to 10 times your current compensation, depending on who or what you wish to protect.

“Are you trying to protect what it would take to hire and train a new employee if you weren’t there, or protect a certain percentage of the profits of your business? Or are you looking for an income continuation after your death or retirement?” she adds.

Key person insurance benefits include covering lost profits, extended absences and any business loans the key person was responsible for. Premiums can cost as little as \$100 per month up to \$1,000 or more depending on the person’s age, gender, salary and health status, plus the amount of coverage your business needs.

### Thinking ahead

Fresh out of college in 2009, Dana Massey was hired as head grower of annuals at Plantworks Nursery in Rougemont, North Carolina, which carries annuals, ornamental grasses, perennials, tropicals and vines. Mentored by owner Douglas Chapman — who founded the company in 1978 — Massey quickly moved up in the organization. Within three years, Chapman had tapped her to take over when he retired.

“We’ve called it my Cinderella story: I was in the right place at the right time with the right people,” says Massey, who agreed to buy Plantworks in 2012.

“Doug and I had a five-year transition plan until he fully retired in July 2017, and when we made the agreement in 2012, he got key person insurance for me. He decided it was in his best interest and mine: If something happened to him, I would be protected, and if something happened to me, it would buy him time to either find my replacement or decide what to do with the business.”

### It’s all in the details

There are other types of insurance growers should



***Did you know?*** Most business insurance policies won’t cover you, the owner, if you get injured, fall ill or must take a leave of absence to care for a loved one.

consider, notes Dooley. For example, while your property insurance will pay to replace the building if it’s damaged by wildfires or windstorms, what about lost profits while you’re unable to operate during rebuilding?

“That’s where business interruption insurance comes into play; it covers your net profit and continuing expenses,” explains Dooley.

Ten years ago, two other potential threats to your business were perhaps not on your radar, but they should be today, she adds.

“Cyber liability — if your information is hacked by another party — and employment practices liability — whether it’s age discrimination, wrongful discharge of employment or sexual harassment — can both have a huge monetary impact on your business,” she says, noting that you can purchase protection to cover you against these threats.



**Be prepared:** Although it can be uncomfortable to think about, purchasing a “key person” or “key man” life insurance policy in tandem to your commercial one will cover you, your spouse — if they work with you — and any essential employees should any of you become incapacitated or die suddenly.

## Have difficult conversations now

Don’t wait until tragedy strikes to figure out a game plan — especially when it comes to partnerships, advises Dooley. Traumatic situations can cloud the ability to make important business decisions.

“Thirty-some years ago, I worked with a small nursery run by three siblings. One was killed in an auto accident,” recalls Dooley. “The other two siblings suddenly had to make a decision: Do they buy out their brother’s family, or allow them — as one-third owners — to come into the business? Ultimately, they decided they couldn’t work together any longer and sold the business.”

Having a buy-sell insurance policy clarifies everything up front, she adds. Depending on the type of business you have, how it’s set up, whether your business is a partnership or an LLC and whether you’re the only managing partner or there are others who need to be protected in case something happens to you, buy-sell policies become very important.

If Partner B dies suddenly, but partner A doesn’t want to be in business

with partner B’s spouse or children, a buy-sell agreement would outline that, says Dooley.

“You can fund a buy-sell agreement with life insurance and set it up so either the partners pay for the insurance, or the business pays for the insurance. If something happens to one of them, the business is the recipient of the life insurance proceeds, and they use that to buy out the other partners,” she adds.

## Invest in your business

Massey is considering multiple insurance coverage options but has focused her attention on running the business.

“Taking over an existing business came with lots of growing pains — you’re watching every penny and waiting for the right moment, but you can’t wait because there’s never going to be a perfect time for anything,” she admits.

“I’m in this for the long haul, so this is something I want to get accomplished.” **GM**

Wendy is an award-winning journalist, content provider and TV producer based in Montreal, Quebec, Canada. Reach her at [wendy@taketwoproductionsca](mailto:wendy@taketwoproductionsca).



**Succession planning:** Dana Massey (left) agreed to buy Plantworks Nursery in North Carolina from her mentor, owner Douglas Chapman (right), in 2012. They had a five-year transition plan until he fully retired in 2017.





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# Creating a resilient company culture

**How to navigate change and thrive amid challenges.**

**By Margaret Graziano**

In an era marked by immense volatility and complexity and characterized by technological advancements, business consolidations, fierce competition and economic fluctuations, you may find yourself in an unprecedented time of change. The aftermath of the pandemic continues to linger, with burnout, stress and overwhelm persisting among individuals and teams. Amid this tumultuous landscape, the challenge is this: How can organizations emerge stronger from the trials of recent years? How can they cultivate a culture that thrives, adapts and responds effectively to the unpredictable? The answer lies in fostering an emergent culture — one characterized by change management prowess, response agility and a positive environment with fulfilled employees.

## Understanding culture

When more than two people come together, whether as a couple, a family or a company, they form a human system. Within this system, culture serves as the driving force or energy. Culture possesses the power to create and destroy, providing guidelines for interaction, conflict resolution, motivation and progress. The objective of examining and shaping organizational culture is to channel the collective energy of individuals into a productive force — one that mirrors the synchronicity found in natural phenomena, such as the coordinated movements of a school of fish or flock of birds. This is called an emergent culture.



## Influencing culture

Effective impact on company culture entails understanding and influencing the energy inherent within the human system. To initiate this process, focus on the following areas:

**Start with the leader.** All culture begins with the CEO, the leader of the organization. What is their vision? Who are they as a leader? What are their values? Are they operating and living congruently with all of those markers, no matter how challenging or stressful the circumstances may be? Having a CEO who can answer those questions clearly and can live in alignment with them consistently is the foundation on which a company's culture gets built. If the CEO is frazzled, overwhelmed and in survival mode, that is going to set the tone for the entire organization. Whatever energy the CEO brings to the company and to their life will be the energy other people pick up on and assimilate to fit in and make it.

Thus, the CEO must be conscious. They must be awake and aware of what they're emanating through their words and their actions. They must ensure that they have a clear vision, bolstered by positive moods and inspiring language that rallies people around their vision and engages them into action. Human systems are guided by behaviors, beliefs, actions, what's said, what's unsaid — all of that equates to the energy of the human system, and energy is culture. So, what kind of culture is the CEO creating?

**Cultivate the leadership team.** The leadership team further propagates cultural attributes throughout the organization. Behaviors exhibited by this team

tend to cascade down to various departments. Similar to the CEO, leadership must demonstrate consciousness and accountability for their actions. This includes acknowledging their role in shaping the culture and undertaking personal growth to support a healthy, high-performance human system. By focusing on the following key elements, the leadership team can contribute to a thriving culture:

**Achievement.** The company knows what they're here to do, why they're doing it and how they're measuring it. Organizational achievements are individual achievements, and vice versa. Achievements are specific, measurable, attainable results that are bound in time.

**Self-actualization.** Each person is conscious. They know what their strengths and weaknesses are, and they're responsible for them and the impact they have on others. They're doing their own development and personal work just like the CEO is.

**Affiliation.** People are partnering, collaborating, sharing ideas and problem-solving on an interdepartmental level. Cross-functional teams are committed to the noble cause and vision for the organization and are coming up with ways to problem-solve together to fulfill the vision.

**Humanistic managers.** Managers authentically care about their people. They are aware of what's going on in their employees' lives, what their goals are and how they want to grow. When an



## Whatever energy the CEO brings to the company and to their life will be the energy other people pick up on and assimilate to fit in.

employee knows to their core that their manager has their best interests at heart and they want them to thrive, difficult conversations to improve performance can happen. Mentorship, coaching and caring for people comes with humanistic management, and it supports employees who grow and thrive.

### **Assess environment and employees.**

Employee behavior provides insights into the prevailing environment. Key considerations include whether they experience autonomy, trust and support in their roles. Ask these questions to assess the environment that your employees are navigating:

- How well do employees handle changes, upsets and challenges in the

market?

- Do people feel the freedom and trust to share new ideas, take risks and have space to fail?
- Is there space in the time at work to ideate, innovate and co-create?
- Are the meetings inspirational and motivating or just a laundry list of getting things done?
- Is everyone clear on what the noble cause is?
- Are the right systems or architecture in place for people to work effectively together?
- Is the leadership team dismantling anything getting in the way of employees taking the ball and running with it?
- If there's a problem, are the employees the ones to solve it?
- Are people being given the autonomy they need?
- Are people held accountable to their agreements, promises and measures?
- Can you have difficult conversations?

### **Achieving resilience through emergent culture.**

In times of uncertainty, organizations with the ability to adapt and pivot harness their power. Such resilience hinges on a healthy human system and a shared commitment to the company's purpose. Leadership needs to exemplify responsibility, optimism and collaborative problem-solving across departments to overcome obstacles and realize the company's vision. This approach cultivates an emergent culture, capable of navigating challenges effectively.

While creating an emergent culture demands considerable dedication, care and focus, the rewards are boundless. With a culture founded on change management skills, response agility and employee fulfillment, organizations can not only weather storms but also soar to new heights. **GM**

Margaret Graziano is the founder and CEO of KeenAlignment and The Wall Street Journal best-selling author of "Ignite Culture." She has been recognized as one of Silicon Valley's Top 100 Women Leaders. Visit [keenalignment.scoreapp.com](https://www.keenalignment.scoreapp.com) to take KeenAlignment's Culture Assessment.



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Green industry experts answer questions  
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## ASK THE EXPERTS: AUTOMATION



Lynn



Mans

# Transform vegetative propagation

Tucker Lynn, Sales Manager, and Michiel Mans, Lead Engineer for Computer Vision and AI, make a case for using automation to increase vegetative propagation productivity while reducing labor costs.

### How do you automate vegetative propagation and planting plugs when growers have a wide variety of plant material and each needs to be treated differently?

Michiel Mans: We start with detection. For our CuttingEdge automated sticking machine for planting rooted and unrooted cuttings, any cutting can be placed in a random configuration on the belt. A camera above it detects the cutting it is and relays the planting information to the robot so the robot knows where to pick up the cutting, how much pressure to use and how to place it in the soil. It can be rooted or unrooted, or both on the same belt. The detection models come from one database of cutting images that are shared among our customers. We have a few hundred per plant genus. For instance, you could do all your bedding plants with CuttingEdge.



### Can growers optimize the CuttingEdge for their own unique plug planting needs, like type of trays or planting depth?

Tucker Lynn: Absolutely. It can be optimized quickly in a couple of days. You can optimize how deep you want to plant, even if the stems are different lengths, and how many cuttings are in a cell, pot or tray. You can optimize planting patterns. It doesn't matter what type of tray you have or how big or small the plant material is. You can make sure it has the room it needs in the plug.

### What if a grower needs to add a type of plant or has started propagating a plant that's brand new to the market?

Michiel Mans: All we need are pictures of the new plant genus, and here at TTA, we use them to train a new detection model. The end is something that is shared among all users. That is

something we improve as our network of users grows. So, the ease increases. We already have over 160 plant genus in the database.

### How many plants can be planted in an hour with CuttingEdge?

Tucker Lynn: The machine can do 2,500 cuttings an hour. And the speed does not change with the plant like with human labor. Planting manually can get more difficult the thinner a stem gets. That's not a problem with the robot. It's consistent, too. It's also scalable. You can plant more plants without adding more people. With one infeed and one outfeed, you can have up to four CuttingEdge machines in series. You only need one operator as it scales, which saves on labor costs. It's simple to adjust as you grow.

### How long does it take to get the CuttingEdge automation up and running in a greenhouse?

Tucker Lynn: Last week, we installed one and ran it in just three days, even with optimization. It will work with your standard infrastructure.





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## ASK THE EXPERTS: CONTAINERS



# Conquering container waste

East Jordan Plastics strategic account manager Bret Sulaver discusses the best way to manage container waste through implementing a closed-loop recycling program.

**How important is managing container inventory in keeping a lid on waste, and are there best practices for container inventory management that you recommend?**

Horticultural containers and trays take up quite a bit of warehouse space and financial overhead, so it's very important to manage container inventory. One of the best ways to do this is with a closed-loop recycling program. Closed-loop recycling programs can help growers get rid of unwanted horticultural plastic while also giving them peace of mind that old containers are going back into the feed stream to manufacture new horticultural containers and trays. As a best practice, we recommend that during the recycling sorting process, growers identify polypropylene trays that can be reused in future seasons.

**It seems inevitable that there will be damaged pots at some point during greenhouse production. How would you recommend reducing that damage and managing breakage?**

There are many factors that go into storing horticultural containers. We suggest growers contact their horticultural container suppliers to identify the best way to package the horticultural containers for specific environments. We also suggest growers keep pallet and case labels until they have fully inspected the product.

**I want to introduce a closed-loop recycling program to my operation. What's the first question I need to answer before getting started?**

Growers should start by asking what they can do to maximize the return on investment for implementing a closed-loop recycling program. We encourage growers to reach out to our team at East Jordan Plastics for details on

how to get involved in our closed-loop recycling program.

**Is a closed-loop recycling program expensive to get started? Are there any eventual cost savings?**

There are initial startup costs to participate in a closed-loop recycling program. Labor is probably the cost we hear about the most. One tip we often give growers interested in maximizing the long-term financial benefits of a closed-loop recycling program is to invest in a baler. A baler will help condense recycling materials and maximize space on trailers.

**If I am recycling none or only some of my pots, what are the biggest hurdles to transitioning to a fully closed-loop recycling program, and how do I position my business to overcome them?**

We've heard over the past couple years that available labor for sorting is one of the biggest hurdles to participating in a closed-loop recycling program. Although a deterrent, we encourage growers to overcome this hurdle because once they commit to the program, they'll see the long-term benefits of being able to reuse polypropylene trays and get paid for recycling their horticultural plastic.

**Aside from reducing plastic in the waste stream, are there any other benefits to managing my waste and implementing a closed-loop recycling program?**

Yes, one of the major benefits of a closed-loop recycling program is the ability to reuse polypropylene trays for multiple years. During the sorting process, many growers can identify trays that can be reused in future seasons. Also, if they follow our process, growers can get paid by East Jordan Plastics for their used horticultural plastic.



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## ASK THE EXPERTS: FUNGICIDES



# Enhance plant health with Mural fungicide

Syngenta technical services manager Nancy Rechcigl explains how Mural fungicide makes plants healthier.

### Why should growers include Mural fungicide in their disease control programs?

Mural® fungicide is a broad-spectrum option for greenhouse and nursery growers that combats destructive diseases during all stages of production, particularly during propagation. It is powered by two active ingredients: SOLATENOL® technology, an advanced generation succinate dehydrogenase inhibitor (SDHI), and *azoxystrobin*, a systemic strobilurin fungicide. Mural is labeled to control more than 50 ornamental diseases, including *Botrytis*, leaf spots, rusts, powdery mildew and many soilborne diseases. Available to use as a spray or drench, it effectively protects against disease during propagation and after transplant.

### What is unique about the strobilurin chemistry found in Mural?

The strobilurin active ingredient in Mural, *azoxystrobin*, systemically moves through a greater area of the plant than other strobilurin chemistries. With its xylem movement, *azoxystrobin* is absorbed by the plant and translocated upward to protect new growth for a longer period of time.

In addition to its fungicide activity, *azoxystrobin* also affects physiological processes that can result in plant health-benefits, such as:

- Lower transpiration rates, maximizing the efficiency of water use.

- Reduced ethylene production, which helps delay senescence. This allows leaves to stay greener longer for more efficient photosynthesis, leading to increased production of carbohydrates within the plant for improved growth and plant vigor.
- Increased nitrate reductase levels, allowing nitrates to be more readily available to produce proteins essential to plant growth.
- Improved root development has also been observed when Mural is applied as a drench.

### What kind of application flexibility does Mural offer?

Mural can be applied as a spray or drench for excellent flexibility. When applied as a drench to control root and stem rots, Mural also suppresses infections in the foliage caused by rust and powdery mildew fungi because of its systemic activity. Applying Mural as a foliar spray allows the product to penetrate and move systemically throughout plant tissue, protecting areas that may have been missed by the application, such as the undersides of leaves.

Discover how you can get more with Mural at [GreenCastOnline.Com/PlantHealth](https://www.GreenCastOnline.Com/PlantHealth).

Syngenta does not recommend or endorse making applications solely for physiological benefits or using reduced rates (lower than labeled) for physiological effects.

Performance assessments are based upon results or analysis of public information, field observations and/or internal Syngenta evaluations. Trials reflect treatment rates and mixing partners commonly recommended in the marketplace.

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### Enhanced Root Growth

Non-treated control

With Mural 4-ounce spray



Poinsettia cuttings treated with Mural showed enhanced root growth. Treatments applied as a spray four days after stick. Plant height and root development evaluated 23 days later. 2017, Syngenta.





## Mural® fungicide is one versatile solution that offers:

- **MORE flexibility:** Apply as a spray or drench from propagation through finish
- **MORE control:** Protect plants from more than 50 diseases
- **MORE benefits:** Enhance plant and root health at low use rates during propagation
- **MORE modes of action:** Two active ingredients offer systemic and translaminar activity

Learn more at [GreenCastOnline.com/PlantHealth](https://GreenCastOnline.com/PlantHealth)



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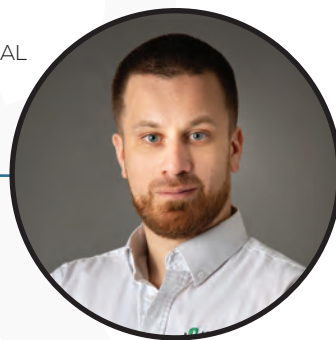
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## ASK THE EXPERTS: STRUCTURES



**Chassouant**



**Dubé**

# Shrink your carbon footprint

Corenthin (Félix) Chassouant, Director of Sales and Business Development, and Yves Dubé, Vice President of Harnois Greenhouses, discuss how achieving carbon neutrality in greenhouse structures can impact your operation.

### **Why should growers be concerned about carbon neutrality?**

Greenhouse growers should prioritize carbon neutrality due to environmental concerns, regulatory requirements, consumer preferences, climate change risks and potential economic benefits. By reducing operation carbon footprint using sustainable technologies and practices, growers can mitigate environmental impacts, comply with regulations, appeal to eco-conscious consumers, build resilience to climate change and potentially achieve cost savings through energy efficiency and renewable energy adoption.

### **How can the greenhouse you choose for your operation affect carbon neutrality?**

The choice of greenhouse design and materials can significantly impact carbon neutrality. Opting for energy-efficient structures, such as those with high insulation or advanced glazing technologies, reduces energy consumption for heating and cooling.

Additionally, selecting greenhouse technology focused on energy efficiency is crucial for achieving carbon neutrality. This choice significantly reduces greenhouse gas emissions associated with energy use, aiding greenhouse operations in their efforts toward carbon neutrality.

### **What factors impact a greenhouse's carbon footprint?**

Several factors influence a commercial greenhouse's carbon

footprint, including energy sources, heating and cooling systems, transportation of materials and products, fertilizer use, waste management practices and the type of crops grown. The greenhouse's design, insulation and orientation also play a significant role in energy efficiency and subsequent emissions. Additionally, the use of renewable energy sources, adoption of energy-efficient technologies like thermo-pump and implementation of sustainable practices can help mitigate the greenhouse's carbon footprint.

### **How can Vermax improve a grower's carbon neutrality? How does the design and construction process work?**

Vermax enhances a grower's carbon neutrality by conducting a comprehensive analysis of factors such as location, energy sources and technology accessibility to design optimal solutions. Our experts integrate the most efficient technologies into turnkey solutions, managed by Vermax and its partners, ensuring seamless implementation and operation.

### **What type of glass is used in the Vermax greenhouses, and what are the advantages of that type of glass?**

Tempered glass with high light transmission of 96% and 60% diffusion significantly reduces energy input for greenhouse operations. This is because the high level of light transmission brings more energy to the plant and radiation to heat the greenhouse.





**VERMAX**

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## ASK THE EXPERTS: HYDRANGEAS



# Hydrangea helpers

Mike Hoffman, Bailey Nurseries Head Grower, Minnesota Greenhouse Production, offers top hydrangea growing tips.

### How should growers use growth regulators on hydrangeas to keep them manageable?

Many hydrangeas can be quite vigorous growers, so performance growth regulators (PGRs) are regularly used in production. For the cultivars that naturally grow larger in the landscape, or those that grow most rapidly in production, we apply two rounds of daminozide when top growth reaches two to three inches, and again every seven to 10 days after in the greenhouse. They will also get two drenches of Paclobutrazol in the standard PGR routine. There are certainly exceptions to this program depending on temperature, hours of sunlight, growing medium and more, but this can serve as a starting point. There are also plants that have different needs, especially the new Pop Star® Reblooming Hydrangea, which is so genetically compact that we only apply one round of daminozide if needed. Beyond that, it stays tight and sturdy without any PGR intervention.

### What is the best method for forcing hydrangeas for early season sales?

If you live in a cooler climate and are forcing bigleaf hydrangeas for early-season sales, you must use the right liner. To take a vernalized liner into a 2-gallon pot, select your crop for the following season in May or June. Do not cut them back during the growing season, and then cut them back in October to four to five inches of stem and overwinter at 30 degrees. In late winter, remove the containers from cold storage early to force the early flowers. The timing to flower can be somewhat regional, so it will take some experimentation to hit your ship window exactly. At Bailey in Minnesota, we force our bigleaf hydrangeas at 60 degrees. Shortly before shipping, we cool the greenhouses down slightly to 55 degrees to help shelf life and overall plant quality.

### What are your top hydrangea watering tips?

When watering hydrangeas in a greenhouse, be sure to do so in the morning, allowing the sun to evaporate moisture from the leaves and flower buds. Allowing moisture to sit on the buds can lead to Botrytis, which adds additional input costs and labor to fix before shipping. Once the flowers are open, any dry stress will burn the flowers first, so do not dry stress once the flowers are open, or you can lose a crop in a day.

### Are there specific methods growers can use to fight disease in hydrangeas?

New hydrangeas, like those in the Endless Summer® Hydrangeas and First Editions® Shrubs & Trees collections, tend to be quite disease resistant. In fact, that's why they were selected. The goal is to have greater natural disease resistance to reduce inputs in production and at retail and have the healthiest product in the landscape with minimal human intervention. A couple things to watch for, though, are aphids and spider mites. We recommend observing and only treat as needed. Too many preventative measures build up resistance and could have long-term negative effects.

### What is the best way to ensure a variety of hydrangea colors?

Since bigleaf hydrangea flower colors can be manipulated, have a solid understanding of if you and your customers want to sell plants with blue/purple or pink/red flowers so you can amend your soil and input recipes. For blue or purple hydrangeas, a pH of 4.5-6 is a good range, with a target of 5-5.5. Remember that blue flowers only occur with this acidic soil pH and the presence of aluminum. To achieve this, apply aluminum the previous year or while the plants are dormant. Applying while the hydrangea is green isn't as effective. If you are in a position where you're applying while the plant is leafed out, avoid using liquid aluminum, or it can burn the foliage.





# IT'S ALL IN THE GENES

BIG REBLOOMER • COMPACT  
VERSATILE • EASY TO GROW



## Pop Star® Bigleaf Hydrangea

Pop Star® is a reblooming lacecap that is compact and incredibly floriferous, allowing this shrub to stand out on the sales floor, in the landscape, and in decorative pots.



## ASK THE EXPERTS: LABOR



# Overcoming labor shortages

Legacy Labor's sales development coordinator Terry Vandercook helps growers understand how looking beyond local and regional labor can solve labor woes.

### **What are the options for growers that have been unsuccessful in filling open seasonal positions?**

One definite reliable and dependable alternative when you can't find local labor is to use the H-2A visa program for temporary agricultural workers. It brings to the greenhouse grower dependable and reliable labor. With this program, migrant seasonal workers are vetted through the U.S. Department of Labor and in turn through a company like Legacy Labor are brought to the grower for a set period to complete a set of tasks that have been predetermined. It's a great way for the grower to know they have reliable labor that's going to show up at a specific date for a specific type of work and stay through a specific date. So, the grower can really plan their growing season around knowing that they'll have labor.

### **Dealing with the bureaucracy around immigration and visas sounds complicated. How can a grower manage the process without getting overwhelmed?**

There are a couple of different federal and state level organizations involved. If a grower isn't familiar with these agencies and how to navigate the bureaucracy that's involved, it can be very cumbersome. That's where an organization like Legacy Labor comes in. As a licensed grower labor contractor, we are turnkey when it comes to navigating through the bureaucracy. We ensure that the visas are filed. We ensure that the workers are vetted and receive the proper documentation before ever leaving their home country. So, we really take the hassle out of navigating that visa application and award process.

### **With an H-2A visa secured, there are still considerations like housing and transportation. Do the growers need to provide those?**

When it comes to vetting of the H-2A visa workers, that's Legacy Labor's responsibility. In turn, as part of the process and the agreement we have with our growers, we take on the responsibility of the required housing. We ensure that the workers we vet and recruit for that grower have transportation. And by doing that, we significantly reduced the grower's liability. Legacy Labor accepts that responsibility, which means we also accept the responsibility for any audits that the U.S. Department of Labor may choose to perform.

### **What kind of management help do you provide?**

We provide a dedicated workforce coordinator who is the same individual who recruited the workforce for the grower. They have a rapport with the workers coming in. They stay on site, perform our Legacy Labor orientation with the workers and ensure they understand the regulations and responsibilities that they have with us and the grower. This helps ease cultural concerns. We go as far as to also ensure that there is a bilingual translator with every crew just helping with the communication between the grower and the H-2A workers.

### **Do growers have to go through the same process with new workers every year?**

No. We will retain up to 90% of the same workers for the grower every season. That beats local and regional recruiting and ensures that you build good, long-lasting relationships with your seasonal workforce.



# LEAVE THE LABOR TO US



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WORKFORCE**

**H-2A VISA  
PROGRAM**



**Justin Bartlett**  
**Co-CEO | Director of Sales & Marketing**

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## ASK THE EXPERTS: LIGHTING



# Light it up with LED

Fluence Horticulture Services Specialist Michelle Montgomery shares the benefits of having supplemental lighting in the greenhouse.

### How critical is supplemental lighting for greenhouse growers?

The three fundamental factors in growing plants are light, temperature and water. Without one of these factors, you basically won't have any growth because light, temperature and water steer photosynthesis in a plant, which in turn equals growth. It's extremely important to have supplemental lighting in a crop. When you don't have light, you will see failures in your crop, and this can reduce or delay the timing of flowering or fruiting and decrease all aspects of growing within the plants. Every plant needs some amount of light to be able to grow properly and become a healthy crop.

In Canada, the winter season has up to six fewer hours of sunlight per day than the summer season. By growing in greenhouses, we're able to control the environment of the plants during the colder time of the year; however, we're still lacking a lot of natural light. Add in shade curtains and hanging plants that block sunlight, and supplemental lighting becomes critical to growing crops on the strict timelines the industry demands.

Timing is key for growers, and that relates to your different propagation strategies, your different cuttings coming in, but also your labor, shipping and meeting customer market demands. To be able to hit those timelines, it's important to have supplemental lighting to grow your plants effectively and efficiently.

### What are the pros and cons of broad-spectrum LED lighting for ornamental propagation?

There are various lighting types, and we have multiple spectra and fixtures that we use at Fluence. Our broad-spectrum light fixtures mimic, as much as possible, the natural light that we get from the sun. Not only do the crops benefit from this more

natural light, so do growers. It's very easy to see the plant's true color under broad-spectrum lighting, and that makes monitoring crop health much easier on the grower.

Broad-spectrum LED lighting is valuable for your beneficial insects, since insects have specific spectrums that they can see under. A lot of bugs use blue-green and UV light to map where they are in the greenhouse and to attack the harmful pests. So, it's key to have some blue and green light for them to be effective in the greenhouse. But on top of that, it's a nice overall light to grow your propagation plants and a nice neutral light for all plants. There isn't one spectrum that is too high that's going to influence the plants too much in one direction or another. Broad-spectrum LED lighting is a great overall light, especially when you have various crops growing in one space. When you're growing many different types of plants, it's nice to have one generalized spectrum that will do good for all of them.

### How important is uniformity of light intensity for ornamental growers?

After intensity, uniformity is the next thing that I look at, especially with my experience as a grower. Uniformity is key. You never want to see a crop that has those hills and valleys, or one that's flowering before the other. As a grower, you want to have consistency in all the plants that you're growing every single time. So, it's important to have a nice, even light spread across the canopy and not just focused on the middle section but focused across the entire bench of plants. You want to have the same growth across the board. You don't want to have any area that's out-competing or outgrowing another area. When it comes down to it and you're shipping your crop, you want to be shipping the entire bench altogether. High-quality uniform plants are always the goal when shipping a new crop to customers.



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BUILT FOR  
SUCCESS

# FOCUS ON YOUR GROW

## Leave your cultivation questions to us.

Fluence has dedicated **horticulture services specialists** on staff that assist our customers in getting the most out of their investment. A successful grow is not just about lights, but making all the key inputs work together seamlessly. Our team of trained horticulture service specialists at Fluence know how to make that happen. We'll focus on the details, allowing you to focus on your grow.



MAXIMIZE  
YOUR YIELD



ON-STAFF  
EXPERTISE



NO ADDITIONAL  
COST



HELPING THE WORLD GROW SMARTER

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 **FLUENCE**

## ASK THE EXPERTS: NUTRIENT EFFICIENCY



# Mighty mycorrhizae

Mycorrhizal Applications Senior Product Development Manager Anissa Poleatewich, Ph.D., explains what growers need to know about mycorrhizae.

### What are mycorrhizal fungi, and what do they do for plants?

Mycorrhizal fungi are soil microorganisms that colonize plant roots and form a mutually beneficial relationship. Mycorrhizal fungi can boost the “nutritional health” of our plants. The fungus essentially acts as an extension of the root system providing the plant with water and nutrients. In greenhouse and container-crop production, crops are grown in soilless media that do not contain mycorrhizal fungi, so they need to be added either by purchasing premixed growing media or applied during production.



### When should growers apply mycorrhizal inoculants?

In general, an application made during propagation or before planting provides the maximum benefit. It takes time for the symbiosis to establish. The interaction requires communication between both plant and fungus. Since plants and microbes cannot “talk,” they communicate via an exchange of biochemical signals. It can take four weeks for colonization of plant roots to establish and up to eight weeks for benefits to be noticed. For this reason, the earlier symbiosis is established, the better the results. Also, early application in a smaller volume of growing media is cost effective, as less product is needed compared to application at later stages of plant growth. Plus, mycorrhizal fungi help plants tolerate stressors such as transplant stress. When applied early and before transplanting, mycorrhizal fungi significantly improve transplant success.

### How should mycorrhizal inoculants be applied?

Mycorrhizal inoculants come in several formulations ranging from dry to liquid and can be applied using a diversity of methods and equipment. Depending on the formulation, products can be applied to unrooted cuttings, incor-

porated into growing media, used as a seed treatment or as a drench or dip. The short answer is whatever method is easiest to integrate into your production system is the one you should use.

### What mycorrhizal species are best for growing operations?

The good news is that most mycorrhizal fungi found in commercial products are generalists and form associations with a broad range of plants. When selecting a product, it is important to look for evidence of established product performance. Has the product been on the market for a while, and are there reports of efficacy in technical magazines written by growers or independent researchers? Another factor is product quality regarding clear labeling and meeting label claims with respect to inoculum guarantee. A product with multiple species of mycorrhizal fungi is an added bonus. The plant turns its connection with different species of mycorrhizal fungi on and off throughout the growing cycle as the plant's needs vary and the availability of nutrients fluctuates. Finally, does the producer offer on-farm technical support or provide testing services?

### Are mycorrhizal fungal inoculants compatible with other microbial products?

Mycorrhizal fungi and their associations with plants naturally occur in the presence of other microorganisms including beneficial bacteria and fungi — some of which have been commercialized into biological control products. Researchers have reported on examples where biocontrol agents such as *Trichoderma* spp. act synergistically with mycorrhizal fungi. Manufacturers of biological products provide compatibility charts that growers can use to double check specific product combinations.



# MycoApply<sup>®</sup>

## SUCCESS STORY: Windmill Nursery, LLC



**WINDMILL**  
NURSERY



**Mycorrhizae is a powerful tool for growers, and "another arrow in the quiver" to improve plant quality,** says Michael Roe, Windmill Nursery LLC's Vice President of Production. Roe explained that after trialing MycoApply Injector Endo to determine if it was worth its cost, he quickly determined that it was. "Now every time we stick a cutting, MycoApply goes on it," he says. "Every time we fill up a propagation house, we drench it in."

**"It's like killing five birds with one stone. It's fantastic!"** Roe says. "Plants root quicker, which translates to be able to pot quicker, and then because of the root density and root mass, they grow faster in the final container. Yeah, you can look at it as an added expense, but once you realize the quicker turn - which is your profitability - and the reductions in the inputs you will use, it's an investment with valuable returns."

– Michael Roe, Windmill Nursery's VP of Production



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## ASK THE EXPERTS: PEAT MOSS



# Peat mix trials

For growers looking to dial in their perfect peat moss mix, Pierre-Marc de Champlain, director of technical services with Berger, offers tips for trialing.

### **Why should growers consider running trials if they want to optimize the peat mixes in their soil?**

A trial helps to understand characteristics of the mix, but also how it fits within a grower's operation. That includes how the mix works with automation, how the mix will settle in containers based on its density and compressibility, if the grower prefers to keep growing media on the wet or dry side, and the water and chemical needs of the plant, including pH and fertilization. Choosing the right mix will reduce issues.

### **Is peat moss better than alternatives at finding the ideal mixture?**

Peat moss is still the backbone of most high performance growing media. It's kind of like a blank canvas where you can adjust the physical properties, and the chemical properties like pH and fertilizer starter change. Alone, or combined with other aggregates or inputs, other characteristics can be fine-tuned to give you ideal conditions. Berger has a great handle on peat; we know how to make the adjustments and provide the right blends to achieve uniformity.

### **What are the major considerations a grower needs to make in setting up a peat mix trial?**

First, have fresh material to start with. And make sure

you label your pots correctly. Berger can provide tags to ship with the mix. And once the trial is set up, you should adjust your watering and fertilization practices according to the mixture you are testing — that way you can understand how much moisture it can take or how quickly it dries. By adjusting your practices to each mix, you will truly identify which one can offer you the best results within your operational capabilities, rather than just seeing which one performs the best within your irrigation program. A full table or section is ideal, but you want a minimum of 20 to 30 plants per mix. Larger trials help you see if there is variation in the mix, or if it's stable.

### **What type of data should I collect?**

Some qualitative data might include grading the uniformity of the canopy or how vigorous and healthy a plant looks and grading it on a scale of 1 to 10. You can measure the average height or diameter of the stem. But then you can also go very intensive by harvesting at different periods of production and cleaning the soil off the roots and measuring shoot and root dry weights. Taking soil samples to test the pH and nutrient content helps, too. Berger will gladly take care of the testing for you. You just send the samples to us, and we'll take care of the rest. We can do soil, tissue and water analysis.



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# BOUNTIFUL ADVICE BEYOND THE MIX

Because at Berger, we go far beyond providing the highest quality growing media. We work with you from the ground up, so you get the most out of your production.

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## ASK THE EXPERTS: PRINCETTIA



# Make spirits bright

Lorentina McKoy, Suntory Flowers' North American sales and product representative, shares how compact, colorful Princettia varieties fit into your poinsettia program.

### How are Princettia varieties different from traditional poinsettias?

Although all poinsettias are euphorbias, we tend to refer to Princettias and others like them as “euphorbia types.” The main differences are heat tolerance/requirement, vigor and the way the bracts are shaped. I lovingly refer to Princettias as “the tropical cousin of poinsettias.”

Princettias were bred to be more compact and tighter in habit, so the standard use of PGRs (plant growth regulators) is not needed. On the flip side, in most regions, Princettia won't size up to a great big church altar-style 12-inch pot, either. Princettia Queen is the subseries we have focused introductions on in the past couple seasons. This is our twist on the more “normal” vigor and bract size, but with super vibrant pinks and crisp colors.

### Can I grow Princettia with my poinsettia crop?

Yes, and most growers do. The difference would be that Princettia may require more heat toward the end of the crop versus the other varieties.

### Which Princettia varieties are you most excited about for 2024?

There has been a lot of buzz around our new variegated introduction, Sparkling Rouge, which I loved from the first trial. However, one that may fly under the radar at first, but is my favorite, is the new Princettia Queen Shell Pink. The name was inspired by that pretty pink/salmon color you often see on the inside of a conch shell. I think

as consumers are decorating in all different styles and colors for the holidays now, this adds a very fun color to maybe have a beach-themed Christmas décor.

### What are the pot size recommendations for Princettia and Princettia Queen?

As mentioned before, Princettia was, and still is, bred to be compact and branching and need less PGR. Because of this, the Princettia line does well in 2-inch mini production up to 6.5-inch pots in most regions. Princettia Queen is a little more vigorous and in most regions can be grown in anything from a 4-inch to an 8-inch. Some Southern growers have been successful sizing Princettia Queen into a 10-inch pot.

### Do you have any recommendations for combos, mixing Princettia varieties with each other or component plants?

The beauty of Princettia is that it is a true family. This means that anything within the original Princettia line (Pink, Dark Pink, Hot Pink, Red, Pure White, Pure Red, Sparkling Rouge and Sparkling Rosé) can all be mixed together for any bicolor or tricolor combination that will time and grow the same. Likewise, anything in the Princettia Queen category will mix with one another. The natural compactness of Princettias makes it a great fit for tabletop and foliage mix bowls as well. You won't have to fight the plant to size up nicely with the foliage bowl, and the mature height is perfect for a centerpiece bowl for parties and holiday dinners.



Sparkling Rouge



# Princettia®



## ***Sparkling New Varieties!***

- Splashy, variegated pattern
- Naturally compact
- Excellent branching
- Festive additions to the Princettia® series

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**Sparkling Rosé**



## ASK THE EXPERTS: SUBSTRATES

# Substrate solutions

Miguel Meneses, Jiffy's global product manager for substrate, discusses different types of substrates and how Jiffy supplies them.



### What kinds of substrates does Jiffy offer growers?

Jiffy has a very wide substrate portfolio, produced at three different locations and using dozens of different raw materials. At our Estonian factory — Treffex — we produce mostly peat-based mixes that tend to maximize plant growth and ensure maximum economy through the use of lightweight and compressible materials that offsets any high transport costs. The high-quality young and spongy peat we use allows us to produce very well aerated mixes without needing to add any perlite or wood fiber, but if necessary those and other raw materials like clay can be added. At our Canadian substrate factory, emphasis is on small bag sizes meant for retail. Our 1Plant factory, in the Netherlands, is a state-of-the-art location that is actually like three different factories combined in one, but all have in common the possibility to incorporate the widest assortment of raw materials that ensures the best result for the crops.



### How do Jiffy substrates enhance plant growth?

Many different parameters combine into the complicated ideal plant growth formula: easily available water, reserve water, air-filled porosity, pH and cation exchange capacity, structural stability, etc. However, if we had to pick the most often prevalent factor maximizing growth, that is primarily secured by the so-called easily available water (EAW): in essence, the amount of water that the plant can uptake at whatever pace transpiration dictates, without ever having to close the stomata and therefore reduce or limit photosynthesis. Anything above 30% is already a good value, but the higher the better (everything else being equal, of course). To achieve these kind of values, we need to use primarily the best quality peat from the top layers of our bogs and combine it with other raw materials that secure other qualities.

### How does Jiffy supply substrates to growers (packaging, shipping, etc.)?

Substrates can be delivered:

Bulk in truck; this is normally done in locations close to our 1Plant factory (northwest Europe). It is the cheapest option, but not all locations can be served this way.

In palletized small bags (50 and 70 liters per bag). This option, that is best for smaller, non-mechanized growers, is available for deliveries worldwide.

Palletized big bags (Tote Bags). This option has a relatively low

packaging cost, but since the maximum volume that can be loaded is limited, the unit transport costs can become too high.

Finally, the most cost effective option for faraway locations is the Big Bale. These are large compressed bales — the footprint of a pallet — that maximize the transported volume at a reasonably low packaging cost. The caveat is that it requires special equipment for handling, like forklifts and bale-grinding machines.

### What product certifications do Jiffy substrates have?

Jiffy can have multiple certifications, the main ones being:

Organic certifications, like CCOF in California, OMRI in U.S. & Canada, SKAL & Demeter in Europe, etc. These apply only to selected substrates.

ISO 9000, ISO 14000 (Environmental Management) and ISO 22000 (Food Safety). These certifications apply to all substrates in all locations.

Responsibly Produced Peat (RPP), a European certification, ensures peat bogs will be managed according to environmental rules after the peat extraction cycle is over.

Veriflora certification, a North American certification, indicates substrate operations meet rigorous environmental and sustainability standards, ensuring responsible production practices and improving the welfare of workers and nearby communities.

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From the grower crop quality point of view, the two most important certifications are the ISO 22000 and RHP.

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# SPIGELIA MARILANDICA

Bright red trumpet-shaped flowers attract attention from a distance with this native perennial.

**MARK DWYER** is currently the garden manager for the Edgerton (WI) Hospital Healing Garden after 21 years as director of horticulture at Rotary Botanical Gardens (Janesville, WI). He also operates Landscape Prescriptions by MD, a landscape design and consultation business. [mcdwyer@zoho.com](mailto:mcdwyer@zoho.com)



It was a short 10 years ago that I was first introduced to this plant, and I've been since thankful for that fortuitous meeting. It was late spring, and I was wandering through the beautiful Jenkins Arboretum and Gardens (Devon, Pennsylvania). Down near a pond, I saw hints of bright red from a distance, and as I was drawn in for closer inspection, I noted a very healthy and robust plant smothered in red, trumpet-shaped flowers featuring a yellow interior. Once properly identified, I became an immediate fan and proponent for Indian pink, which is native to the southeastern United States (hardy to zones 5-9).

Reaching heights of 18-24 inches, this clump-forming perennial prefers a neutral pH as well as moist, rich soils with good drainage (essential). The emerald-green, glossy leaves (oppositely arranged) are a wonderful backdrop for the flowers that bloom from the bottom of the plant to the top in late spring into early summer. Upward-facing, these ruby-red, tubular flowers extend to 2 inches in length with

the interior yellow conspicuously flaring at the top of the flower, appearing like a vibrant "yellow star." Deadheading spent blooms will result in prolonged flowering. Hummingbirds love these flowers, and flowering stems are long-lasting in fresh arrangements.

Tolerating both deer and rabbits, this perennial does prefer partial sun, but I've seen it in full sun situations (with adequate moisture) where it has produced even more prolific flowering. More sun also equates to a more compact plant. I like to use this plant as an accent or in groupings for the impact of those "hot" flowers. Propagation is typically by spring sown seed or root divisions. The variety 'Little Redhead' is touted as a superior selection and is vegetatively propagated. To me, it seems a bit more compact and more floriferous. I'm also very excited about the variety 'Ragin Cajun' from Tony Avent at Plant Delights Nursery. This selection is nicely rounded and features a bright orange-red cast to the flowers.

## SPECIFICS

**Name:** *Spigelia marilandica*

**Common name:** Indian pink, pinkroot, woodland pinkroot

**Description:** *Spigelia marilandica* features a profusion of bright red, 2-inch, trumpet-shaped blooms with a bright yellow center in late spring and early summer.

**Hardiness:** USDA Zones 5-9

**In the landscape:** This perennial is excellent as an accent plant, in groupings and has value in moist, partly shaded garden settings. It also is very successful in attracting hummingbirds.

### Why grow *Spigelia marilandica*?

- Choice, native species with amazing flowers
- Shade tolerant species
- Good candidate for moist woods and stream banks
- Attracts hummingbirds





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# The importance of MEASURING LIGHT

*Light meters can help growers extend and often speed up production of certain crops.*

**Compiled from staff reporting**

With the right amount of supplemental light, a grower can expand their growing season, growing 24/7 or, in some cases, speed up production time.

There is a catch: Using supplemental lighting is not as simple as buying fixtures, installing them in the greenhouse and then reaping the rewards a few weeks later. With lighting, growers need to be mindful of how much light is actually being absorbed and how effective it is. To do that, they need to measure the light, most commonly with a light meter and/or light sensors.

“You’re not going to be able to calculate your daily light integral [with a handheld light meter], but it’s a good way of going into your greenhouse and seeing what the light intensity is when it’s bright outside or what the light intensity is when it’s cloudy,” says Roberto Lopez, an assistant professor at Michigan State University specializing in controlled environment specialty crop production. “Obviously, it’s going to vary from day-to-day and from one season to the other. But at least it’s going to give you kind of a snapshot of what your light levels are and whether you should be using supplemental lighting or whether you should be using your shade curtains.”

## Light measurement options

There are a number of light meter options available, ranging in cost from a few hundred dollars to more than \$1,000. In Lopez’s opinion, there is one type of light meter growers should invest in because it gives an extra layer of information that other options do not.

“Having a light meter is important, but having a quantum meter is even more important,” he says. “A quantum meter is basically measuring the light that a plant perceives in the photosynthetic radiation, and that’s what we’re most concerned with — [is it] the light the plant is using for photosynthesis? If you have a foot candle meter, it is basically just measuring the light that we can see as humans, and that’s not what we are concerned with in this particular situation.”

Additionally, Lopez says that light meters must be calibrated with the type of lights a grower is using to give the grower the most accurate readings possible. For example: If a grower has LED lights but uses a light meter calibrated

Growers should invest in quantum meters because they give an extra layer of information that other options don’t: the light that a plant perceives in the photosynthetic radiation.



for high-pressure sodium bulbs, their readings are going to be incorrect.

“In most instances, it’s going to be lower than what you are actually measuring,” Lopez says. “Or, in other instances, it could be higher. Unfortunately, the cost is going to be higher for these quantum sensors, but if you want to have accurate readings, you have to pay the price.”

## Best practices

Lopez says light meters are vital for growers who have invested in supplemental lighting. Meters can also help inform future decisions about whether to add more lighting.

“Being able to go in at night when those lights are on and take your own measurements is quite important. Being able to determine what light intensity your lights are putting out, then you can use that to calculate your DLI and determine whether that light intensity is sufficient or if you’ll need to add more lights,” he adds.

And the ability to properly measure light is important for smaller greenhouse operations — even though they may only have a few light fixtures in the greenhouse. Growers who don’t know their light levels are at a disadvantage.

Lopez recommends taking measurements “as often as you can” — once a week at minimum, especially if the greenhouse is not fitted with an automated environmental control system that manages the lights — and recording the readings. From there, a grower can determine if the lights are aiding plant growth or not — and what the next step should be.



## AD INDEX

<b>AdeptAg</b> .....	<b>12-13</b>
adeptag.com	
<b>AmericanHort</b> .....	<b>17, 35, 63</b>
americanhort.org/cultivate	
<b>Atlas Manufacturing</b> .....	<b>20</b>
atlasgreenhouse.com	
<b>B&amp;K Installations</b> .....	<b>38</b>
bkinstall.com	
<b>Ball FloraPlant</b> .....	<b>21</b>
ballfloraplant.com	
<b>Encore360</b> .....	<b>5</b>
encore360.com	
<b>ICL</b> .....	<b>68</b>
growwithpeters.com	
<b>JRM</b> .....	<b>30</b>
soilmoist.com	
<b>Lambert Peat Moss Inc.</b> .....	<b>67</b>
lambertpeatmoss.com	
<b>OHP</b> .....	<b>2</b>
ohp.com	
<b>Profile Products</b> .....	<b>31</b>
profileproducts.com	
<b>Quietaire</b> .....	<b>25</b>
quietaire.com	

## ASK THE EXPERTS

<b>Bailey Nurseries.....</b>	<b>48-49</b>
baileynurseries.com	
<b>Berger .....</b>	<b>56-57</b>
berger.ca	
<b>East Jordan Plastics .....</b>	<b>42-43</b>
eastjordanplastics.com	
<b>Fluence.....</b>	<b>52-53</b>
fluence.science	
<b>Harnois.....</b>	<b>46-47</b>
harnois.com	
<b>Jiffy.....</b>	<b>60-61</b>
jiffygroup.com	
<b>Legacy Labor .....</b>	<b>50-51</b>
legacylabor.com	
<b>Mycorrhizal Applications</b>	<b>54-55</b>
mycorrhizae.com	
<b>Suntory Flowers.....</b>	<b>58-59</b>
suntoryflowers.com	
<b>Syngenta .....</b>	<b>44-45</b>
greencantonline.com/planthealth	
<b>TTA USA.....</b>	<b>40-41</b>
tta-usa.com	

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## *Bidens ferulifolia* Blazing Glory

Orange and yellow flowers call for attention in this bidens.

Part of the Timeless collection from Danziger, **Blazing Glory** is part of the new generation of bidens. It's well-suited for quart programs and requires little to no plant growth regulators. It does best in full or part sun.

### Culture notes

- Propagation tips: Stick on priority, number 4 out of 4 categories. Apply broad spectrum fungicide the day of sticking to control leaf disease.
- Irrigation specification: Remove from mist as soon as possible.
- Average time from liners to 5-inch pot: 6 to 8 weeks.
- Little to no PGR needed: Apply Daminozide spray at 1500 ppm week 3. Pinch is optional.
- Cool temperature for best finishing quality and optimum flower color.
- Maintain good airflow and allow plants to dry before nightfall. Drench for protection against Rhizoctonia after transplant and again during finishing stage.

### In the landscape

- Flowering time: Spring/summer
- Width: 20-36 cm (8-14")
- Height: 15-36 cm (6-14")
- Blazing Glory has a mounding/semi-trailing habit

Source:

Danziger ([danzigeronline.com/catalog/annuals/blazing-glory](http://danzigeronline.com/catalog/annuals/blazing-glory))







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