KANSAS STATE UNIVERSITY RESEARCH

Editors' Note: This is the first in a seven-part series on Extension, teaching and research programs being performed at Kansas State University.

Floriculture at Kansas State University

CHECK OUT AND LEARN MORE ABOUT THE RESEARCH AND ACTIVITIES HAPPENING AT KSU.

By Chad Miller, Raymond Cloyd, Kimberly Williams, Alan Stevens, Megan Kennelly, Judy O'Mara and Scott McElwain

Individuals from the horticulture, entomology and plant pathology departments contribute to the floriculture working group at Kansas State University. The horticulture department hosts several faculty who are involved in floriculture activities, including Kimberly Williams, Alan Stevens, Chad Miller and Scott McElwain. Raymond Cloyd, a nationally renowned researcher and extension specialist in the entomology department, contributes greatly to the floriculture extension program, both locally and nationally. Megan Kennelly and Judy O'Mara are in the plant pathology department and provide valuable horticulture plant disease extension support through the diagnostic laboratory.

Annual trials at Kansas State University

Curriculum and Education Opportunities

Curriculum. The horticulture department offers diverse opportunities for students to earn Bachelor of Science degrees in different areas of horticulture, including greenhouse and nursery management, fruit and vegetable production, landscape management, landscape design, professional horticulture science, sports turf operations management and golf course management. Enrollment in the horticulture program has been steady in recent years at around 140 students. Our hands-on program features a required internship experience, University Gardens as a learning laboratory and a student-run vegetable and fruit production farm.

In addition to traditional graduate programs, K-State also offers a Graduate Certificate in Advanced Horticulture that can be completed via distance and a Master of Science program in Urban Food Systems.

The primary greenhouse production courses, taught by Kim Williams, include Greenhouse Operations Management, Herbaceous Ornamental Plant Production and Floral Crops Production and Handling. Chad Miller is responsible for teaching the plant identification courses for the department: Landscape Plants I and II. In addition, Miller co-teaches the Pre-Internship Course for incoming/transfer students and the Plant Propagation course. Judy O'Mara teaches an undergraduate plant pathology course in diseases of landscape and commercial production problems.

There has been increased activity and focus on providing international experiences for the horticulture students. Stuart Warren, Cathie Lavis and Chad Miller have regularly offered international study abroad trips for students. Previous trips have included visits to England, Wales, Italy, Australia and Costa Rica. Miller is currently planning a study abroad trip to the Netherlands, Belgium and France to visit different greenhouse and nursery production facilities and gardens.

Kansas State University Gardens. Under the leadership of Scott McElwain, the KSU Gardens (www.ksre.ksu.edu/ksugardens) are horticulture display gardens established as an educational resource and learning laboratory for students and the public. The garden boasts a large daylily, bearded iris and rose collection. The gardens are a privately funded project, located on campus and are in the progress of expanding. When all expansion phases are completed, the gardens will encompass around 19 acres. Faculty

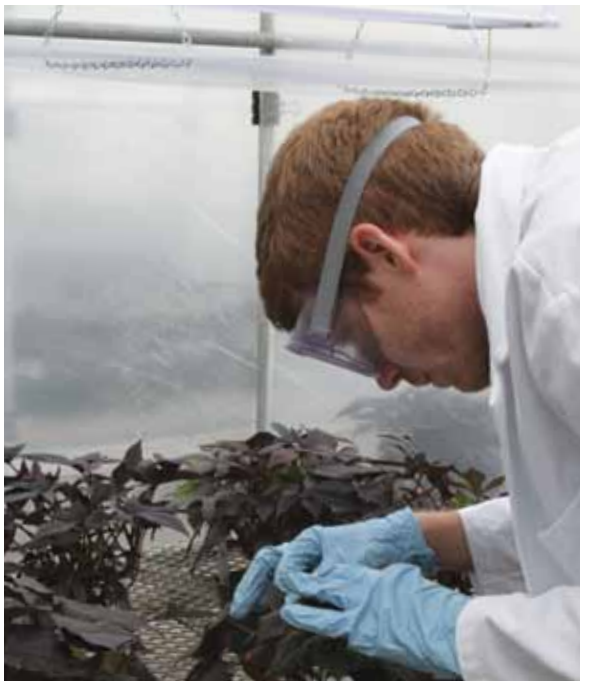
and students utilize the KSU Gardens as a part of their courses. The gardens serve as an excellent teaching tool for Chad Miller's plant identification courses, where students get hands-on experience and insight into various plant materials. Each year students in Kim Williams' production course produce several of the All-American Selections plant winners that are displayed, along with other annual flower crops.

International internships. Kansas State University and Zamorano University in Honduras have established an internship program, in which as a part of the Zamorano degree program, students participate in an internship to gain professional experience, a part of the 'Learn by Doing' philosophy. In recent years, several members of the floriculture program have had international interns participate in their research and teaching programs. Ray Cloyd, Kim Williams and Chad Miller have all hosted interns from Zamorano.

Floriculture Research

Physiological disorders. A series of research projects focuses on understanding the mechanisms behind the physiological disorders of edema and intumescences on greenhouse-produced crops such as ivy geranium and tomato. Chad Miller, Kim Williams and Joshua Craver are currently investigating how ultra-violet light influences intumescence development on the ornamental sweet potato vine.

Plant nutrition. One aspect of Kim Williams' plant nutrition projects focuses on adapting organic fertilization to greenhouse cropping systems. This includes developing techniques to manage nutrition provided by organic fertilizers in hydroponics and soilless substrates, evaluating organic fertilizer impact on plant architecture, and investigating the impact of organic fertilization on microbial activity in soilless substrates. Another focus of Williams' research includes use of calcined minerals as a component of soilless substrates to increase their nutrient retention, reduce water use and minimize nutrient leaching.



Ultra-violet light research on sweet potato vine

Ornamentals. As a part of Chad Miller's research, in conjunction with commercial

growers, research has been conducted investigating different PGR applications for controlling height of different bulb crops, including amaryllis and calla lily. Other research investigating forcing specialty bulbs for greenhouse forcing production is also being conducted.

Insect and mite pest management. Raymond Cloyd has developed a research program for greenhouse-grown floricultural crops associated with management of the major insect and mite pests including spider mites, western flower thrips, whiteflies, fungus gnats and mealybugs. Currently, his research emphasis includes: 1) incorporatiing entomopathogenic or beneficial fungi (e.g., *Beauveria bassiana*, *Isaria fumosoroseus* and *Metarhizium anisopliae*) into rotation programs against the western flower thrips (*Frankliniella occidentalis*) in order to avoid the potential for resistance and preserve existing insecticides; 2) understanding the effects of systemic insecticides against the citrus mealybug (*Planococcus citri*) and how feeding behavior may affect efficacy of these types of insecticides; 3) using barriers applied to the growing medium to prevent emergence of fungus gnat (*Bradysia* spp.) adults and reduce egg-laying by females; and 4) investigating the use of the rove beetle (*Dalotia coriaria*) as a biological control agent against fungus gnats and their susceptibility to pesticides (e.g., insecticides and fungicides) and plant growth regulators. In addition, Cloyd evaluates new compounds in pesticide efficacy trials throughout the year.

Floriculture Outreach and Extension Activities

Floriculture. Alan Stevens has the floriculture extension responsibilities in the horticulture department. He is based at the Kansas State Research and Extension Center in Olathe, near Kansas City. Ray Cloyd of entomology, along with Megan Kennelly and Judy O'Mara in plant pathology, all have extension appointments and provide leadership for helping the floriculture industry manage related pests.

Plant disease diagnostics. The Kansas State University Plant Disease Diagnostic Laboratory processes more than 1,000 samples a year from a diverse array of commodities, including commercial ornamental horticulture. Judy O'Mara is the director of the laboratory and works closely with the faculty extension specialists. Megan Kennelly works with commercial horticulture crops, conducting many of the diagnostics, and she provides management information for those commodities. The diagnostics lab identifies diseases caused by fungi, bacteria, viruses and nematodes as well as abiotic/environmental stress problems. Information about the laboratory and services, including instructions and fees can be found at www.plantpath.ksu.edu/p.aspx?tabid=725. Kansas State University also serves as the hub for the Great Plains Diagnostic Network (www.gpdn.org), a consortium of nine states established to assist in quickly detecting, identifying and communicating pest and pathogen concerns in the region. The GPDN

is part of the larger National Plant Diagnostic Network (www.npdn.org).

Kansas Greenhouse Growers Association. The Kansas Greenhouse Growers Association organizes a bus trip in September every other year that visits greenhouse/nursery operations throughout the Midwest, which allows greenhouse growers and owners to evaluate other facilities. The association also conducts an annual educational conference in October. The conference typically includes presentations on marketing, new varieties and cultivars, growing medium issues, pest management and components of greenhouse production. The topics presented are relevant to retail and/or wholesale greenhouse operations and garden centers. In addition, the conference always has greenhouse growers or owners give presentations on their operations and how they have been successful. The conference has an attendance of 50 to 60 individuals including greenhouse growers and owners, extension agents, industry personnel and horticulture students. Raymond Cloyd serves as the faculty adviser for the association and is responsible for organizing the educational conference.

Grower and extension publications. Numerous publications have been developed and made available to the growers and producers online. Raymond Cloyd has developed several extension publications associated with the management of several of the major insect and mite pests of floricultural crops including western flower thrips, fungus gnats, bulb mites, broad and cyclamen mite, two-spotted spider mite and mealybug. He has also developed extension publications on resistance management and pesticide rotations, pesticide mixtures and pesticide metabolites. These and other publications relating to greenhouse production, management and identification of diseases and their control, and other issues pertaining to floriculture crop production can be found at the following sites:

Floriculture:
www.hfrr.ksu.edu/p.aspx?tabid=282
Entomology:
http://entomology.k-state.edu/extension/publications/
www.ksre.ksu.edu — (search for 'Cloyd publications')
Plant Pathology:
www.plantpath.ksu.edu/p.aspx?tabid=49

Plant Trials

Poinsettia trials. Each fall, over 50 poinsettia cultivars from several major breeding companies are trialed at Kansas State University. The trialing is conducted in the Greenhouse Operations Management course, providing the students with hands-on, real-world learning experience. At the end of the fall semester, Kim Williams conducts an open house, inviting the community to come and view the trials and participate in a consumer preference survey. Results from previous trials can be found at www.ksre.ksu.edu/poinsettias/p.aspx?tabid=1.

Prairie Star program. Prairie Star Flowers

is the Kansas State University flowering plant field trials research program, led by Alan Stevens and research associate Robin Dremsa. The comprehensive Prairie Star Flowers program evaluates annuals (Prairie Star), perennials (Prairie Bloom) and flowering woody shrubs in field research trials. The primary trial site is located off campus at the 345-acre Kansas State University Horticulture Research Center near Kansas City with secondary sites in Wichita, Hays and Colby, Kan. Successful Prairie Star trial plants are internationally recognized by plant breeders and distribution companies through notations in their catalogs and at displays at industry events, such as the California Pack Trials. The independent, research-based information provided by the Prairie Star Flowers program has benefitted Kansas greenhouse growers, garden centers, landscapers and home gardeners. Every summer the research center hosts open houses for horticulture industry professionals and the general public. The 2013 flower field day for horticulture industry professionals is Tuesday, July 23 and the general public open house is Saturday, July 27. A complete list of plants, pictures and research reports are maintained online at www.prairiestarflowers.com. Information about the trials can also be found on the recently added Prairie Star Flowers blog: www.prairiestarflowersblog.com.

All-America Selections Trials. The All-America Selections' (AAS) mission is to promote new garden seed varieties with superior garden performance. Each year, Alan Stevens and Robin Dremsa conduct AAS flower trials at the Kansas State University Horticulture Research Center. Cary Rivard also conducts AAS vegetable trials. Field days and open house events are coordinated, inviting growers and producers, along with the general public to view the trials. In addition, the Kansas State University Gardens is one of approximately 200 AAS display gardens in the United States, which provide opportunities for visitors to view the newest AAS winners in an attractive display.

Future Floriculture at KSU

It is an exciting time for greenhouse production at Kansas State University. The group continues to work with the regional and national industry, aiming to provide valuable information and results relevant to greenhouse industry needs. The support the industry provides is appreciated and the group looks forward to developing further partnerships.

Chad Miller is assistant professor of horticulture, Raymond Cloyd is professor of entomology, Kimberly Williams is professor of horticulture, Alan Stevens is associate professor and director of K-State Research and Extension Center—Olathe, Megan Kennelly is associate professor of plant pathology, Judy O'Mara is instructor/diagnostician of plant pathology and Scott McElwain is director of KSU Gardens. Miller can be reached at ctmiller@kstate.edu.