BBG Boxwood Blight Insight Group

Newsletter

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USDA United States Department of Agriculture
National Institute of Food and Agriculture

FEATURED NEWS

CONTENTS

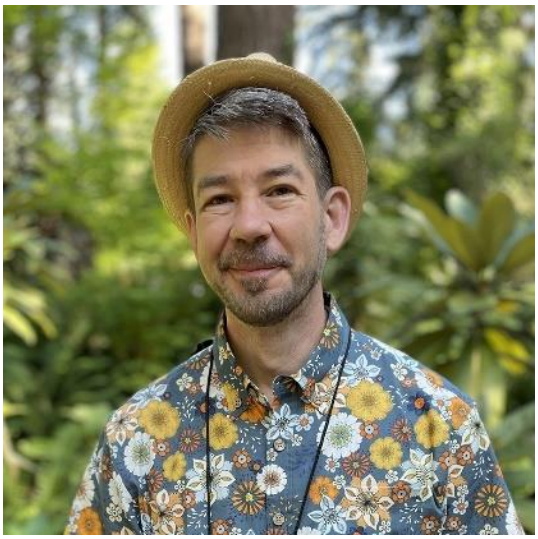
DELIVERABLES
(Sep to Nov 2024)

Research
- 3 Refereed journal articles
- 4 Conference presentations

Extension & Outreach
- 4 Extension presentations
- 24 Samples diagnosed
- 25 Email/phone inquiries answered
- 3,145 People reached with articles/news

Education
- 3 Postdoctoral Associates
- 1 Graduate Student

Dr. Jerry Weiland Promoted to GS-15 at the USDA-ARS Horticultural Crops Disease and Pest Management Research Unit



Dr. Jerry Weiland was recently promoted to GS-15 at the USDA-ARS Horticultural Crops Disease and Pest Management Research Unit, in part due to his lab's outstanding contributions to boxwood blight research. He was first to show that boxwood blight in Oregon was more severe during cool weather, which led to a loss of disease resistance in a popular boxwood cultivar, Winter Gem. His research team was also the first to demonstrate how frequent irrigation and close plant spacing leads to boxwood blight outbreaks in nurseries. These findings have been used to improve the accuracy of boxwood blight forecasting and mapping apps and will be used to update boxwood blight best management practices. Other accomplishments include training growers and state nursery inspectors to identify boxwood blight and helping to improve the stringency of Oregon's boxwood blight cleanliness program.

Best Management Practices (BMPs) for Preventing and Managing Boxwood Blight in the Nursery

By Dr. Fulya Baysal-Gurel, Tennessee State University

Nursery BMPs encompass a range of practices designed to maintain a clean production environment and promote plant health. For managing boxwood blight, these practices are essential for containing, eliminating, or significantly reducing pathogen populations that threaten crops. When properly implemented, these practices can be highly cost-effective, particularly when they target specific contamination points.

1. Use of Blight-Free Plant Materials

- Source Plants Carefully: Purchase boxwood plants and cuttings exclusively from licensed and certified nurseries that comply with phytosanitary regulations.

- Pre- and Post-Purchase Inspections: Conduct thorough inspections for symptoms of boxwood blight before and after acquiring plants.

- Isolation of New Plants: Hold newly purchased plants in an isolation area for at least one month, away from existing boxwood or other hosts like sweet box (Sarcococca) and pachysandra (Pachysandra).
    - The isolation area should ideally be on non-porous surfaces like concrete, asphalt, or a weed mat over gravel or plastic.
    - Avoid Fungicides During Isolation: Fungicides may suppress symptoms, delaying accurate diagnosis. Inspect tolerant or moderately tolerant boxwood species carefully, as they can harbor the fungus asymptomatically.
- Handling Suspected Infections:
    - Submit symptomatic plants to a state agricultural department or diagnostic lab for confirmation.
    - Destroy infected plants immediately, along with any fallen leaf and stem debris, to prevent disease spread.
    - For severe infestations, consider flaming the soil with a propane push flamer to reduce fungal populations in the topsoil.
- Avoid High-Risk Practices:
    - Refrain from using boxwood greenery for holiday decorations near boxwood production or landscape plantings.
    - Do not accept returned boxwood plants or add boxwood greenery to compost piles.

2. Sanitation Practices

Effective sanitation of tools, equipment, and surfaces is crucial for controlling boxwood blight. Recommendations include:

- Disinfecting Equipment: Use disinfectants such as:
    - Sodium hypochlorite
    - Hydrogen dioxide or hydrogen peroxide blends
    - Peroxyacetic acid and octanoic acid mixtures
    - Phenolic compounds
    - Quaternary ammonium compounds
    - Alcohol-based solutions
- Sanitized Growing Materials: Use new or properly sanitized pots, flats, and potting media free of boxwood debris.

3. Cultural Practices

- Pruning: Regularly prune infected plants to reduce fungal growth, improve light penetration, and enhance air circulation. Disinfest pruners frequently.

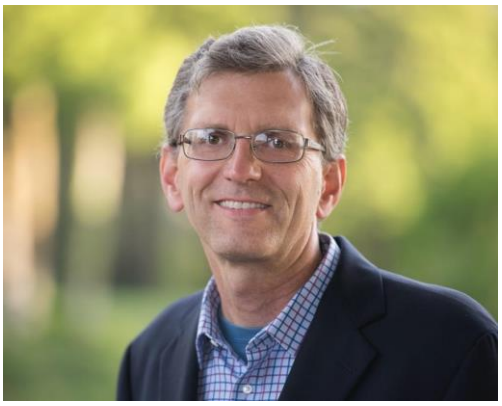
- Plant Arrangement: Use smaller production blocks and intersperse them with non-host plants (e.g., 3-yard barriers).

-Field Management:
    - Avoid working in wet conditions in areas suspected to harbor boxwood blight.
    - Use clean, disposable booties and coveralls in infested areas and dispose of them before entering clean zones.
- Irrigation Management:
    - Prefer drip irrigation over overhead systems to minimize water splash that spreads spores.
    - Prevent water runoff from isolation areas into production zones by installing proper drainage systems.

By implementing these practices, boxwood producers can significantly reduce the risk of boxwood blight and protect the health of their boxwood plants.

ADVISORY PANEL SPOTLIGHT

Interview of John Keller conducted by Taylor Phelps of Virginia Tech



John Keller has spent much of the last decade serving as the Vice President of Production Planning at Monrovia, one of the nation's most widely recognized wholesale nurseries. However, his journey with Monrovia began much earlier, in 1991, when he joined the nursery's research department. Although John held both a B.S. and an M.S. in plant science, he was initially unfamiliar with the nursery industry. Over time, he gained expertise and took on various roles, including Research Manager, Technical Services Manager, and Vice President of Operations, before ultimately assuming his current leadership position.

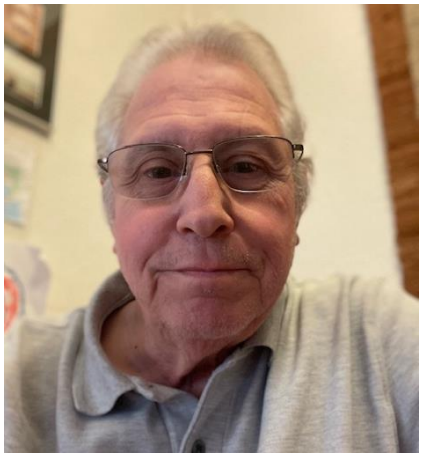
With extensive operations in California, Oregon, Georgia, and Connecticut, Monrovia cultivates approximately 2,000 varieties of containerized plants, which are distributed to garden centers and wholesalers across the United States and Canada. John is particularly proud of Monrovia's large-scale irrigation runoff recycling initiative, one of the first of its kind in the industry. This pioneering effort has since become a standard practice within the horticulture sector.

John's love for plants goes beyond production numbers and operational efficiency. He believes in the power of plants to bring joy and enhance the spaces where people live and work. This belief drives his daily work and shapes his vision for production planning at Monrovia. As the nursery works to implement a new production planning program, John is focused on enhancing Monrovia's capabilities to meet the ever-evolving demands of the market.

In addition to his role at Monrovia, John currently serves as Chair of the Plant California Alliance, an organization that represents a unified voice for the nursery industry in California. His dedication to the industry is further highlighted by his involvement with BBIG, where he has served as an advisory panel member, providing valuable insights from a large grower's perspective. His contributions to BBIG have shaped strategies that benefit both growers and landscapers, while also enabling the distribution of critical information to people and places that may otherwise be difficult to reach.

Outside of work, John's passion for plants extends into his personal hobbies, including gardening and winemaking. When asked about his favorite plant, he named *Alstroemeria* Rock & Roll®, a cultivar known for its striking, variegated foliage and long bloom time. His curiosity and dedication aren't limited to horticulture; they also extend to his interest in foreign languages, reflecting his lifelong commitment to learning and growth.

Interview of Richard Schnall provided by Filiz Gurel of USDA ARS Floral and Nursery Plants Research



Mr. Richard A. Schnall holds a bachelor's degree in Plant and Soil Science from the University of Tennessee and a Master's degree in Ornamental Horticulture and Landscape Design. He is retired from his position as Vice President of Rosedale Nurseries, Inc., where he was responsible for the horticulture program, personnel management, and strategic planning for over 20 years. From 1986 to 1999, he worked at the New York Botanical Garden, Bronx, NY where he served as Arboretum Grounds Manager, Director of Horticulture, and later as Vice President. In this role, he oversaw the planning, budgeting and implementing of a horticultural program for the 250-acre garden, which focused on display, education and research. Mr. Schnall has authored numerous conservation assessments for the Institute of Museum and Library Services and Heritage Preservation. He has also served as Vice President of the New York Hortus Club Inc., Secretary

of the Metro Hort Group, and has been involved with the Queens Botanical Garden. Additionally, he is a member of several horticultural organizations in the metropolitan area and serves on the Advisory Panel for the United States Department of Agriculture Boxwood Blight Mitigation Specialty Crop Research Initiative. Mr. Schnall currently serves as Vice-Chairman of the Board of Directors, Chairs the Sales, Development & Environment Committee, and is a member of the Executive Committee. He is also on the Board of Directors of the Friends of Kensico Cemetery, Inc.

Mr. Schnall describes his interest in horticulture as 'genetic' and tells us that his father attended one of the oldest Colleges in the Northeast, Delaware Valley, to study Ornamental Horticulture. As a person who grew up in NYC, Richard also wanted to do something "outdoor". He met the horticulture world in mid-Tennessee for the first time, and then spent a lot of time in greenhouses where he gained hands-on experience.

During his career building, and now, he has always had a strong passion for landscaping which was the main factor motivating him. He explains how landscaping improves properties in a wonderful way, and how satisfying it is to plant into the ground and follow how the plants are growing. During the time when his career thrived, "it was not like today" he says. Today, there are a lot of open information sources, including the internet, for people who have no formal education in horticulture —so education on plant culture is a lot better than it was before. On the other hand, both starting a new business and managing an operation are quite complex compared to how they were in the past.

Going back to Rosedale Nurseries Inc., where Schnall was vice president for nearly 24 years, he describes the three components of the company: retail outlet, landscaping design and field growing operations. He emphasizes that Rosedale successfully combines these three fields with comprehensive experience and knowledge to be a strong player in the market. Field operations serves both retail and landscaping segments, which cover small properties to larger corporate properties.

Schnall experienced changing growing patterns of small trees and shrubs during his career. "We were dealing with cold hardiness in the area and expanding the palette of plants to further north, to Connecticut and even NYC," he says. Climate change made it possible for us to start using more of the plants out of the South" he adds. "Crape myrtle is one of the examples, which is a southern plant now moved up to NY".

Schnall has an important role in the BBIG project by serving as a member of the advisory panel. He defines boxwood as a backbone in landscaping. By participating in BBIG, he says he has met many people and found a chance to learn cutting-edge research and exchange information on outbreaks of blight. He says "a lot of great information came" via BBIG.

Boxwood is a very versatile part of landscaping and Mr. Schnall says that there is nothing to compare with boxwood in the small tree world. It is needed in almost every landscape. "Today we know very important practices to prevent blight in gardens, such as appropriate irrigation, pruning practices and using clean tools — all of these dramatically reduce the incidence of Boxwood Blight and fungal spread," he adds. If future technology enables, he would like to see damage-resistant, leaf miner resistant, blight-tolerant and box-moth resistant boxwoods, especially for the PA and NY regions.

Mr. Schnall explains the benefit of being involved in BBIG as "being surrounded by people with incredible expertise. We demonstrated a quick, coordinated response to Boxwood Blight, which is important, we made a major impact" he says, and also emphasizes that such a collaboration will be a guide for addressing future similar problems. He remembers past problems like Ash Yellows and Dutch Elm, which were also dramatic.

Mr. Schnall traveled to Europe and was impressed by hundreds-of-years-old gardens; he says, "It was an eye-opening experience to see how climate favors a wide range of plants in the landscape". One suggestion of Mr. Schnall's to people who are new to the horticulture industry who want to prevent diseases in boxwood is to open themselves to other people's expertise and perspectives. "There is a tremendous amount of knowledge in the field," he said—and adds, "the industry is great about sharing."

FEATURED RESEARCH

Grower-level Costs of Boxwood Blight Mitigation by Dr. Charlie Hall, Texas A&M University

The purpose of this study was to examine the changes in boxwood production best management practices (BMPs) that have resulted from mitigating boxwood blight and the economic cost of having to integrate these new BMPs. In observing container-production systems for marketable boxwood in #3 containers in the U.S., the diversity of production systems protocols was striking. A specific objective of this study was to study the effects of incorporating BMPs associated with mitigating boxwood blight on variables costs associated with the production system components in three distinct production systems for Buxus species grown in a #3 container in the U.S. The different nursery production systems were modeled because cultural practices tend to differ regionally within the U.S. because of soil and climatic conditions, so it was hypothesized that variable costs may differ accordingly.

This research was conducted using funding received by USDA-NIFA as part of the Specialty Crop Research Initiative. The Boxwood Blight Insight Group (BBIG) is a collaborative research team involving researchers, extension specialists, and industry professionals focused on managing and mitigating boxwood blight, a devastating fungal disease affecting boxwood plants. Their efforts encompass conducting studies to understand the biology, epidemiology, and spread of the pathogen, Calonectria pseudonaviculata, as well as monitoring the disease in various regions and examining environmental factors influencing its spread. They develop and disseminate best practices for managing and controlling boxwood blight, including cultural practices, fungicide recommendations, and resistant plant varieties. Education and outreach are key components of their work, providing resources and training to landscapers, nursery workers, and homeowners through workshops, webinars, publications, and an informational website. The group fosters partnerships among academic institutions, industry stakeholders, and government agencies to coordinate efforts, share research findings, and develop comprehensive management strategies. Additionally, they create and update guides, fact sheets, and diagnostic tools to aid in the identification and management of boxwood blight, ensuring the latest information and recommendations are available to the public and professionals. Through these efforts, the BBIG aims to reduce the impact of boxwood blight on the horticulture industry and landscapes by promoting effective disease management and prevention strategies.

Materials and Methods

Goal, scope and functional unit. The functional unit for this study was a #3 container of Buxus species. The three scenarios for boxwood production were defined following general best management practices (BMPs) and validated through interviews with several nursery managers serving on a SCRI advisory panel. A detailed protocol, including a detailed inventory of materials (production inputs), labor requirements for each cultural practice, and the equipment associated with each cultural practice was defined. Of course, there are many combinations of production protocols that could be modeled for boxwood production, but these three combinations were chosen to be representative of the most common nursery production techniques representing widely accepted best management practices in the green industry in the various boxwood-producing regions across the country.

Scenario A involved sticking cuttings in September directly in 40-cell flats in a greenhouse under mist, moved to a plastic-covered hoop house the following spring, and grown for 11 months before being transplanted into #1 containers in the spring of year 2. They would be transplanted to #3 containers in the spring of year 3 and grown for 18 months before being marketed in the spring/summer of year 4.

Scenario B involved sticking cuttings in community trays under mist in September, transplanting rooted cuttings to 38-cell flats after 6 months and grown for 18 months before being transplanted to the field during the fall of year 2 and grown for 3 years before being dug bare root in the fall of year 5 and transplanted into #3 containers. They would be grown for one year in #3 containers before being marketed in the fall of year 6.

Scenario C involved sticking cuttings in community trays under mist in September, transplanting rooted cuttings to 38-cell flats after 6 months and grown for 12 months before being transplanted to #1 containers in the spring of year 2 and grown for 19 months, including two growing seasons. Plants would be transplanted from #1 containers to #2 containers in the fall of year 3, growing for 18 months before being transplanted into

#3 containers and marketed the following spring (year 6) after 12 months. In all scenarios, 80% of the marketable crop would be sold in a target market window as noted above and 20% sold 6 months later. When partial crops are sold, the cost of the remaining plants has been incorporated into each model accordingly.

As mentioned, activities for each phase for the three production scenarios were inventoried in terms of materials applied, equipment used, and labor hours utilized – always the main 3 components of production inputs. Variable costs were then determined for these production inputs based on prevailing rates in the allied trade (manufacturing and distribution) sector, the cost of operating the equipment and implements used (e.g., related to fuel, lubrication, or electricity usage), as well as the labor requirements for each cultural practice performed during the production states in each model system.

Results and Discussion

The base scenario for each of the three production models was modified to include specific boxwood blight mitigation BMP's during nursery production as indicated in HRI (2020), LaMondia et al. (2023) and Dart et al. (2016). Each BMP identified by the Boxwood Blight Insight Group (BBIG) was evaluated as to the labor required, the equipment used, and whether any materials (inputs) were applied as part of each cultural practice.

The total costs of incorporating cultural practices to proactively mitigate boxwood blight for each of the three production systems are summarized in Table 1. Total variable costs for each of the scenarios were $8.57, $9.19, and $11.26 per plant for Scenarios A, B, and C, respectively. Each growing stage was summarized independently ranging from propagation, #1 containers, field stage (only for Scenario B), #2 containers (only for Scenario C), and #3 containers for all scenarios. Thus, as compared to pre-boxwood blight production costs, the added costs throughout the entire production cycle for each of the three scenarios, as compared to the pre-boxwood blight base scenarios, were $1.85, $1.99, and $2.13 higher per plant in #3 containers for each of the three scenarios, respectively. This equated to adding 26.0%, 27.8% and 23.3% in additional variable costs per plant for boxwood blight mitigating practices.

Interestingly, data obtained from cooperating growers indicate that the costs of scouting, training, and recordkeeping went from pre-boxwood blight rates of $0.95, $1.14, and $0.95 per plant for Scenarios A, B, and C, respectively, to $1.90, $2.27, and $2.27 per #3 container plant when incorporating additional tasks for boxwood blight mitigation for each of the three scenarios respectively. Thus, the proactive control of boxwood blight is a time intensive task that must be considered in costing procedures throughout the entire growth phase of the boxwood plants.

In conclusion, Boxwood blight, caused by the fungal pathogens Calonectria pseudonaviculata and Calonectria henricotiae, has had a significant impact on the nursery industry, particularly for those involved in the production and sale of boxwood plants (Buxus species). Boxwood is a popular ornamental shrub widely used in landscaping, and the disease has led to substantial economic losses for nurseries and growers, including: (1) plant losses from severe defoliation, stem cankers, and eventual death of infected boxwood plants. Nurseries may also experience significant losses of their salable boxwood stock (since some affected plants may not be completely dead but are not salable), leading to reduced inventory and revenue; (2) quarantine and regulatory measures to prevent the spread of the disease which many states and countries have implemented strict quarantine measures and regulations on the movement of boxwood plants and related materials should this disease be detected on a production facility. These measures can disrupt nursery operations, limit trade, and increase compliance costs; (3) treatment and management costs associated with controlling boxwood blight require the proactive application of fungicides, removal and destruction of infected plants, and implementation of strict sanitation measures. Many nurseries are now proactive on this and have a fungicide program in place to protect their crops from being affected. However, these measures are labor-intensive and costly for nurseries, affecting their profitability; (4) reduced demand and market losses as awareness of the disease increases, consumers and landscapers may become hesitant to purchase or plant boxwood, leading to reduced demand and market losses for nurseries specializing in these plants; (5) breeding and development efforts to develop boxwood cultivars with increased resistance or tolerance to boxwood blight, which can be a costly and time-consuming process; and (6) reputation and brand impact affecting nurseries known for their high-quality boxwood products. The presence of boxwood blight can damage their reputation and brand value, potentially leading to long-term consequences for their business. Overall, boxwood

blight has posed significant challenges to the nursery industry, prompting changes in production practices, increased costs, and potential market shifts as nurseries adapt to mitigate the impacts of this destructive disease.

	Scenario A (Propagation to #1 to #3)	Scenario B (Propagation to Field to #3)	Scenario C (Propagation to #1 to #2 to #3)
Propagation stage	($)	($)	($)
Materials in cutting stage	$0.1068	$0.0923	$0.1597
Equipment used in cutting stage	$0.0064	$0.0269	$0.0266
Labor in cutting stage	$0.2592	$0.4885	$0.4836
Variable overhead	$0.0011	$0.0005	$0.0003
Subtotal - propagation stage	$0.3734	$0.6081	$0.6703
#1 Container stage			
Materials in #1 container stage	$0.4959		$0.7221
Equipment used in #1 container stage	$0.1026		$0.0799
Labor in #1 container stage	$0.3893		$0.4180
Variable overhead	$0.0010		$0.0074
Subtotal - #1 container stage	$0.9888	$0.0000	$1.2274
Field stage			
Materials in field nursery stage		$0.5971	
Equipment used in field nursery stage		$0.1382	
Labor in field nursery stage		$0.3864	
Variable overhead		$0.0280	
Subtotal - Field stage	$0.0000	$1.1497	$0.0000
#2 Container stage			
Materials in #2 container stage			$0.9646
Equipment used in #2 container stage			$0.2350
Labor in #2 container stage			$0.5291
Variable overhead			$0.0115
Subtotal - #2 Container stage	$0.0000	$0.0000	$1.7402
#3 Container stage			
Materials in #3 container stage	$3.7221	$3.2081	$3.7307
Equipment used in #3 container stage	$0.2492	$0.1647	$0.1906
Labor in #3 container stage	$1.7087	$1.7783	$1.4140
Variable overhead	$0.0166	$0.0077	$0.0132
Subtotal - #3 Container stage	$5.6966	$5.1588	$5.3485

Total cost breakdown			
Total materials costs	$4.3248	$3.8975	$5.5771
Total equipment costs	$0.3581	$0.3298	$0.5321
Total labor costs	$2.3572	$2.6532	$2.8447
Total variable overhead	$0.0187	$0.0362	$0.0324
Scouting, training, and recordkeeping costs	$1.8947	$2.2737	$2.2737
GRAND TOTAL variable costs	$8.9535	$9.1903	$11.2601
Baseline total variable costs (no boxwood blight mitigation costs included)	$7.1031	$7.1937	$9.1293
Added costs associated with boxwood blight mitigation per 3-gallon plant	$1.8505	$1.9966	$2.1307
(Percentage increase in VARIABLE costs)	26.05%	27.75%	23.34%

Table 1. Total variable costs of producing #3 boxwood plants for each of the three production systems, including baseline cultural practices plus proactive best management practices (and inputs) associated with mitigating boxwood blight.

EXTENSION HIGHLIGHTS

Extension of Research Developments and Virtual Outreach **By Dr. Margery Daughtrey, Cornell University, Riverhead, NY**

Fall extension activities included BBIG member participation in the 23rd Ornamentals Workshop in Raleigh, NC, October 22-24, where B. Ghimire and F. Baysal-Gurel reported on their studies using UV-C against the boxwood blight pathogen and N. Shishkoff reported on her examination of early and advanced stages of symptom development in different cultivars. K. Snover-Clift gave the story of the BBIG Team at the National Plant Disease Diagnostic Network meeting in Portland, OR on September 12. M. Daughtrey gave a talk on Nov 6 in Melville, NY that included the latest on boxwood blight management in "See Spot Run" presented at the 2024 Landscape Contractors of Long Island Educational Conference. Chuan Hong gave a presentation on IPM for Boxwood Blight and Phytophthora at the IPM Conference in Roanoke, VA on Nov 6-7, and at the Extension Agents Onboarding Tour at the Hampton Roads Research & Education Center at Virginia Beach, VA on October 29.

Extending the research developed during the SCRI project on Boxwood Blight, our next Research Seminar will be presented in January (date TBD) by Nina Shishkoff of USDA, who conducts research at Fort Detrick, MD. She will cover the effects of environmental manipulations on the boxwood blight pathogen, *Calonectria pseudonaviculata*, such as using steam, hot water and composting. A future webinar by Ping Kong will cover the development of biological control for the pathogen.

The boxwoodhealth.org website is being constantly updated and improved, largely through the efforts of Chuan Hong of Virginia Tech and Nicolas Leas of American Hort. Luisa Santamaria has begun a project to populate the site with a special Spanish-language section. This will be designed with workers using cellphones in mind as the primary target audience and will feature short voice-over PowerPoints to illustrate key points of disease recognition and best management practices.

PROJECT MEETING BRIEF

The Quarterly Advisory Panel meeting was held on September 6, 2024, featuring boxwood blight field epidemiology and forecasting by Dr. Chuan Hong of Virginia Tech. Activities highlighted during this meeting included the BBIG Boxwood Seminars and populating the Knowledge Center's Box Tree Moth tab, and the soon to be released, Spanish tab.

Three monthly Project Leadership Team Meetings were held on September 5, October 10, and November 13, 2024. In addition to planning for the monthly digests, quarterly newsletter and meetings, the Leadership Team identified new topics for the BBIG Boxwood Seminar Series, discussed the development of Boxwood Blight Best Management Practices building upon those already published by Horticultural Research Institute, the Boxwood Blight Task Force and the Connecticut Agricultural Experiment Station.

The Spanish tab development coordinating team, consisting of Dr. Luisa Santamaria, Dr. Margery Daughtrey, Jennifer Gray and Nicolas Leas, met on November 18, 2024, to discuss the special needs of the target readership, major topics/sections, initial materials for posting, the development of new materials, and a better communication process to expediate development of the new tab. The new Spanish tab will be available soon!

Project Directors and Associates as well as one Advisory Panel member – Dr. Casey Sclar – met for the quarterly BBIG Project-Wide Meeting on November 20, 2024, featuring Grower-level costs of boxwood blight mitigation by Dr. Charles Hall of Texas A&M University. Dr. Chuan Hong presented his lab's research findings on their flutriafol drench trials in two private gardens and informed team members of the USDA's mandate on public access to its sponsored research products.

PUBLICATIONS

Refereed Journal Articles

1. Khaliq, I., Avenot, H. F., Baudoin, A., Coop, L., and Hong, C. X. 2024. Epidemiology of boxwood blight in western North Carolina and Virginia and evaluation of the boxwood blight infection risk model. Scientific Reports 14:26829 Open access at https://rdcu.be/dZcsR.
2. Kong, P., Guarnaccia, V., Carter, C., and Hong, C. X. 2024. First report of *Calonectria henricotiae* causing boxwood blight in Switzerland and Italy. New Disease Reports 50, e70006. https://DOI.org/10.1002/ndr2.70006.
3. Kong, P., and Hong, C. 2024. Evaluation of 1021Bp, a close relative of *Pseudomonas eucalypticola*, for potential of plant growth promotion, fungal pathogen suppression and boxwood blight control. BMC Microbiology. Open access at https://doi.org/10.1186/s12866-024-03497-w.

RECENT PRESENTATIONS

Professional Conference Presentations, Seminars and Webinars

1. Li, X. P., Weiland, J. E., Ohkura, M., Luster, D. G., and Hong, C. X. 2024. Rhizosphere microbial composition and mycorrhizal fungi associated with boxwood blight resistance? International Phytobiomes Conference, St. Louis, MO, USA, November 19 to 21.
2. Snover-Clift, K., Daughtrey, M., Luster, D., Hong, C., Hall, C., Weiland, J., Baysal-Gurel, F., Gouker, F., Kong, P., Crouch, J., LaMondia, J., Pscheidt, J., Santamaria, L., Shishkoff, N., Ohkura, M., and Yang, X. 2024. BBIG - A team battling boxwood blight to ensure this iconic woody ornamental lives on. NPDN national meeting. Portland, ME. September 12.
3. Shishkoff, N. 2024, Difference in boxwood blight symptom expression in different boxwood cultivars. 23rd Ornamental Workshop on Insects and Diseases, Raleigh, NC, October 22 to 24.
4. Shishkoff, N. 2024, Symptoms of boxwood blight from 24-96 hr on different boxwood cultivars. 23rd Ornamental Workshop on Insects and Diseases, Raleigh, NC, October 22 to 24.

Extension/Outreach Programs and Presentations

1. Daughtrey, M. 2024. See Spot Run. 2024 Landscape Contractors Association of Long Island Educational Conference, Melville, NY. November 6, 2024.
2. Ghimire, B., Pandyala, B., Patras, A., Baysal-Gurel, F. 2024, Evaluating UV-C sensitivity of *Calonectria pseudonaviculata* using light-emitting-diode system. 23rd Ornamental Workshop on Insects and Diseases, Raleigh, NC, October 22 to 24.
3. Hong, C. X. 2024. An award-winning program – Boxwood Blight Insight Group. New Virginia Cooperative Extension Agents Onboarding Tour at Hampton Roads Agricultural Research and Extension Center, Virginia Beach, VA, October 29.
4. Hong, C. X. 2024. IPM Principles and Strategies for Ornamental Plant Diseases – Boxwood Blight and Phytophthoras. 2024 Integrated Pest Management Workshop, sponsored by USDA, Virginia Tech Pesticide Programs, and Virginia Cooperative Extension, Roanoke, VA, November 6 to 7, 2024.

PROJECT DIRECTORS

Chuan Hong (Project Leader), Virginia Tech, Virginia Beach, VA
Margery Daughtrey (Extension Leader), Cornell University, Riverhead, NY
Douglas Luster (Research Leader), USDA, ARS, Foreign Disease & Weed Science Research, Ft. Detrick, MD
Charles Hall, Texas A&M University, College Station, TX
Jerry Weiland, USDA, ARS, Horticultural Crops Disease and Pest Management Unit, Corvallis, OR
Fulya Baysal-Gurel, Tennessee State University, McMinnville, TN
Fred Gouker, USDA, ARS, Floral & Nursery Plants Research, Beltsville, MD
Ping Kong, Virginia Tech, Virginia Beach, VA
Jo Anne Crouch, USDA, ARS, Foreign Disease & Weed Science Research, Ft. Detrick, MD
James LaMondia, Connecticut Agricultural Experiment Station, Windsor, CT
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